PROJECT 142

NONDESTRUCTIVE EVALUATION

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RAPID LEAK DETECTION FOR SEA FLOOR PIPELINES:

DEVELOPMENT OF PRACTICAL NEW METHODS

by

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1. SUMMARY AND RECOMMENDATIONS

1.1 Leak Detection Performance Goals

The overall objective of this project is to define what is meant by a pipeline leak and what is practical for immediate leak detection. This is the Phase I preliminary planning effort, limited to about 100 person-hours. It includes a preliminary definition task, literature and telephone surveys to acquire all information, and development of a practical philosophy and planning options with approximate costs.

This report first presents the types and causes of sea floor pipeline leaks. Discussion illustrates that each line segment can be assigned a risk level, characterized by likely spill scenarios, approximate spill volumes, and consequences. Two major factors cause spill sizes to be high - from 25,000 to 750,000 gallons:

1) leak detection and shutdown time limitation (typically 10 minutes to hours)
2) long response time to stop leakage from the pipe (remote-operated valves can significantly reduce this problem)

Achievable criteria are proposed for rapid ("immediate") detection (1 to 20 minutes) and pinpointing of large (6" break) to tiny (.003" pinhole) leaks. Spill size can be reduced by half for large breaks, or by 90% for small spills. To perform immediate detection, a method must monitor continuously and detect immediate effects! This requires extreme sensitivity and reliability. Pinpointing requires accurate information about leak location.

The efficiency of presently used detection methods is estimated for large and small leaks. Improvements in detection methods - sensing, data transmission, and analysis - are all critical to rapid response and leak reduction.

1.2 Summary of Survey and Evaluation Procedures

NDE Environmental Corporation conducted a survey to select state-of-the-art methods for leak monitoring and pipeline inspection. This included an extensive literature search, and a telephone and mail survey of equipment vendors, appropriate experts, and users of inspection and detection methods. We performed seven searches of the technical literature using four computer data bases.

Review and evaluation of this literature provided a "shopping list" of techniques and equipment for future development. We studied conference proceedings, in-house references, and technical society memberships to select vendors, experts and users for personal contact. The telephone survey gave practical and evaluative information in the form of written notes, reviews and analyses. The end result was a "short list" of promising future techniques. These require further development to demonstrate immediate detection.

1.3 Research and Development Recommendations

The most promising technologies were: acoustic emission continuous monitoring, hydrocarbon monitoring using a newly developed ECL (electrochemiluminescent) optical electrode for sensor, real-time math models tied to SCADA (Supervisory Control And Date Acquisition) systems, and fiber optic strain monitoring systems.

Acoustic emission systems offer the singular advantage of detecting a critical pipeline deficiency prior to a break. This is the optimum in immediate leak detection! Real-time computerized math models are presently in use on inland pipelines, but have not yet been proven for offshore pipelines. Aircraft and satellite surveillance are also state-of-the-art; however, costs are high to provide coverage required for immediate detection, and weather limits performance.

The other methods show high promise in sensitivity and immediacy, but require further development and demonstration. All results are preliminary but indicative. Further work is necessary to adequately specify the promising systems and their research needs. The Phase II program to provide rapid leak detection for offshore pipelines is shown in Section 5.

2 BACKGROUND:

LEAKS AND LEAK DETECTION FOR SEA FLOOR PIPELINES

2.1 Sea Floor Pipeline Leaks: Types, Causes, Consequences

Leaks from sea floor pipelines are just as frequent as pipeline leaks on land (Reference 5, p. 3-22 to 3-29). Further, the risk of subsea pipeline spills is about the same as tank vessel spills and other oil transportation disasters (Reference 5, p. 3-16 to 3-20). Such leaks can be catastrophic events, causing extensive environmental damage, human injuries or fatalities. Sometimes fire or explosion also occurs. Leaks may be undetectable small spills of 1-5 gallons per hour from pinhole leaks caused by pipeline wall defects. However, a major rupture may be caused by a well blowout, releasing thousands of barrels an hour until discovery and shutdown.

Some leaks may be discovered quickly. A large rupture causes a large pressure drop on instrumentation at offshore facility or shoreside. Valves may be closed in less than an hour in such cases. Unfortunately, essentially all the oil between valves escapes to the environment after the shutdown. Earlier discovery and identification can significantly reduce the loss and damage. Other smaller leaks may be discovered quickly in areas of heavy vessel and aircraft traffic, during the day.

However, many leaks of any size can spill ten thousands of barrels before detection and shutoff. The pressure drop due to a major rupture might not be noticed due to operator inattention! A large leak may go unnoticed for ten hours or so if it occurs in isolated offshore areas or at night. Much smaller leaks can go undetected for months if:

- o the leak rate is small enough not to be noticed by inventory and control systems
- o ocean currents and weather disperse the oil at the sea surface

Causes of pipeline leaks range from external impacts on the pipeline (anchors, vessel keels, dredges) to metallurgical defects in the pipeline wall. Investigation of accidents often turns up contributing factors just as important as the obvious cause. Table 1 lists many of the causes and contributing factors for pipeline leaks, and shows the likely leak rate magnitude and final consequences. The ratings are L for Large, M for Medium and S for Small.

The type of accident or cause partly defines the scenario. This helps describe the likely risk and consequences. Wellhead blowouts are normally some distance offshore, but immediately endanger the drilling or production crew with attendant fire/explosion hazards. Firefighting and evacuation gear are required right away, while spill cleanup equipment can arrive within four to six hours. Anchor damage to a line is likely to occur closer to shore, and faster environmental response is required to shut down the line and clean up.

TABLE 1. CAUSES OF SEA FLOOR PIPELINE LEAKS

Causes & Contributing Factors	Probable Leak Rate	Probable Consequences
Physical damage due to:		
o anchor dragging	L - M	L
o trawler damage	L - M	L
o vessel grounding	L - M	L
o dredging operations	L - M	L
o sabotage (possible)	L	L
o earthquake	L - M	L - S
o geological instability	M - S	L - S
Catastrophic rupture due to:		
o wellhead blowout	L	M
o platform fire/explosion	L	M
Seam break		
o weld failure	M - S	S
Corrosion, external scaling, pitting		
o damage by crustaceans and/or sea water	S	S
o missing or damaged cathodic protection	M - S	M - S
o missing concrete or insulation coating	M - S	M - S
Corrosion, internal		
o pipeline wall defects	S	S
Overpressure		
o surges in product pressure	M - S	S
o hydrostatic test conduction	M - S	S

L = Large M = Medium S = Small

Working from a knowledge of:

- o shipping lanes, routes and channels,
- o fishing areas
- o pipeline location on bottom contour charts,
- o seismic and geological maps,

risk levels can be assigned to each pipeline segment for large, medium and small leaks. From estimates of likely response times to shut down the line and clean up, spilled volumes can be estimated. Various leak detection and pinpointing times can be assumed. Until the leak is identified and pinpointed, the spilled volume continues to multiply as:

Leak Rate x time.

This multiplication effect is incredibly large for major leaks from offshore pipelines. Typical crude oil lines are 4 to 12 inches in diameter and operate at 200 to 700 psi pressure. Smaller leaks can also result in very large discharges because the detection time can be so much longer. As the size of spillage increases, all potential consequences become greater:

- o fire/explosion hazard - near platforms, wellheads, and in harbors, especially
- o environmental damage - especially to recreational beaches, productive estuaries, and marshlands
- o financial and property losses due to fire, environmental damage, and lost oil, etc.
- o lost oil

2.2 Detection Improvements Critical to Rapid Response

Now, detection of sea floor pipeline leaks depends almost entirely on visual observation from the air, sea, or offshore facilities. The sensitivity and reliability of current visual observation cannot be estimated except in high traffic areas for helicopters (platform servicing helicopters, especially). The potential for improvement in detection is therefore large, and resulting mitigation impacts are highly beneficial. The goal of this project is to define present and future possibilities for leak mitigation by newer and more rapid detection methods.

Relevant leak scenarios can be developed to typify risks for different pipeline segments. These can be used to estimate the response times required to mitigate by:

- o shut down the line and minimize the spill
- o stop the leak, and prevent further spillage
- o contain the spilled oil, to optimize treatment and cleanup
- o commence treatment of spilled oil, e.g., by dispersant
- o start cleanup using skimmers, beach cleanup, etc.

Table 2 lists and classifies leak detection and pinpointing methods presently used. They are classified as to their primary

TABLE 2. ESTIMATED EFFICIENCY OF PRESENTLY AVAILABLE DETECTION METHODS

Description of Methods and Deployment	Present Usage, Sea Floor P/L	Detection Time Estimate	
		Small Leak	Large Leak
CONSTANT MONITORING			
Real-Time Computer Math Modeling Systems	S	30m - 2h	1m - 5m
Chemical Monitoring, e.g., Hydrogen Sulfide	S	30m	2m - 24h
SURVEILLANCE (Daily or better)			
by Aircraft:			
Visual observation	H	15m - 1wk	5m - 6h
Side-Looking Airborne Radar	S	1h - 24h	1h - 24h
Ultraviolet (UV) and Infrared (IR) Linescanner Instrumentation	S	1h - 24h	1h - 24h
Forward-Looking Infrared (FLIR) Imaging		1h - 24h	1h - 24h
High-Resolution Reconnaissance Photography	S	6h - 48h	6h
by Satellite:			
High-Resolution Reconnaissance Photography		4h - 24h	4h
INSPECTION AND TESTING (NDT) OR PINPOINTING	Performed annually or less often, and to pinpoint a known leak		
by Submarine, Towed or Propelled ROV (Remote-Operated Vehicle)			N.A.
High-Resolution Colour-Imaging Sonar System	M	Pinp: 12h-72h	N.A.
Side-Scan Sonar	H	Pinp: 12h-72h	N.A.
Hydrophone	M	Pinp: 12h-72h	N.A.
Cathodic Protection Survey	S	1y - 3y	1y - 3y
by Diver			N.A.
Hydrophone		Pinp: 8h- 48h N.A	N.A.
Magnetic Particle Inspection		N.A.	N.A.
Smart Pig		Inspection	N.A.
Caliper Logging		1y - 3y	1y - 3y
Photographic or Television Logger		1y - 3y	1y - 3y
Magnetic Flux Logging		1y - 3y	1y - 3y
Ultrasonic Logging		1y - 3y	1y - 3y
Hydrostatic Pressure Test		1y - 3y	1y - 3y
Air Pressure Testing		1y - 3y	1y - 3y

deployment method. The major efficient method of detection is by visual observation from aircraft, and the primary pinpointing methods are either visual from the surface or underwater sonics such as sonar and hydrophone. Current usage is estimated as high (H), medium (M) or low (L). Detection times, as well as some pinpointing times, are estimated for small and large leaks.

Constant monitoring methods can potentially detect even small spills (down to some lower practical limit in gallons per hour) in minutes. There are now several reliable real-time computer math modeling systems on the market. Many have been in use for several years on land-based pipelines. Few if any have yet been applied to subsea pipelines. The one chemical monitoring system that has been used for a subsea pipeline, is not primarily intended for the subsea portion of the line.

The four airborne sensor systems listed are not routinely used for surveillance in the U.S. The Coast Guard has downgraded their use to operational spills only, because of expense of aircraft surveillance. Other nations such as Italy and the Netherlands are beginning routine aircraft surveillance using these sensors. The sensitivity, resolution and reliability of these combined instrumentation packages have been proven in practice, according to several Coast Guard sources.

Satellite deployment has not as yet offered adequate reliability, due to cloud cover, nor the desired resolution for detecting small spills.

Most of the inspection and testing techniques listed on Table 2 are most suitable for:

- o periodic monitoring of integrity or condition of a pipeline
- o pinpointing leaks already detected by surveillance (visual)

Periodic testing is highly important as a long-term means of preventive maintenance, and possible detection of very small leaks. Pinpointing is most efficiently conducted using ROV's with the several sonic systems listed. Divers may also be used, but have limited stay times at depths close to 200 ft. Pinpointing times are high because of the time required to transport and deploy an ROV at the pipeline site.

The bottom line is that detection time for a very large pipeline break (6" hole) will probably be from 10 minutes to 1 hour, and the main valves can be closed very quickly to drop the pressure. Before the valves are closed, or the pumps shut down, 250,000 gallons can easily leak into the sea. After shutdown leakage continues more slowly until:

1) the leak itself is stopped (plugged), or

2) most of the pipeline contents between valves is released

The response time to actually stop a leak may be ten hours or more, and the likely spill size is 550,000 - 750,000 gallons. For a smaller leak (say a 1" hole), detection is more delayed and the final spill size may be 25,000 to 50,000 gallons.

These spill sizes can be minimized, even reduced to about half, by the using a constant monitoring technique. Such methods can reliably detect and pinpoint the leak within a few minutes. Several techniques show promise of achieving this goal in the field. Acoustic methods have been demonstrated, but require further refinement and field testing. Some chemical detection techniques have extreme sensitivity, but feasibility has not yet been demonstrated. Some new deployment methods for pipeline sensors are now available, but untested. Adequate pinpointing resolution is needed. New fiber optic sensors are now being designed into aircraft structures to provide strain monitoring of entire airframes. These new sensors may also prove viable for new pipelines.

2.3 Rapid Detection Performance Goals for Methods and Strategies

Even with immediate detection of a leak, the spilled oil may approach the volume of oil between pipeline closure valves. This problem is best mitigated by developing new standards for distance between valves, and policy for remote-operated valves. Investigation of these possibilities is recommended for future work in Section 5.

Immediate leak detection may be arbitrarily defined as the goal:

- o detect all spills of > 50 gph within 20 minutes
- o pinpoint location of detected spills to accuracy of +/- 50 ft within less than 30 minutes of occurrence
- o detect larger spills in appropriately smaller times

If larger spills can be detected as follows:

Size of Leak	Approximate Spill Rate	Detection Time	Pinpointing Time
large, 6" break	~1,000,000 gph	1 min	+ 3 min
small, 1" hole	~ 25,000 gph	2 min	+ 5
minor, 1/4"	~ 1,000 gph	5 min	+ 7
tiny, .003"	~ 50 gph	20 min	+10 min

then the spill size can be limited as follows:

Size of Leak	Spill Size, X min Detection	Spill Size when Pinpointed	Spill Size when Plugged
large, 6" break	20,000 gals	32,000 gals	350,000 gals
small, 1" hole	1,000 gals	1,100 gals	8,600 gals
minor, 1/4"	100 gals	101 gals	400 gals
tiny, .003"	25 gals	26 gals	50 gals

A minute or two is required to close valves isolating the leak. A median time of ten hours has been assumed to plug the leak, considering the logistics required for accomplishing this. These criteria assure that the volume of spilled oil is primarily due to the time required to plug the hole, stopping the leak. The above numbers are approximate - but serve as practical criteria for discussion purposes at this time.

A prospective new detection method must have great sensitivity and resolution to meet the above detection and pinpointing times for smaller leaks. This is particularly difficult because crude oil lines are noisy - variations in pressure from the well, changing temperature along the line, two-phase flow, turbulence. Resolution criteria may only be feasible for deployment of sensors along the line, and this is realistic only for new pipelines. Potential deployment methods for each new method must be carefully evaluated and designed to optimize pinpointing resolution and also meet reliability goals.

3. LEAK MONITORING AND PIPELINE INSPECTION AND METHODS

A survey was conducted to determine state-of-the-art methods for pipeline inspection and leak monitoring. The purpose of the survey is to identify those techniques showing promise for rapid detection and pinpointing of sea floor pipeline leaks. The following sections describe the types of surveys and results.

3.1 Literature Survey: State-of-the-Art Pipeline Inspection and Leak Monitoring Methods

A computer data-base search was conducted to turn up sources of new research and development information world-wide that might not be in our own library of information. Several data bases were interrogated using the services of NASA Industrial Application Center (NIAC) at University of Southern California, Los Angeles, California. The citations from these surveys are printed in Appendix A in the following sections:

A.1) NTIS - [National Technical Information Service Data Base]

- Leak Detection in Subsea Pipelines

A.2) APILIT - [API Literature Data Base]

- Monitoring and Inspection of Pipes
- Nondestructive Testing of Pipes

A.3) Compendex

- Monitoring and Leak Detection in Subsea Pipelines
- Inspection of Subsea Pipelines

A.4) NASA Recon Data Base

- Leak Detection in Pipelines
- Nondestructive Tests of Pipes or Pipelines

A total of seven extensive searches were conducted through the four databases. The search titles given above only hint at the complexity and exhaustiveness of the search methods, key words, sources and review method. Emphasis or limitation was given to recent work. Section 6, References, cites earlier work in NDE Environmental Corp.'s technical library, that was also reviewed.

Citations and abstracts were reviewed and culled for specific applicability. Technical libraries in the Los Angeles area were combed to obtain as many as possible of these. About seventy-five technical papers were read to identify and evaluate methods, suitability, feasibility, stage of development and demonstration, and costs. Several new methods were found. Many improvements and innovations in well-known techniques, such as air pressure testing, were also reported. Table 3 lists and categorizes the important leak monitoring methods now and into the near future.

TABLE 3. LEAK DETECTION METHODS

DESCRIPTION OF LEAK DETECTION METHODS AND DEPLOYMENT	PRESENT USE	FUTURE PROMISE
CONSTANT MONITORING		
Real-Time Computer Math Modeling Systems	S	H
Chemical Monitoring, e.g. H_2S	S	M
Tracer Monitoring	-	H
Acoustic Monitoring	-	H
Fiber Optic Strain Monitoring	-	H
SURVEILLANCE (Better than daily)		
by Aircraft:		
Visual only	H	S
Side-Looking Airborne Radar (SLAR)	S	M
UV and IR Linescanner	S	M
Forward-Looking Infrared (FLIR)	-	M
High-Resolution Reconnaissance Photography	S	M
Active Gated Television	-	M
by Satellite:		
High-Resolution Reconnaissance Photography	-	M
INSPECTION AND TESTING (NDT) OR PINPOINTING		
by Submarine, Towed or Propelled ROV: (Remote-Operated Vehicle)		
High-Resolution Colour-Imaging Sonar	M	H
Side-Scan Sonar	H	H
Hydrophone	M	H
Cathodic Protection Survey	S	M
Ultrasonic Testing	-	M
by Diver:		
Hydrophone	-	-
Standard NDT, magnetic, ultrasonic	-	-
Smart Pig:		
Photographic, magnetic, ultrasonic	-	-
Hydrostatic Testing, Air Pressure Tests	-	-

H=High Usage M= Medium S=Small

As this document is being prepared, additional references important to the topic and bottom-line results are arriving daily. There are also many poignant references that have not been readily available at local sources. It is recommended that further efforts be undertaken to pursue the objectives in greater depth. Results presented here must be considered preliminary, and are of insufficient detail for the planning of serious research and development of the newer techniques.

3.2 Survey of Vendors and Leak Detection Experts

Vendors of equipment and services, as well as research and development firms, were contacted in order to:

- o identify additional techniques, present and future, that are practical for rapid detection of sea floor pipeline leaks
- o learn of improvements and variations of known methods, that may provide improved detection comparable to other known and future techniques

Experts in relevant areas of inspection, NDT, sensor technology and spill/leak response were contacted to review and assist in the evaluation of available and future technology as applied to undersea detection. In addition, many users of detection and inspection equipment and services, for example, oil drilling and production companies offshore, were also contacted to provide realistic appraisal of the utility, feasibility, costs and potential problems of innovative methods.

A survey form, Figure 1, was developed to gain information and insight from the vendors, experts and users, foreign and domestic, in a structured format. This form was sent by mail or telefacsimile for rapid response.

Appendix B provides the lists of industry vendors and users, as well as a separate listing of experts (including government officials) contacted to provide information and opinion regarding the methods.

To accomplish this survey, a total of 12 vendors, 14 users and 8 experts were contacted personally. A total of 10% responded to the survey questionnaire. Responses verbal and written were insightful and highly valuable in forming conclusions and recommendations. Technical results of both literature and vendor/expert/user surveys are summarized in the following section.

3.3 Survey Findings for Rapid Response

Significant reductions are urgently needed in detection and pinpointing time. Minimizing detection time enables rapid response to shut down and plug leaks. This will provide the greatest reduction in accidental leakage volume from sea floor pipelines. We estimate achievable reduction of about one-half for the larger breaks, to 90% or greater for the smaller spills.

FIGURE 1. QUESTIONNAIRE ON RAPID DETECTION OF LEAKS ON OFFSHORE PIPELINES

1. NAME: ADDRESS:
   COMPANY: PHONE:

2. Do you perform NonDestructive Testing (NDT) of pipelines, preferably subsea pipelines: if not, could your equipment do the type of testing required for rapid leak detection?

   a. If your company does not do NDT testing could you recommend a company that does?

3. What methods do you use for rapid leak detection on pipelines?

   a. What methods would you like to use for rapid leak detection?

4. What are the most recent or advanced methods being used that you have heard of that show promise and where were they used?

   a. What's in store for the future for rapid leak detection, in your opinion?

5. What in your opinion is the most effective method being used?

   a. Use the table below; what experience do you have in using these methods?

6. Do you have any recommendations for research of any promising methods?

7. Would you be willing to use a new method and what types of performance would you need to justify its use?

8. Please list organizations or companies you would recommend we contact that may have done research.

9. The table below provides a summary of typical methods that can be used for rapid leak detection of pipelines. Please fill in the table for any method you have experience with or a promising method that you believe may work. The table is for ball park estimates.

TABLE I

SUMMARY OF METHODS FOR RAPID LEAK DETECTION

METHOD	DETECTION TIME	SENSITIVITY	PIN-POINTING	SPILL SIZE (MINIMUM)
	HOURS	GPH	FEET	GALLON
ACOUSTIC				
PRESSURE				
CABLE				
MATH MODEL				
REMOTE-PLANE				
VEHICLE ABOVE PIPE				
REMOTE-SATELLITE				
ELECTRO PIG				
OTHER (1)_____				

NOTE OTHER (1): Airborne infra red/stereo camera systems/Photogrammetic Side-scan sonar/ROV's/Ultra sound, etc.

Immediate detection requires sensing direct information from the leak that is highly characteristic (leak signature) and has information about the location. A pipeline leak causes several immediate detectable effects:

- o a reduction in pressure and loss of fluid volume in the line
- o an acoustic wave through both the pipe and the fluid
- o discharge of oil into the sea, adjacent to the leak location
- o strain of pipeline wall material prior to and during the leak
- o appearance of oil at the sea surface after time delay (depends on oil properties, quantity, sea state and currents)

Immediate detection of a leak by means of reduction in pressure and loss of fluid volume is present state-of-the-art for large leaks. SCADA (Supervisory Control and Data Acquisition) systems are installed on many pipelines to allow inventory control. Real-time computer math models have been designed and installed on many pipelines to optimize and improve the value of SCADA systems, including modeling designed to detect and locate leaks. Crude oil lines from producing wells at sea are subject to pressure and temperature changes, two phase flow, etc., all of which cause difficulties in computer modeling identification and pinpointing. To counter these types of problems, simulation engineers have developed additional algorithms to provide checks and balances:

- o rapid pressure change detection - the simplest
- o volume balances - the most accurate in the long term
- o P, T, flow, and density - compare math model and SCADA data (Pressure, Temperature, flow and density)
- o deviations analysis - most accurate in the short term
  - enables leak pinpointing

In spite of greater difficulties for math modeling as a leak detector for sea floor pipelines, the present state of sophistication is very good and getting better every year. References 23 and 24 are two companies providing computer systems to work with a pipeline SCADA, and Reference 25 discusses the selection, design and implementation of this type of real-time leak detection system, for a particular pipeline. This type of system can be installed on existing and new pipelines, but does require SCADA instrumentation.

Acoustic emission (AE) technology recognizes characteristic frequency spectra of the acoustic wave emanating from leaks, as distinguished from background noises. If measurements are taken at two or more positions along a pipeline, the location can be calculated from time differences and signal intensities. The technology is not new, but has been under constant development, refinement, and application to new engineering systems. It is used in fault monitoring systems for nuclear pressure vessels, power plants, and other machinery. It has been demonstrated by NDE Technology, Inc. for application to deepwater port hose leak monitoring (Reference 5) at two facilities. Sensitivity can be as low as 1 gph. In fact, acoustic emission signals from incipient leaks can be detected and located. This offers the unique opportunity to prevent leaks! Real-time computer analysis is used to recognize leak signatures and calculate the leak location.

Although it is possible to utilize only the two points at both ends of a pipeline, it is desirable to sample more locations along longer pipelines. In principle, the method can be used for existing as well as new pipeline installations. In practice, accessibility for additional measurement points, and data transmission requirements must be looked at, especially for existing lines. This method is high on the list of new monitoring techniques since its feasibility has been demonstrated in many applications, as well as offshore (Reference 5 and 26). Results in the literature demonstrate (References 27 and 28) that AE is reliable even with high background noise conditions. This make it particularly suitable for immediate leak detection for offshore pipelines.

It is possible to detect the oil discharge into the sea immediately as well. To do this reliably and efficiently requires deployment of chemical sensors along the pipeline. Some chemical detection techniques applicable to on-land pipelines just would not work for subsea pipelines. For example, Leak Alert, of Anaheim, CA has developed a system applicable only to desert areas, since it detects and locates leaks based simply on liquid sensing. Other sensors detect petroleum, but do not function well underwater.

Another land pipeline leak detection and locating technique involves laser detection of vapors from leaking oil, above the pipeline. This would not work well under water because of turbidity. Methane and other light hydrocarbons can be readily detected, but the many sensor signals must generally be amplified and transmitted (usually by cable) to a terminal location. Chemical sensors must be extremely sensitive, since the oil is rapidly floated upwards by gravity. There is therefore little opportunity for the chemical to diffuse laterally to sensors that may be too widely spaced.

Dr. Myles Walsh of Cape Cod Research and Paul Heckman of Naval Ocean Systems Center are proposing to apply a novel tracer technique to underwater leak detection. A specific electrochemiluminescent optical electrode has been developed that is extremely sensitive to petroleum hydrocarbons dissolved in water (Parts per billion range for contaminants such as benzene). The development is being undertaken by the Air Force Engineering and Services Center at Tyndall AFB, FL, to provide the Air Force a reliable and sensitive device for underground monitoring. This sensor is so sensitive that deployment spacing may not be so critical. One fiber optic cable should be able to carry the signals multiplexed from many sensors, thus minimizing the problem of data transmission. The device is resistant to pressure as well.

The age of fiberoptic sensors is developing very rapidly. Strain and temperature are readily detected, and the sensors can be embedded in structures (References 29, 30, 31, 32, 33) and the sensor information can be transmitted through structures along optical fibers that can also be embedded in materials. Such a system has been designed for aircraft structures, and aircraft are likely to have the first "smart structure." Nonetheless, specific proposals are already in print (References 30, 31, 32) regarding application to pipelines. Demonstration of feasibility for underwater pipelines is the next step.

Underwater pipeline leaks will be accompanied by dramatic changes in strain at the leak location, and likely change in temperature on the outside of the pipe due to discharging fluid. Detection would be immediate, and not subject to problems due to the noisy fluid flow of subsea pipelines. A composite material coating the pipeline could contain both the embedded sensors and optical fiber transmission lines. Fiber optic systems appears well suited for new pipelines, but may be awkward for retrofits.

Additional techniques may be deployed for surveillance from aircraft or satellite, to detect oil leaked to the sea surface. Aircraft surveillance using several types of sensing instrumentation is being successively initiated by one country after another, usually by the Coast Guard. The U.S. Coast Guard was first to initiate such a system, the HU-25B Aireye aircraft, equipped with:

- o Side Looking Airborne Radar (SLAR)
- o Infrared and Ultraviolet Line Scanners (IR/UV)
- o High-Resolution KS-87B Reconnaissance Camera

The U.S. Coast Guard has provided a brief description of the system (Reference 34), which includes the proposed Active Gated Television System (AGTV) planned for 1993. This system will be a combination of low light level TV and gated laser illuminator (for night operations). The aircraft has never really been deployed for monitoring surveillance, since Congress has not funded this continued operation. Other nations have taken this calling, however, as recent papers (1987 and 1989, References 35, 36, 37, 38, 39) document. Forward Looking Infrared (FLIR) imaging is used by many systems to facilitate the search for and location of targets. Datalinks are used to provide immediate downlink to control centers for data processing, analysis and recording. Figure 2 diagrams the information flow for the Swedish Real-Time Surveillance System (Reference 39).

Although this type of system probably cannot satisfy our goals for "immediate" detection, it is today's best answer at the regulatory level. Detection and locating time are limited by:

- o appearance of the oil at the sea surface
- o arrival of aircraft in position to detect the spilled oil

These times are somewhat variable, but the second can be planned and managed by the surveillance agency. All parties agree that this type of surveillance has now arrived, and will be here to stay for some time.

Satellite surveillance may very well be possible, especially with newer military surveillance capabilities. We do not know how accessible the technology is, but documentation of capabilities has been shown in the press. Nonetheless, we only found readily available satellite systems promising no better than 28 meter resolution. This would not be adequate for small spills at all. More research must be done in this area. IR sensors are quite useful from space as well. Further work is needed identify good sources. We have limited information from the Earth Observation Satellite Company, cited in Appendix B.

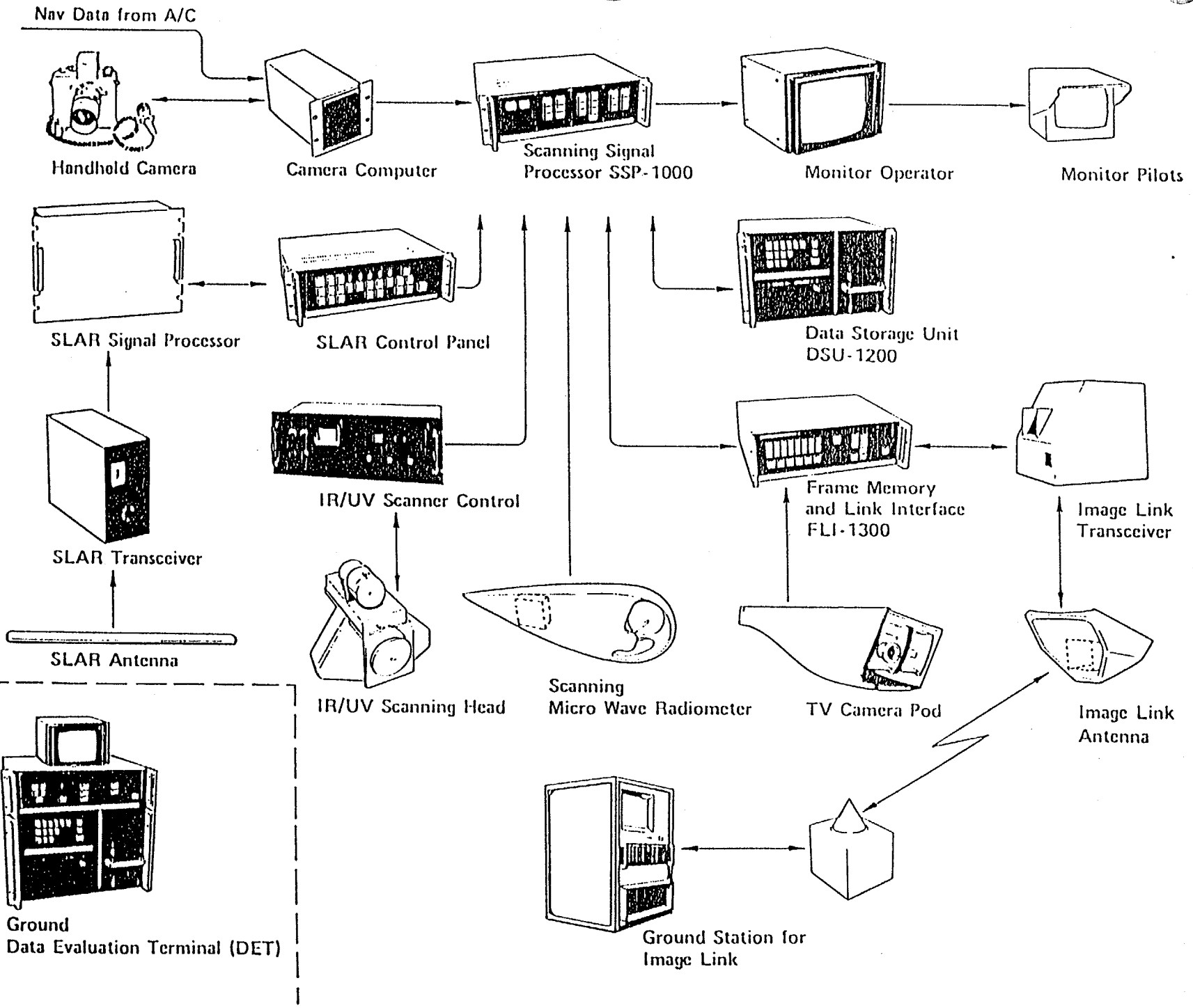

FIGURE 2. SWEDISH AIRCRAFT MARITIME SURVEILLANCE SYSTEM

ROV's (Remotely-Operated Vehicles) can potentially detect and locate spills underwater along a pipeline. They are presently used to perform many underwater tasks associated with offshore platforms and pipelines. When a spill is identified, they are used for pinpointing the leak.

ROV technology is more cost-effective than conventional diving operations. ROV operations may cost more, but provide far superior results. SubSea International (Reference 40) not only operates ROV's but is involved in designing, developing and building new vehicles and associated specialized tooling for specific sea floor work tasks. ROV's are equipped with pipetrackers, sonars, cathodic potential systems, and advanced camera systems. The workhorse technologies for leak pinointing right now are: high-resolution colour sonar (Mesatech, Vancouver, B.C.), side-scan sonar (EG&G, San Francisco), and hydrophones to pick up liquid (oil) leaks.

Oceaneering (Reference 43) routinely performs a variety of underwater projects including pipeline and subsea inspection, maintenance and repair. Each job utilizes ROV's. Solus Schall does nondestructive testing, leak detection and leak prevention using ROV's. The Computer Aided Inspection Reporting System is used remotely by datalink to record and analyze all inspection data. Hydro Vision, International provides underwater cameras, lighting, and closed circuit television for the ROV's. Inspection and monitoring can be conducted at 2,000 ft operating depth using this eqwuipment, with low light cameras having sensitivity levels as low as .0005 footcandles.

Prevention also plays a part in the reduction of leakage. Conventional NDT techniques, and innovations in these techniques can and will contribute greatly to reducing leaks. Greater public awareness and more stringent requirements on financial responsibility for spills consequences have focussed industry attention on the problem. We expect this focus, perspective and financial stress to continue and escalate. These pressures will result in added requirements on offshore pipeline operators for inspections and testing. In addition, responsible industry operators will respond to the pressures on their own initiative, in order to control their risks. The periodic (annual recommended) NDT methods now coming into ascendancy are:

- o Acoustic inspection using Side-Scan Sonar and other high-resolution sonar systems (Reference 16 and 17)
- o Visual inspection using ROV (Reference 16)
- o Cathodic Protection Monitoring, using ROV (Reference 16)
- o Intelligent (Smart) Pigs, primarily magnetic flux (Reference 16 and 18)
- o Hydrostatic Pipeline Testing, Pressure and Acoustic Velocity Testing, and Air Pressure Testing (Reference 19 and 20)
- o Ultrasonic Testing (Reference 21)
- o Magnetic Particle Inspection, new methods (Reference 22)

4 PRACTICAL RAPID LEAK DETECTION STRATEGY, PRESENT AND FUTURE

The front-runner technologies were identified by a two-state process: first, our review of the literature, second, by evaluation and culling during the telephone and written survey. The front-runners were presented in Section 3.3. Discussion focussed on:

- o the method of implementation
- o adequacy for meeting immediate leak detection criteria
- o feasibility, and likely problems in development
- o deployment

Further evaluation has been performed to provide comparison between the methods. Comparison includes a statement of the strategy for deployment of each technique (method), applicability (present, future, and when), immediacy of detection (expected lower sensitivity limit), applicability (especially as to retrofit or new pipelines), feasibility, and cost to provide. [Dollar value costs have been estimated from the costing results of Reference 4, applying a 10% overage for subsea pipelines, and an inflation factor from the year 1978 to 1990.] Table 4 provides the final summary results of the evaluation.

Our research indicates there are:

- o additional techniques worthy of further documentation
- o established techniques worthy of innovative adaptations
- o variations in implementation strategies or technologies, that do require further study

Further research will allow development and presentation of a highly credible report documenting an expert, comprehensive assessment of all applicable methods. The bottom line will be specific hardware development proposals, comprising reliable estimates of cost, schedule, and system development specifications.

TABLE 4. EVALUATION OF RAPID LEAK DETECTION/PINPOINTING METHODS

Technology Leak Detection Methods	Strategy [Deployment]	Applicability	Immediacy	Applicability	Feasibility	Cost
Acoustic Emission						
AE Continuous Monitoring System	Multiple sensors, signals by wire or radio,	Present & Future	1 minute to detect 2-5 gph, 2 minutes to locate leak	Retrofit existing sea floor pipelines	Sensors can only attach to exposed locations	$462/mile (Ref. 4)
				Designed into new pipelines	Sensor placement flexible, but require wires along pipeline	$2098/mile (Ref. 4)
Chemical Detection						
Hydrocarbon Monitoring System	Electrochemi-luminescent optical electrode sensor with optical fiber data link	Future - 1997	1 minute to detect 1-5 gph, locates leak at same time	Retrofit only by stringing fiber optic cables	Must string optical fiber data link cable	Unknown at present
				Sensors and optical fibers designed into pipeline wall	Research and demonstration of feasibility required	Unknown, further research required
Tracer Monitoring System	Fuorescein powder tracer; fluorimeter detector in ROV	Future - 1994	ROV patrol limits detection time; may be best for NDT	ROV NDT patrols for existing and future lines	Not feasible for immediate detection; requires research for NDT application	Cost low as NDT method
Real-Time Math Model						
Analysis of Pressure, Flow, and Volume	Tied to SCADA, and additional instruments	Present	1 to 5 minutes to detect 50 gph	Retrofit existing sea floor pipelines	Limited by Inaccuracies due to noisy, transient conditions	$816/mile (Ref. 4)
				Design into new pipelines	Requires instruments	Cost-effective
Strain Monitoring						
Fiber Optic Sensors	Space for best detection of strain; embed sensors and optical fiber cables	Future - 1997	1 minute to detect 50 gph	Retrofit not practical	Retrofit not feasible	N.A.
				Design new pipe wall to embed sensors and optical fibers	Research and demosntration required	Embedded pipe wall may be expensive

5. RAPID LEAK DETECTION: RECOMMENDED PROGRAM

This report on rapid leak detection methods is the very first step, a preliminary plan, in providing rapid leak detection for offshore pipelines. This section defines and recommends the next step - formulating a bold program to accomplish definitive objectives along the path to reduce spills. Here are the main objectives:

1. Definitize this report by completing goals of the telephone and literature surveys. Provide comprehensive results.

   We were able to reach only ten percent of the people by phone, due to time and budget limitations.

   We were able to obtain only twenty percent of the literature needed to assure definitive results.

2. On-Site Systems Evaluation. Personally visit the site of leak detection methods undergoing research, development, or demonstration. Evaluate credibility of hardware, data, etc., and prepare a specification of the system, its capabilities and limitations.

   Information concerning many of the monitoring and detection methods recommended for the future has been gleaned almost entirely from literature. Claims must be corroborated to substantiate R&D recommendations.

3. Identify and interview prospective co-sponsors of further research, particularly non-government organizations such as American Petroleum Institute (API), American Society of Nondestructive Testing (ASNT), National Research Council, etc. Gain their cooperation and commitment.

   To assure success of the development and implementation of new methods, partnership in both principal and finance is desirable and needed. Early development of the best contacts among the interested organizations should spur interest and enhance funding possibilities for demonstration and ultimate hardware development.

4. Provide a demonstration of prospective acoustic emission leak monitoring system for offshore pipelines by evaluating the capabilities and limitations of the NDE Acoustic Leak/Failure Detection System (ALFDS).

   a. Feasibility Demonstration in laboratory environment

   b. Determine a company operating an underwater pipeline that will be willing to have NDE demonstrate the acoustic emission leak monitoring system (ALFDS) on their underwater lines and valves.

5. Evaluate the feasibility and cost-effectiveness of using remotely-operated valves in sea floor pipelines to limit the size of accidental spills. Explore the types of valves available to provide isolation of a leak and possible strategies for valve spacing. Prepare a program plan to specify all requirements and costs of implementation.

16. Operating the Frigg System: Constant Inspections Keep North Sea Line Operational, R.S. Pritcharrd and P.J. Brown, Total Oil Marine, Pipeline & Gas Journal, September 1989, p 51

17. High Resolution Methods for Inspection of Unburied and Partly Buried Pipelines, H. Meister and I. Nording, Danish Hydraulic Institute, International Conference on Measuring Techniques of Hydraulic Phenomena in Offshore, Coastal & Inland Waters, London, 1986

18. Intelligent Pigs Prove Valuable: Improved Inspection of In-Service Pipelines, Dr. W.E. Shannon, British Gas, Pipeline & Gas Journal, October 1987, p 14

19. Leak Testing of Pipelines Using Pressure and Acoustic Velocity, J.E. Hough, SAIPEM Australia Pty, Ltd., Seventh International Conference on Offshore Mechanics and Arctic Engineering, p 61, Houston, TX, February 1988

20. Air Pressure Testing of the Normal Wells Pipeline, J.D. Smith and A.R. Pick, Intterprovincial Pipeline, Ltd., Edmonton, Canada, Proc. Seventh International Conference on Offshore Mechanics and Arctic Engineering, Volume 5, p 147, Houston, TX, 1988

21. Testing and Experience Collected With an ;Ultrasonic Riser Pipe Inspection Tool, J.A. de Raad, M. Ligthart, and J. Labrujere, Shell International, Pipeline Systems, the Netherlands, Seventh International Conference on Offshore Mechanics and Arctic Engineering, Volume 1, p 61, Houston, TX, 1988

22. New and Controllead Method for Conducting Magnetic Particle Inspections, A.M. Watt, Subsea International, Inc., and K.G. Walther and R.G. Walther, Magfoil and I.T. GmbH, Offshore Technology Conference Proceedings 1989, Volume 2, p 269

23. Scientific Software - Intercomp; 10333 Richard Ave., Suite 1000, Houston, TX, 77042; System Description, On-Line System

24. Pipeline Systems Inc.; 460 North Wiget Lane; Walnut Creek, CA 94598; Pipeline Systtem Computer Model Development and Transient Pressure Analysis, PSI Document 96BD-001, and Demo-Disk

25. Spillage Minimization Through Real-Time Leak Detection, M.S. Yoon, and M. Mensik, Novacorp International Consulting Ltd., and W.Y. Luk, Novacorp Pipelines Ltd., Calgary, Alberta, Canada, Seventh International Conference on Offshore Mechanics and Arctic Engineering, Volume 5, p 67, 1988

26. Detection and Monitoring Offshore - Validation of Acoustic Emission Results, L.M. Rogers, E.J. Keen, S.N. McWade, 21st Annual British Conference on Non-Destructive Testing - NDT86, p 433, 1986

27. Tapping, Zapping and Attenuation Mapping, T.J. Holroyd, J.R. Webster, P.E. Cox, Advanced Research Laboratory, Rolls-Royce, p 405, September 1986

28. Acoustic Emission Testing of Vessels and Piping, T.J. Fowler, Monsanto Chemical Co., Chemical Engineering Progress, May 1987, p 25

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2. Study and Prepare Maintenance Standard for Petroleum Oil Lubricant (POL) Pipelines, John R. Mastandrea, NDE Technology, Inc., Torrance, CA, for Department of the Navy, Commanding Officer, Southern Division, Naval Facilities Engineering Command, Charleston, SC, 1982

3. Assessment of the Technology and Practice for Determining Casing Degradation During Offshore Drilling Operations, J.R. Mastandrea, K.R. Nippear, NDE Technology, Inc., Torrance, CA, for U.S. Naval Oceans Systems Center, San Diego, CA, 1982

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7. Judging Defect Severity on Offshore Pipelines, Kiefner, J.R. and Maxey, W.A., Interpipe Conference, Houston, TX, February 1982

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17. High Resolution Methods for Inspection of Unburied and Partly Buried Pipelines, H. Meister and I. Nording, Danish Hydraulic Institute, International Conference on Measuring Techniques of Hydraulic Phenomena in Offshore, Coastal & Inland Waters, London, 1986

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19. Leak Testing of Pipelines Using Pressure and Acoustic Velocity, J.E. Hough, SAIPEM Australia Pty, Ltd., Seventh International Conference on Offshore Mechanics and Arctic Engineering, p 61, Houston, TX, February 1988

20. Air Pressure Testing of the Normal Wells Pipeline, J.D. Smith and A.R. Pick, Intterprovincial Pipeline, Ltd., Edmonton, Canada, Proc. Seventh International Conference on Offshore Mechanics and Arctic Engineering, Volume 5, p 147, Houston, TX, 1988

21. Testing and Experience Collected With an ;Ultrasonic Riser Pipe Inspection Tool, J.A. de Raad, M. Ligthart, and J. Labrujere, Shell International, Pipeline Systems, the Netherlands, Seventh International Conference on Offshore Mechanics and Arctic Engineering, Volume 1, p 61, Houston, TX, 1988

22. New and Controllead Method for Conducting Magnetic Particle Inspections, A.M. Watt, Subsea International, Inc., and K.G. Walther and R.G. Walther, Magfoil and I.T. GmbH, Offshore Technology Conference Proceedings 1989, Volume 2, p 269

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26. Detection and Monitoring Offshore - Validation of Acoustic Emission Results, L.M. Rogers, E.J. Keen, S.N. McWade, 21st Annual British Conference on Non-Destructive Testing - NDT86, p 433, 1986

27. Tapping, Zapping and Attenuation Mapping, T.J. Holroyd, J.R. Webster, P.E. Cox, Advanced Research Laboratory, Rolls-Royce, p 405, September 1986

28. Acoustic Emission Testing of Vessels and Piping, T.J. Fowler, Monsanto Chemical Co., Chemical Engineering Progress, May 1987, p 25

29. Embedded Sensors Make Structures "Smart", Eric Udd, McDonnell Douglas Astronautics Co., Huntington Beach, CA, Laser Focus/ Electro-Optics, May 1988, p 135

30. Sensing the Presence of Potential Problems, Edmun L. Andrews, New York Times, Sunday, May 6, 1990, p9

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33. Sensors and Systems for Better and Faster Monitoring, Designfax, April 1990, p 24

34. HU-25B Aireye Description, U.S. Coast Guard Headquarters (G-MER), Washington DC, 1990

35. Integrated Remote Sensing System for Maritime Surveillance Operational in Italy, A.L. Geraci, Universita di Catania, and Cdr. F. Lolli, Ministero della Marina Mercantile, Proceedings 1989 Oil Spill Confference, p 131, San Antonio, TX, February 1989

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37. Remote Sensing Techniques for Detecting Oil Slicks at Sea - A Review of Work Carried out in the United Kingdom, D. Cormack, N. Hurford, D. Tookey, Warren Spring Laboratory, U.K., Proceedings 1987 Oil Spill Conference, p 95, Baltimore, MD, April 1987

38. Operational Air Surveillance and Experience in the Netherlands, R.C. Schriel, Ministry of Transport and Public Works, Proceedings 1987 Oil Spill Conference, p 129, Baltimore, MD, April 1987

39. Swedish Coast Guard Starts Using Third Generation Maritime Surveillance System, Olav Fast, Swedish Space Corporation, Sweden, Proceedings 1987 Oil Spill Conference, p 137, Baltimore, MD, April 1987

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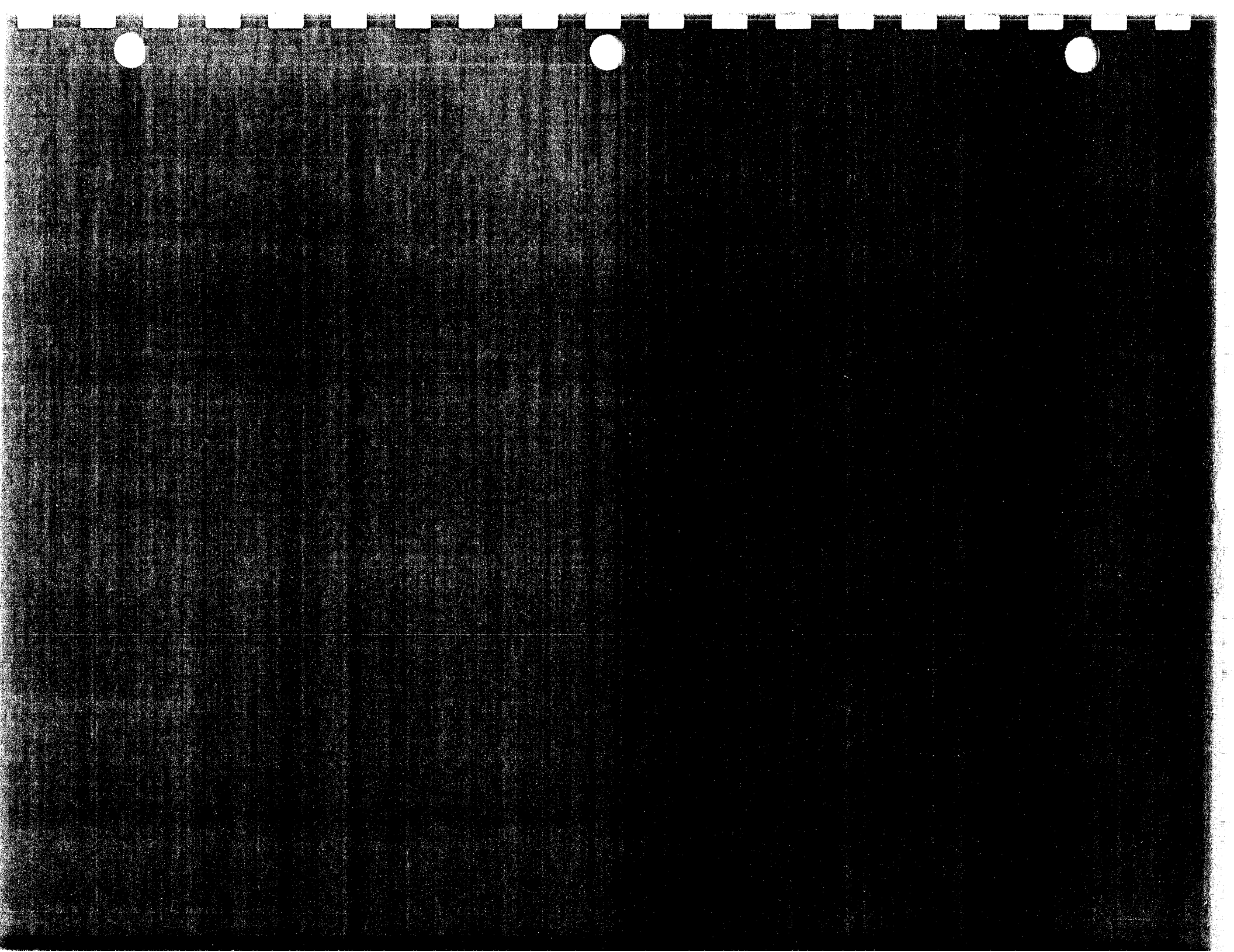
41. Flourimeter Detection of Tracer-Laden Oil Using ROV, Paul Heckman, Naval Ocean Systems Center, San Diego, Telephone conversation, August 9, 1990

42. Small Leaks In Line Can be Located: Subsea Leak Detector, P&GF Staff, Pipeline & Gas Journal, June 1967, p 36



APPENDIX A

LITERATURE SURVEY

A.1 NTIS Citations

Leak Detection in Subsea Pipelines
(Citations from the NTIS Database)

5/7/3
1396770 DE88705860/XAB
Survey on Industrial Applications of Radioactive Tracers
Kim, J. R. ; Yoo, Y. S. ; Lee, J. D. ; Awh, O. D. ; Kim, J. H.
Korea Advanced Energy Research Inst., Daeduk (Republic of Korea).
Corp. Source Codes: 086244000; 3634050
Report No.: KAERI/RR-560/86
Dec 86 93p
Languages: Korean
Journal Announcement: GRAI8916
In Korean.
U.S. Sales Only.
NTIS Prices: PC A05/MF A01
Country of Publication: Korea, Republic of
Current status and future feasibilities of industrial tracer applications in the Republic of Korea have been surveyed. Microleak detection using Krypton-85 in eight electronics industrial companies, and efficiency tests of steam generators in four nuclear power plants using Sodium-24 are the principal applications in Korea. Future applications are expected for mercury inventory in one soda industrial company, and alkali movement studies in two cement industrial companies. Korean industries expressed deep interest in leak detection in underground pipelines, abrasion/corrosion studies, mixing rate and residence time measurements. (Atomindex citation 20:022883)

5/7/4
1248113 DE87751175/XAB
Determination of Methane in Water by Absorption Spectroscopy
(Diss.)
Balssen, G.
GKSS - Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)
Corp. Source Codes: 072705000; 2818600
Sponsor: Hamburg Univ. (Germany, F.R.). Fachbereich Physik.
Report No.: GKSS-86/E/37
1986 103p
Languages: German
Journal Announcement: GRAI8713; NSA1200
In German.
U.S. Sales Only. Portions of this document are illegible in microfiche products.
NTIS Prices: PC A06/MF A01
Country of Publication: Germany, Federal Republic of
Several laser spectroscopic techniques for the determination of dissolved aliphatic hydrocarbons have been investigated. Best sensitivity is achieved if the dissolved substances are in the gaseous phase. Therefore different extraction methods have also been studied. Helium stripping with direct optical absorption in a two-mirror multipass cell turned out to be most favourable combination. The results are discussed in view of underwater pipeline leak detection, petroleum exploration, and other applications. With 38 figs., 10 tabs. (ERA citation 12:013846)

5/7/13
887509 PB81-970891
Ultrasonic Leak Detectors for Underwater Pipelines: Nonintrusive meters detect small leaks
(NTIS Tech Note)
Army Materiel Development and Readiness Command, Alexandria, VA.
Sponsor: Department of the Army, Washington, DC.
Dec 81 1p
Languages: English
Journal Announcement: GRAI8207
For information about subscribing to Tech Notes, please write NTIS Subscription Dept.
NTIS Prices: Subscription
Country of Publication: United States
This citation summarizes a one-page announcement of technology available for utilization. A program was conducted by the Harry Diamond Laboratories to assess the applicability of ultrasonic flowmeters to the detection of leaks in underwater pipelines. Repeatability of measurements in both models was generally better than 1 percent. Although the ultrasonic meters are not as precise as the positive-displacement, custody-transfer meters used on clean oil, they are sufficiently reliable for leak detection and are better able to withstand the erosive and corrosive action of sand, salt water, and other containments in raw crude oil. Furthermore, they require no pipe-diameter change and do not intrude into the pipe, thus offering no obstruction to the passage of pipeline pigs. ...FOR ADDITIONAL INFORMATION: Detailed information about the technology described may be obtained by ordering the NTIS report, order number: AD-A081791, price code: A02 or contact Project officer Allan B. Holmes (202) 394-3080.

5/7/15
834001 PB81-158420
Research and Engineering Design of a Microcomputer Controlled Unmanned Free Swimming Vehicle
(Final rept. 1 Nov 79-31 Oct 80)
Corell, Robert W.
New Hampshire Univ., Durham. Marine Systems Engineering Lab.
Corp. Source Codes: 012609016
Sponsor: Geological Survey, Washington, DC.
Nov 80 157p
Languages: English
Journal Announcement: GRAI8113
NTIS Prices: PC A08/MF A01
Country of Publication: United States
Contract No.: DI-14-08-0001-18636
Three years ago the U.S. Geological Survey, through the intermediary of NOSC, initiated studies for the development of technology related to unmanned, untethered vehicles for offshore inspection purposes. The Geological Survey is charged with responsibility relating to the safety, as well as the environmental consequences, of pipelines and structures in the Coastal Zone. Since many of the locations requiring inspection imply danger for human divers, and pose a threat of entanglement for tethered vehicles, studies of technologies related to the ultimate development of autonomous vehicles to replace tethered vehicles in some work environments were initiated. The Project Report for 1978 - 1979 describes the development of the system through the completion of the pipeline follower testing. This

report continues with the modification of the vehicle system from a mission of pipeline following to structural inspection.

5/7/18
760560 AD-A081 791/6
Analyses of Ultrasonic Flowmeters for Leak Detection in Liquid Hydrocarbon Pipelines
(Technical rept.)
Gehman, Stacy E. ; Holmes, Allen B.
Harry Diamond Labs., Adelphi, MD.
Corp. Source Codes: 054878000; 163050
Report No.: HDL-TR-1907
Dec 79 25p
Languages: English
Journal Announcement: GRAI8013
NTIS Prices: PC A02/MF A01
Country of Publication: United States
A program was conducted to determine repeatability and linearity of the ultrasonic time-delay types of flowmeters, so that their applicability to leak detection on underwater pipelines could be assessed. Field tests using merchantable crude oil were conducted on two off-the-shelf, commercially available flowmeters at a refinery meter proving station. These tests showed a short-term repeatability of 0.2 percent for both meters. Long-term (7 hours) repeatability was 0.6 percent for one meter and 2.5 percent for the other. For a leak detection system in which line balance is continually computed and line packing is compensated for, slow drifts in line balance due to drifts of meter factors can be compensated for by periodically adjusting meter factors. For a meter with drift characteristics similar to those measured, a computerized simulation indicates that the probability of detecting a leak greater than 0.6 of the total flow in 10 minutes is greater than 99 percent. The probability of a false alarm for the same conditions is about once per week. (Author)

5/7/19
700055 RHO-LD-61
Report on Boeing Pipeline Leak Detection System
Aichele, W. T.
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
Corp. Source Codes: 9505438
Sponsor: Department of Energy.
Aug 78 69p
Languages: English
Journal Announcement: GRAI7911; NSA0400
NTIS Prices: PC A04/MF A01
Contract No.: EY-77-C-06-1030
Testing was performed on both simulated (test) and existing (water) pipelines to evaluate the Boeing leak detection technique. This technique uses a transformer mounted around the pipe to induce a voltage level onto the pipeline. The induced ground potential is measured from a distant ground probe, inserted into the surrounding soil, with respect to the excited pipeline. The induced voltage level will depend on the soil characteristics, the distance from the excited pipeline, and the probe types. If liquid should leak from the excited pipeline, the escaping liquid will modify the induced potential of the soil surrounding the excited pipeline. This will change the response of the quiescent soil

characteristics and cause the voltage level on the detecting probes in the area of the leak to increase. This voltage increase will indicate a soil anomaly. However, the liquid does not have to reach the detection probe to reveal an anomalous soil condition. Several different detection probes were used and evaluated for sensitivity and response time. Although not evaluated during this test, results indicate that a wire laid parallel to the pipe axis may be the best probe configuration. A general sensitivity figure for any of the probes cannot be made from these tests; however, the technique used will reliably detect a pipeline leak of ten gallons. An additional test was performed using the Boeing pipeline leak detection technique to locate the position and depth of an underground pipeline. This test showed that the location and depth of an excited pipeline could be determined from above the ground where other methods for pipeline location had previously failed. (ERA citation 04:011449)

5/7/24
362816 COM-73-11776/4
Leak Detection in Underwater Oil Pipelines
Jackson, Patricia A.
National Maritime Research Center-Galveston, Tex. Cargo Handling and Terminals Program.
Report No.: NMRC-272-23100-R2
Sep 73 41p
Journal Announcement: GRAI7401
NTIS Prices: PC A03/MF A01
Contract No.: NMRC-272-23100

The findings of a brief state-of-the-art review of leak detection devices suitable for underwater oil pipelines is discussed. The review includes consideration of leak or crack detection by flow measurement, pressure, ultrasonics, acoustic emission, magnetic flux, visual examination, eddy current, radioactive slugs, electromechanical and electrochemical tapes, doublewalled pipes, coaxial cable, lasers, permeable membranes, and remote sensing. The review was performed to provide appropriate pollution control information prior to the construction of underwater oil pipelines from deep water tanker terminals to shore facilities. It was recommended that a stationary ultrasonic through-the-pipe-wall crack/flow detector be used with a coaxial cable and shroud positioned a short distance above the pipe.

A.2 APILIT Citations, 1

Buried Pipes--Monitoring and Inspection
(Information from the APILIT Database)

-6-
AN - 3650954
TI - (Pipeline & Gas Journal) international pipeline report/Operating the Frigg system...Constant inspections keep North Sea line operational
AU - Pritchard R S; Brown P J; Total Oil Marine plc
OS - Total Oil Marine plc
SO - Pipeline Gas J. V216 N.9 51-52,54-56 (Sept. 1989)
LA - English
NU - ISSN 00320188
BH - PIPELINE CONSTRUCTION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - C1/N; CARGO/N; COMPAGNIE FRANCAISE DES PETROLES/N; DAILY/N; DAMAGE/N; DOCK/N; DRYING/N; DRYING AGENT/N; FRIGG FIELD/N; INSIDE/N; *INSPECTING/N; MECHANICAL WAVE/N; METHANOL/N; MONOHYDROXY/N; MULTIPLE/N; NATURAL GAS/N; NONDESTRUCTIVE TESTING/N; NORTH SEA/N; *OFFSHORE/N; OIL AND GAS FIELDS/N; OPERATING CONDITION/N; OUTSIDE/N; PHYSICAL SEPARATION/N; *PIPELINE/N; PIPELINE PIG/N; PRESSURE/N; PRESSURE 1500 PSIG AND HIGHER/N; RELIABILITY/N; REPORT/N; SAFETY/N; SATURATED CHAIN/N; SCOTLAND/N; SEA/N; SEA FLOOR/N; SHIP/N; SINGLE STRUCTURE TYPE/N; SOUND WAVE/N; SUBSURFACE/N; THICKNESS/N; THROUGHPUT/N; TOWING/N; TRANSPORTATION/N; TRANSPORTATION TERMINAL/N; TRENCH/N; TWO/N; UNDERGROUND/N; UNDERWATER/N; UNITED KINGDOM/N; USE/N; WALL/N; WESTERN EUROPE/N; WORLD WIDE/N
RN - 67-56-1/N
LT - CARGO/N; NATURAL GAS/N
LT - INSIDE/N; MULTIPLE/N; OFFSHORE/N; OUTSIDE/N; PIPELINE/N; RELIABILITY/N; SUBSURFACE/N; TWO/N; UNDERGROUND/N; UNDERWATER/N
LT - THICKNESS/N; WALL/N
LT - C1/N; DAILY/N; DRYING AGENT/N; METHANOL/N; MONOHYDROXY/N; OPERATING CONDITION/N; SATURATED CHAIN/N; SINGLE STRUCTURE TYPE/N; THROUGHPUT/N; USE/N

-7-
AN - 3633086
TI - Gas concentration over an underwater gas release
AU - Billeter L; Fanneloep T K
OS - Swiss Fed. Inst. Technol, Zuerich
SO - Atmos. Environ. V23 N.8 1683-94 (1989)
LA - English
NU - ISSN 00046981
BH - AIR POLLUTION SOURCES
BH - HEALTH & ENVIRONMENT
IT - ACCIDENT/N; AIR/N; AIR POLLUTANT/N; *BLOWOUT/N; BUBBLE/N; *BURSTING/N; COMPOSITION/N; CONCENTRATION/N; DISTRIBUTION/N; ELEMENT/N; *FAILURE/N; FLAMMABILITY/N; GAS/N; HAZARD/N; *HEALTH/DISEASE/N; HELIUM/N; LABORATORY SCALE/N; MATHEMATICAL MODEL/N; MODEL/N; NOBLE GAS/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PLUME/N; POLLUTION SOURCE/N; SHALLOW WATER/N; SIZE/N; SUBSURFACE/N; SURFACE/N; *TOXIC EFFECT/N; UNDERWATER/N; UNIFORMITY/N; VELOCITY/N
LT - ELEMENT/N; HELIUM/N; NOBLE GAS/N
LT - AIR POLLUTANT/N; PLUME/N

LT - DISTRIBUTION/N; UNIFORMITY/N
LT - BUBBLE/N; GAS/N; SIZE/N
LT - MATHEMATICAL MODEL/N; MODEL/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N
LT - SHALLOW WATER/N; SURFACE/N

-9-
AN - 3683700
TI - Radar Detection of Buried Pipes and Cables
AU - Scott H F; Gunton D J
OS - British Gas plc U K
SO - Inst. Gas Eng. Commun. 1345 (1987) 25P Gas Abstr. ABSTR. NO. 89-0138 V45 N.1 (January 1989) Gas Abstr. 89-0138
LA - English
NU - ISSN 00164844
BH - PIPELINE CONSTRUCTION
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ALLOY/N; BRITISH GAS CORP/N; CABLE/N; ECONOMIC FACTOR/N; FEASIBILITY/N; LOCATION/N; *MONITORING/N; NONE/N; PIPE/N; *PIPELINE/N; PROCESS TESTING/N; *RADAR/N; SUBSURFACE/N; TIME/N; UNDERGROUND/N
ST - LOCATING
LT - MONITORING/N; TIME/N
LT - CABLE/N; LOCATION/N; PIPE/N; PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N
LT - ALLOY/N; NONE/N

-15-
AN - 3650631
TI - Precise location and reliable assessment of buried (pipeline) coating defects
AU - Mulvany J; Pipeline Induction Heat Ltd Australia; Santos Ltd
SO - Anti-Corros. Methods Mater. V36 N.4 17 (Apr. 1989)
LA - English
NU - ISSN 00035599
BH - PIPELINE CORROSION
BH - TRANSPORTATION AND STORAGE
IT - AUSTRALIA/N; CARGO/N; CLAY MINERAL/N; *COATING MATERIAL/N; COMPOSITION/N; *DEFECT/N; DIRECT CURRENT/N; EFFICIENCY/N; ELECTRIC CURRENT/N; ELECTRICAL PROPERTY/N; ELECTRICITY/N; GROUP IVA/N; GROUP VIA/N; IDE/N; *INSPECTING/N; MINERAL/N; MODERNIZATION/N; MODIFICATION/N; NATURAL GAS/N; OCEANIA/N; OXYGEN/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PULSE/N; RELIABILITY/N; RESISTIVITY/N; SAND/N; SILICA/N; SILICATE MINERAL/N; SILICON/N; SOIL (EARTH)/N; SUBSURFACE/N; UNDERGROUND/N; *USE/N; WET/N
RN - 7631-86-9/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N
LT - GROUP IVA/N; GROUP VIA/N; IDE/N; OXYGEN/N; SAND/N; SILICA/N; SILICON/N
LT - CARGO/N; NATURAL GAS/N
LT - INSPECTING/N; RELIABILITY/N

-22-
AN - 3681940
TI - ISIS (Interactive Sonar Interpretation System) - A Cost Effective System for the Analysis of Pipeline Inspection Data
AU - Williams J P; Welford R J
OS - Chi Offshore Ltd
SO - Int. Underwater Syst. Design 10(5), 20-23 (Sept.-Oct. 1988) Pet. Abstr. ABSTR. NO. 460,199 V29 N.18 (5/6/89) Pet. Abstr. 460,199

LA - English
NU - ISSN 02671085; ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACCURACY/N; ANNUAL/N; BUDGET/N; BUSINESS OPERATION/N; COST/N; DETECTOR/N; ECONOMIC FACTOR/N; EFFICIENCY/N; *INSPECTING/N; INSTRUMENT/N; *PIPELINE/N; REMOTELY OPERATED VEHICLE/N; REVIEW/N; SHIP/N; *SONAR/N; SUBSURFACE/N; TOWING/N; TRANSPORTATION/N; UNDERWATER/N
ST - INTERACTIVE SONAR INTERPRETATION SYSTEM; ISIS; SIDESCAN SONAR
LT - PIPELINE/N; SUBSURFACE/N; UNDERWATER/N
LT - ANNUAL/N; BUDGET/N; BUSINESS OPERATION/N

-23-
AN - 3650351
TI - Offshore (pipeline) corrosion surveys...Computerized monitoring methods improve inspection results
AU - Weldon C
OS - Corrpro Co. Inc.
SO - Pipeline Gas J. V216 N.2 19-20,22,24 (Feb. 1989)
LA - English
NU - ISSN 00320188
BH - PIPELINE CORROSION
BH - TRANSPORTATION AND STORAGE
IT - ANALYTICAL METHOD/N; *CATHODIC PROTECTION/N; COASTAL AREA/N; COATING MATERIAL/N; COMPUTER CONTROL/N; COMPUTING/N; CORROSION/N; *CORROSION CONTROL/N; COST/N; DEEP WATER/N; DEFECT/N; DISTRIBUTION/N; ECONOMIC FACTOR/N; ELECTRIC FIELD/N; ELECTRIC POTENTIAL/N; ELECTRICITY/N; *ELECTROCHEMICAL PROTECTION/N; ELECTRODE/N; *INSPECTING/N; MODIFICATION/N; MONITORING/N; NORTH SEA/N; *OFFSHORE/N; OFFSHORE STRUCTURE/N; *PIPELINE/N; POTENTIOMETRY/N; REMOTE/N; REMOTELY OPERATED VEHICLE/N; REVIEW/N; RISER/N; SEA/N; SUBSURFACE/N; SURVEYING/N; TOWING/N; TRANSPORTATION/N; UNDERWATER/N; USE/N; WELL/N; WIRE/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N
LT - SUBSURFACE/N; UNDERWATER/N; WIRE/N
LT - ELECTRODE/N; REMOTE/N

-24-
AN - 3650350
TI - **Systeme de controle des pipelines C-SCAN** The C-SCAN pipeline inspection system
AU - Edwards J I; Nordon R
OS - Dynalog Electron. Ltd.; Soc. I.P.S.I.
SO - Pet. Inf. N.1650 72 (Nov. 1988)
LA - French
NU - ISSN 0755561X
BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ALTERNATING CURRENT/N; ANTENNA/N; ARCTIC AREA/N; BUSINESS OPERATION/N; COATING MATERIAL/N; COMPUTER CONTROL/N; COMPUTING/N; *CORROSION/N; DEFECT/N; ELECTRIC CURRENT/N; ELECTRICAL INSULATION/N; ELECTRICITY/N; FAILURE/N; FRANCE/N; *INSPECTING/N; INSULATING MATERIAL/N; MARKETING/N; MIDDLE EAST/N; MONITORING/N; OFFSHORE/N; ONSHORE/N; *PIPELINE/N; PORTUGAL/N; PRODUCT DEVELOPMENT/N; *REMOTE/N; SAUDI ARABIA/N; SUBSURFACE/N; UNDERGROUND/N; USE/N; WESTERN EUROPE/N

LT - OFFSHORE/N; ONSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N
LT - INSPECTING/N; MONITORING/N; REMOTE/N
LT - COATING MATERIAL/N; ELECTRICAL INSULATION/N; INSULATING MATERIAL/N; USE/N

SS 18 /C?
USER:
prt fu 25 32 35 40 46 48-49

PROG:

-25-
AN - 3680789
TI - An integrated seismic response analysis of offshore pipeline-sea floor systems
AU - Romagnoli R; Varvelli R
OS - Torino Polytechnic
SO - 7th ASME et al. Offshore Mech. & Arctic Eng. Int. Conf. (Houston, Texas, 2/7-12/88) Proc., 5 139-145 (1988) Pet. Abstr. ABSTR. NO. 455,721 V29 N.8 (2/25/89) Pet. Abstr. 455,721
LA - English
NU - ISSN 00316423
BH - PIPELINE CONSTRUCTION
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ASME/N; ASSOCIATION/N; COMPUTER SIMULATION/N; COMPUTING/N; DEEP WATER/N; *EARTHQUAKE/N; FAILURE/N; FINITE ELEMENT METHOD/N; FULL SCALE/N; INTEGRATED/N; MATHEMATICAL MODEL/N; MATHEMATICS/N; MECHANICAL WAVE/N; MEDITERRANEAN SEA/N; MEETING PAPER/N; MODEL/N; OFFSHORE/N; *OPERATIONS RESEARCH/N; *OPTIMIZATION/N; *PIPELINE/N; SEA/N; SEA FLOOR/N; SEISMIC WAVE/N; SUBSURFACE/N; UNDERWATER/N; WORLD WIDE/N
LT - INTEGRATED/N; MATHEMATICAL MODEL/N; MODEL/N; OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-32-
AN - 3550961
TI - A 3D VIDEO DEVICE FOR INSPECTING UNDERWATER STRUCTURES (OR PIPELINES)
AU - ISET
SO - PET. INF. (ISSN 0755-561X) N.1647 97-98 (JULY 1988)
LA - ENGLISH
NU - ISSN 0755561X
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - CABLE/N; CAMERA/N; DISPLACEMENT/N; ECONOMIC FACTOR/N; EFFICIENCY/N; ENGINEERING/N; *INSPECTING/N; NEWS/N; PERSONNEL/N; PHOTOGRAPHIC EQUIPMENT/N; *PIPELINE/N; *REMOTELY OPERATED VEHICLE/N; SUBSURFACE/N; UNDERWATER/N
LT - ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-35-
AN - 3586500
TI - SPECIALISED CORROSION SURVEYS FOR BURIED PIPELINES: METHODS AND EXPERIENCE
AU - ALLEN M D; BARNES N R
OS - SPENCER & PARTNERS

SO - 7TH BHRA INTERNAL & EXTERNAL PROTECT. OF PIPES INT. CONF. (LONDON, ENGL. 9/21-23/87) PROC. (ISBN 0-947711-32-5) PAP.NO.A2 9-14 (1987) PET. ABSTR. (ISSN 0031-6423) ABSTR. NO. 448,100 V28 N.42 (10/15/88)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; BURYING/N; CASE HISTORY/N; *CATHODIC PROTECTION/N; COATING MATERIAL/N; *CORROSION CONTROL/N; *CORROSION TEST/N; DATA/N; ELECTRIC POTENTIAL/N; ELECTRICITY/N; *ELECTROCHEMICAL PROTECTION/N; INSULATING MATERIAL/N; *MATERIALS TESTING/N; MEETING PAPER/N; *MONITORING/N; OUTSIDE/N; PHYSICAL PROPERTY/N; *PIPELINE/N; REVIEW/N; SELECTIVITY/N; SOIL (EARTH)/N; SUBSURFACE/N; UNDERGROUND/N; USE/N
ST - CLOSE INTERVAL POTENTIAL SURVEY; PEARSON SURVEY; SIGNAL ATTENUATION COATING SURVEY
LT - OUTSIDE/N; PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N
LT - COATING MATERIAL/N; INSULATING MATERIAL/N; USE/N

-40-
AN - 3585390
TI - RELIABILITY SYSTEMATICS FOR INCREASED IN-SERVICE INSPECTION AND MAINTENANCE EFFICIENCY.
AU - CARLIN B S
SO - INSTN. CIVIL ENGRS., PROCS. OF THE 2ND INTL. CONF. ON THE MAINTENANCE OF MARITIME AND OFFSHORE STRUCTURES, (LONDON 2/19-20/86) PAPER NO. 23 (1986) 8P BMT (BR. MAR. TECHNOL.) ABSTR. (ISSN 0268-9650) ABSTR.NO. 88061476 V43 N.6 (JUNE 1988)
LA - ENGLISH
NU - ISSN 02689650
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; CONTROL/N; CYCLE/N; ECONOMIC FACTOR/N; EFFICIENCY/N; *INSPECTING/N; LEGAL CONSIDERATION/N; *MAINTENANCE/N; MEETING PAPER/N; OFFSHORE/N; OFFSHORE STRUCTURE/N; *PIPELINE/N; PIPING SYSTEM/N; PRESSURE VESSEL/N; RELIABILITY/N; RISER/N; SUBSURFACE/N; UNDERWATER/N
LT - CONTROL/N; CYCLE/N
LT - INSPECTING/N; MAINTENANCE/N; RELIABILITY/N; SUBSURFACE/N; UNDERWATER/N
LT - OFFSHORE/N; PIPELINE/N; PIPING SYSTEM/N; PRESSURE VESSEL/N; RISER/N

-46-
AN - 3550754
TI - OGJ ((OIL & GAS JOURNAL)) ANNUAL PIPELINE REPORT/FLUX-LEAKAGE VEHICLES PASS TESTS FOR PIPELINE INSPECTION
AU - SHANNON R W E; BRAITHWAITE J C; MORGAN L L
OS - BR. GAS P.L.C.
SO - OIL GAS J. (ISSN 0030-1388) V86 N.32 47,49-50,52,54,57,59 (8/8/88)
LA - ENGLISH
NU - ISSN 00301388
BH - PIPELINE CONSTRUCTION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - BALLAST/N; BRITISH GAS CORP/N; BURYING/N; CARGO/N; COATING MATERIAL/N; COMPARISON/N; CORROSION/N; DAMAGE/N; DEFECT/N; EQUIPMENT TESTING/N; FAILURE/N; GAS/N; HYDROSTATIC TESTING/N; *INSPECTING/N; LEAK/N; MAGNETIC

PARTICLE TEST/N; MAINTENANCE/N; MATERIAL DEPLETION/N; MODEL/N; NATURAL GAS/N; NONDESTRUCTIVE TESTING/N; OFFSHORE/N; ON STREAM/N; OPERATING CONDITION/N; PATH/N; *PIPELINE/N; PROTOTYPE/N; REMOTELY OPERATED VEHICLE/N; REPORT/N; SEA FLOOR/N; SPECIFICATION/N; SPLITTING/N; STRESS CORROSION/N; STRESS CORROSION CRACKING/N; SUBSURFACE/N; *TRUNK PIPELINE/N; UNDERGROUND/N; UNDERWATER/N; USE/N

LT - BALLAST/N; CARGO/N; COATING MATERIAL/N; NATURAL GAS/N; USE/N

LT - CARGO/N; NATURAL GAS/N

LT - MODEL/N; PROTOTYPE/N; REMOTELY OPERATED VEHICLE/N

LT - OFFSHORE/N; PATH/N; PIPELINE/N; SUBSURFACE/N; TRUNK PIPELINE/N; UNDERGROUND/N; UNDERWATER/N

-48-

AN - 3581365

TI - THE INSPECTION OF PIPELINES ON- AND OFFSHORE.

AU - SHANNON R W E; BRAITHWAITE J C; BRITISH GAS PLC

OS - BRITISH GAS PLC

SO - PIPES PIPELINES INT. PIPELINE INTEGRITY MONIT. MTG. (ABERDEEN, SCOT. 10/29-30/86) PROC. (1986) 23P PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 433,545 V28 N.9 (2/27/88)

LA - ENGLISH

NU - ISSN 00316423

BH - PIPELINE MAINTENANCE

BH - TRANSPORTATION AND STORAGE

IT - ABSTRACT/N; BRITISH GAS CORP/N; *CLEANING/N; COMPUTER SIMULATION/N; COMPUTING/N; DATA ACQUISITION/N; *DETECTOR/N; DIAMETER/N; EFFICIENCY/N; FORCE/N; *INSPECTING/N; *INSTRUMENT/N; LEAK/N; *LEAK DETECTOR/N; MAGNETIC PROPERTY/N; MATHEMATICS/N; *MECHANICAL CLEANING/N; MEETING PAPER/N; MODEL/N; MODIFICATION/N; OFFSHORE/N; OFFSHORE STRUCTURE/N; ONSHORE/N; OPERATING CONDITION/N; PHYSICAL PROPERTY/N; *PIGGING/N; *PIPELINE/N; PIPELINE PIG/N; PRESSURE/N; REVIEW/N; RISER/N; SAFETY/N; SEPARATION EQUIPMENT/N; SHIP/N; STRESS/N; SUBSURFACE/N; THICKNESS/N; TRAP/N; UNDERWATER/N; WALL/N

LT - DIAMETER/N; OFFSHORE/N; ONSHORE/N; PIPELINE/N; SHIP/N; SUBSURFACE/N; UNDERWATER/N

LT - MATHEMATICS/N; MODEL/N

LT - THICKNESS/N; WALL/N

-49-

AN - 3550569

TI - TROUBLE-SHOOTING TOOL (FOR PIPELINES)

AU - STURGESS R W; DYNALOG ELECTRONICS LTD

OS - PIPELINE INF. TECHNOL. LTD.

SO - PIPELINE GAS J. (ISSN 0032-0188) V215 N.2 18,20-22 (FEB. 1988)

LA - ENGLISH

NU - ISSN 00320188

BH - PIPELINE CORROSION

BH - TRANSPORTATION AND STORAGE

IT - BED/N; CANADA/N; CARGO/N; CASING/N; DAMAGE/N; *DEFORMATION/N; DEPTH/N; GATHERING LINE/N; HIGH TEMPERATURE/N; HOT SPOT/N; ICE/N; INDUSTRIAL PLANT/N; INSULATING MATERIAL/N; LINE PIPE/N; MAINTENANCE/N; *MONITORING/N; MOTION/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; NORTH AMERICA/N; OIL REFINERY/N; OPERATING CONDITION/N; OPERATIONAL PROBLEM/N; PERMAFROST/N; PHYSICAL SEPARATION/N; PIPE/N; *PIPELINE/N; PIPELINE CROSSING/N; ROAD/N; SAND/N; *SUBSIDENCE/N; SUBSURFACE/N; TEMPERATURE/N;

THEORETICAL STUDY/N; THERMAL INSULATION/N; TRENCH/N; UNDERGROUND/N; USE/N; VERTICAL/N; WASHING/N; WATER/N
LT - CARGO/N; NATURAL GAS/N
LT - DEPTH/N; PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N; VERTICAL/N

SS 18 /C?
USER:
prt fu 53 61 62 67 69 73 82 85

PROG:

-53-
AN - 3584667
TI - INTERNAL CORROSION MONITORING OF SUBSEA PIPELINES.
AU - BRITTON C F
OS - CORROSION MONITORING CONSULTANCY UK
SO - PIPES PIPELINES INT. 31 12-18 (NOV.-DEC. 1986) GAS ABSTR. (ISSN 0016-4844) ABSTR.NO. 87-1577 V43 N.9 (SEPT. 1987)
LA - ENGLISH
NU - ISSN 00164844
BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ANALYTICAL METHOD/N; CARGO/N; *CORROSION CONTROL/N; CORROSION TEST/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DETECTOR/N; ECONOMIC FACTOR/N; GUIDELINES/N; HAZARD/N; INSIDE/N; INSPECTING/N; INSTRUMENT/N; MAINTENANCE/N; MATERIALS TESTING/N; MONITORING/N; NATURAL GAS/N; NORTH AMERICA/N; OFFSHORE/N; OPERATOR/N; PERSONNEL/N; *PIPELINE/N; PROBE/N; REVIEW/N; SAMPLING/N; SUBSURFACE/N; TRANSPORTATION/N; UNDERWATER/N; USA/N; WESTERN EUROPE/N
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N
LT - CORROSION CONTROL/N; INSIDE/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-61-
AN - 3582603
TI - MARINE APPLICATIONS FOR A CONTINUOUS FIBRE OPTIC STRAIN MONITORING SYSTEM.
AU - MCKEEHAN D S; GRIFFITHS R W; HALKYARD J E
SO - PROC. 18TH OFFSHORE TECHNOLOGY CONF. (HOUSTON, TEXAS, 5/5-8/86) 1 345 (1986) BMT (BR. MAR. TECHNOL.) ABSTR. (ISSN 0268-9650) ABSTR.NO. 71,404 V42 N.5 (MAY 1987)
LA - ENGLISH
NU - ISSN 02689650
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; CABLE/N; CASING/N; COMPRESSION/N; CONTINUOUS/N; DATA TRANSMISSION/N; DEFORMATION/N; *DETECTOR/N; DIAMETER/N; DISTRIBUTION/N; ELECTRIC CIRCUIT COMPONENT/N; FORCE/N; *GAGE/N; *INSPECTING/N; *INSTRUMENT/N; MARINE/N; MEETING PAPER/N; MODEL/N; *MONITORING/N; MULTIPLEXER/N; OPTICAL FIBER/N; *PIPELINE/N; POWER/N; PROTOTYPE/N; SHEAR/N; STRAIN/N; *STRAIN GAGE/N; STRESS/N; SUBSURFACE/N; UNDERWATER/N; UNSTEADY STATE/N

ST - ELECTRO-OPTICAL MEASURING; TENSILE STRAIN
LT - CABLE/N; DIAMETER/N
LT - CONTINUOUS/N; INSPECTING/N; MONITORING/N
LT - DETECTOR/N; GAGE/N; INSTRUMENT/N; MODEL/N; PROTOTYPE/N; STRAIN GAGE/N
LT - MARINE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-62-
AN - 3582599
TI - CORROSION PROBLEMS AND CONTROL OF NORTH SEA PIPELINES.
AU - JELINEK J
SO - U.K. CORROSION "86, (BIRMINGHAM, 11/17-19/86) 2 205 (1986) BHT (BR. MAR. TECHNOL.) ABSTR. (ISSN 0268-9650) ABSTR.NO. 71,380 V42 N.5 (MAY 1987)
LA - ENGLISH
NU - ISSN 02689650
BH - PIPELINE CORROSION
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACTIVITY/N; CARBON/N; CARBON DIOXIDE/N; CARBON OXIDE/N; CARGO/N; COATING MATERIAL/N; *COATING PROCESS/N; CORROSION/N; *CORROSION CONTROL/N; CORROSION TEST/N; CORROSIVITY/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; ECONOMIC FACTOR/N; ENHANCED OIL RECOVERY/N; FAILURE/N; FERROUS ALLOY/N; GROUP IVA/N; GROUP VIA/N; IDE/N; IN SITU/N; INSIDE/N; MATERIALS TESTING/N; MECHANICAL WAVE/N; MEETING PAPER/N; MULTIPHASE/N; NORTH SEA/N; OCCIDENTAL PETROLEUM/N; OFFSHORE/N; OIL AND GAS FIELDS/N; OIL RESERVOIR/N; ONSHORE/N; OPERATING CONDITION/N; OPERATOR/N; OXYGEN/N; PERSONNEL/N; PHYSICAL PROPERTY/N; *PIPELINE/N; RECOVERY/N; REVIEW/N; SEA/N; STACKED/N; STEEL/N; SUBSURFACE/N; SURFACE WAVE/N; TRANSPORTATION/N; UNDERWATER/N; UNSTEADY STATE/N; USE/N; WATERFLOODING/N
RN - 124-38-9/N; 12795-06-1/N; 8002-05-9/N
LT - CARBON/N; CARBON DIOXIDE/N; CARBON OXIDE/N; GROUP IVA/N; GROUP VIA/N; IDE/N; OXYGEN/N; USE/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N
LT - COATING PROCESS/N; IN SITU/N; ONSHORE/N
LT - INSIDE/N; OFFSHORE/N; PIPELINE/N; STACKED/N; SUBSURFACE/N; UNDERWATER/N

-67-
AN - 3580935
TI - SUBSEA PIPELINES INTERNAL AND EXTERNAL BIOLOGICAL CORROSION.
AU - KING R A; MILLER J D A; STOTT J F D
OS - INST SCI TECHNOL UNIV MANCHESTER MANCHESTER UK M60 1QD
SO - INT. CORROS. CONF. SER., (PUB. 1096), NACE-8(BIOL. INDUCED CORROS.) 268-74 (1985) CHEM. ABSTR. ABSTR.NO. 199757 V106 N.24
LA - ENGLISH
BH - PIPELINE CORROSION
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ANODE/N; BACTERIA/N; BACTERICIDE/N; BEACH/N; *BIOCHEMICAL REACTION/N; *BIODEGRADATION/N; CARGO/N; *CATHODIC PROTECTION/N; CORROSION/N; *CORROSION CONTROL/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; *ELECTROCHEMICAL PROTECTION/N; ELECTRODE/N; EQUIPMENT TESTING/N; FERROUS ALLOY/N; INSIDE/N; MEETING PAPER/N; MICROORGANISM/N; MONITORING/N; NATURAL GAS/N; OFFSHORE/N; OUTSIDE/N; PESTICIDE/N; *PIPELINE/N; REVIEW/N; SACRIFICIAL ANODE/N; SALINE WATER/N; SEA FLOOR/N; SEDIMENT/N; SOIL (EARTH)/N; STEEL/N; SUBSURFACE/N; TRANSPORTATION/N; UNDERWATER/N; USE/N; WATER/N
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N

LT - INSIDE/N; OFFSHORE/N; OUTSIDE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-69-
AN - 3580277
TI - PIPELINE INSPECTIONS AN OVERVIEW.
AU - WEBB D L
OS - HUNTING SURVEYS LTD
SO - SOC. UNDERWATER TECHNOL. OCEANOLOGY INT. CONF. (BRIGHTON, ENGL. 3/4-7/86) PROC. (SOC. UNDERWATER TECHNOL. ADV. UNDERWATER TECHNOL. OCEAN SCI. & OFFSHORE ENG. SER. VOL. 6) 315-331 PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 419,752 V27 N.25 (6/20/87)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACCURACY/N; BUSINESS OPERATION/N; COST/N; COST REDUCTION/N; DAMAGE/N; DATA PROCESSING/N; DEBRIS/N; ECONOMIC FACTOR/N; *EQUIPMENT TESTING/N; FAST/N; *INSPECTING/N; LEGAL CONSIDERATION/N; MANAGEMENT/N; MOTION/N; NORTH SEA/N; OFFSHORE STRUCTURE/N; *PIPELINE/N; PLANNING/N; SEA/N; *SONAR/N; SUBSURFACE/N; TIME/N; TOWING/N; TRANSPORTATION/N; *TRUNK PIPELINE/N; UNDERWATER/N; USE/N; VELOCITY/N
LT - INSPECTING/N; TIME/N
LT - PIPELINE/N; SUBSURFACE/N; TRUNK PIPELINE/N; UNDERWATER/N

-73-
AN - 3451006
TI - ROV"S ((REMOTELY OPERATED VEHICLES))...WHAT CAN THEY ACHIEVE
AU - MARINE ENGINEERS REVIEW
SO - MAR. ENG. REV. (ISSN 0047-5955) 34 (JULY 1987)
LA - ENGLISH
NU - ISSN 00475955
BH - PIPELINE MAINTENANCE
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ANALYTICAL METHOD/N; CAMERA/N; COMMERCIAL/N; COMPOUNDS/N; COST/N; DETECTOR/N; DYE/N; ECONOMIC FACTOR/N; FUGITIVE EMISSION/N; HYDROCARBON/N; *INSPECTING/N; INSTRUMENT/N; LEAK/N; LEAK DETECTOR/N; LENS/N; MOTOR VEHICLE/N; PHOTOGRAPHIC EQUIPMENT/N; *PHOTOGRAPHY/N; *PIPELINE/N; REMOTE/N; REVIEW/N; SEA FLOOR/N; SHIP/N; SUBSURFACE/N; SURVEYING/N; TRACER/N; TRENCH/N; TURBIDIMETRY/N; UNDERWATER/N; USE/N
LT - CAMERA/N; INSPECTING/N; MOTOR VEHICLE/N; PHOTOGRAPHIC EQUIPMENT/N; PHOTOGRAPHY/N; REMOTE/N
LT - COMPOUNDS/N; FUGITIVE EMISSION/N; HYDROCARBON/N
LT - DYE/N; TRACER/N; USE/N
LT - PIPELINE/N; SHIP/N; SUBSURFACE/N; UNDERWATER/N

-82-
AN - 3450482
TI - MARINE APPLICATIONS FOR A CONTINUOUS FIBER-OPTIC STRAIN-MONITORING SYSTEM--2
AU - MCKEEHAN D S; GRIFFITHS R W
OS - INTEC ENG. INC. ; G2 CONSULT.
SO - 19TH OFFSHORE TECHNOL. ANNU. CONF. (HOUSTON 4/27-30/87) PROC. N.5564 V4 115-23 (1987)
LA - ENGLISH

BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
BH - WATER TRANSPORT OPERAT. PROBL.
IT - *ANALYTICAL METHOD/N; *BULK CARRIER/N; CABLE/N; CARGO/N; COATING MATERIAL/N; COMPOSITE/N; CONTINUOUS/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DEFORMATION/N; DETECTOR/N; INSTRUMENT/N; MEETING PAPER/N; MODEL/N; *MONITORING/N; *OPTICAL FIBER/N; *PIPELINE/N; PROTOTYPE/N; REPRODUCIBILITY/N; *SHIP/N; *SPECTRAL ANALYSIS/N; STRAIN/N; SUBSURFACE/N; *SUPERTANKER/N; *TANKER/N; UNDERWATER/N; USE/N;
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N
LT - COATING MATERIAL/N; COMPOSITE/N; USE/N
LT - CONTINUOUS/N; MONITORING/N
LT - DETECTOR/N; INSTRUMENT/N; MODEL/N; PROTOTYPE/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-85-
AN - 3450416
TI - MONITORING OF EXTERNAL AND INTERNAL CORROSION IN LOW VELOCITY CRUDE LINES USING AN INSTRUMENTED TOOL
AU - AL-SAFFAR A H; ABU DHABI CO FOR ONSHORE OIL OPERATI
OS - ABU DHABI CO. ONSHORE OIL OPERATIONS
SO - NATL. ASSOC. CORROS. ENG. "CORROS./87" MEET. (SAN FRANC. 3/9-13/87) PAP. N.37 16P
LA - ENGLISH
BH - PIPELINE CORROSION
BH - TRANSPORTATION AND STORAGE
IT - #8002-05-9/N; ABU DHABI/N; ARAB EMIRATES/N; ASSOCIATION/N; CARGO/N; *CORROSION/N; COST/N; COST REDUCTION/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DATA RECORDING/N; ECONOMIC FACTOR/N; FLOW RATE/N; INSIDE/N; *INSPECTING/N; INSTRUMENT/N; LEAK/N; LINE PIPE/N; MAGNETIC FIELD/N; *MAGNETIC PARTICLE TEST/N; MAGNETISM/N; MAINTENANCE/N; MEETING PAPER/N; MIDDLE EAST/N; *MONITORING/N; NACE/N; *NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; OUTSIDE/N; PIPE/N; *PIPELINE/N; *PIPELINE PIG/N; PREVENTION/N; PREVENTIVE MAINTENANCE/N; SLOW/N; SUBSURFACE/N; *TRUNK PIPELINE/N; UNDERGROUND/N; VELOCITY/N; WALL/N
RN - #8002-05-9/N
LT - #8002-05-9/N; CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N
LT - INSIDE/N; OUTSIDE/N; PIPELINE/N; SUBSURFACE/N; TRUNK PIPELINE/N; UNDERGROUND/N

SS 18 /C?
USER:
prt fu 87-89 94 96 112-113

PROG:

-87-
AN - 3481285
TI - SUBSEA PIG TRACKING.
AU - KERSHAW C
OS - MCALPINE KERSHAW LTD
SO - PIPES PIPELINES INT. SUBSEA PIGGING CONF. (HAUGESUND, NORWAY, 9/23-25/86) PROC. (1986) 25P PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 417,772 V27 N.20

(5/16/87)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; CLEANING/N; ECONOMIC FACTOR/N; LOCATION/N; MECHANICAL CLEANING/N; MEETING PAPER/N; *MONITORING/N; OFFSHORE/N; OPERATOR/N; PERSONNEL/N; PIGGING/N; PIPELINE/N; *PIPELINE PIG/N; SUBSURFACE/N; UNDERWATER/N
LT - LOCATION/N; PIPELINE PIG/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-88-
AN - 3481276
TI - INSPECTION AND MAINTENANCE PHILOSOPHY FOR OFFSHORE PIPELINES FUTURE DEVELOPMENT.
AU - DECARO R; ASSIRELLI C; MAZZUCCHELLI R
OS - SNAM PROGETTI SPA ; SNAM SPA
SO - 3RD DEEP OFFSHORE TECHNOL. (DOT) INT. CONF. (SORRENTO, ITALY, 10/21-23/85) PROC. 1(II.7) (1985) 11P PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 417,754 V27 N.20 (5/16/87)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; BUSINESS OPERATION/N; DAMAGE/N; DATA BASE/N; DEEP WATER/N; INFORMATION SERVICE/N; *INSPECTING/N; *MAINTENANCE/N; MANAGEMENT/N; MEETING PAPER/N; *PIPELINE/N; PLANNING/N; SEA FLOOR/N; SUBSURFACE/N; *TRUNK PIPELINE/N; UNDERWATER/N
LT - PIPELINE/N; SUBSURFACE/N; TRUNK PIPELINE/N; UNDERWATER/N

-89-
AN - 3481270
TI - SUBSEA INTELLIGENT PIGGING.
AU - RIVETT A F
OS - AMF INTERNATIONAL LTD
SO - PIPES PIPELINES INT. SUBSEA PIGGING CONF. (HAUGESUND, NORWAY, 9/23-25/86) PROC. (1986) 20P PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 417,739 V27 N.20 (5/16/87)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; *CLEANING/N; DATA RECORDING/N; INSPECTING/N; JOINT/N; MAGNETIC FIELD/N; MAGNETISM/N; *MECHANICAL CLEANING/N; MEETING PAPER/N; *PIGGING/N; *PIPELINE/N; *PIPELINE PIG/N; SCRAPER/N; SUBSURFACE/N; UNDERWATER/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-94-
AN - 3480425
TI - OPERATIONAL METHODS TO IDENTIFY DEFECTS IN SUBSEA PIPELINES.
AU - MCDINE M P; POORE A W
OS - BROWN & ROOT (UK) LTD

SO - ELECTRON. IN OIL & GAS TECH. PROGRAM (LONDON, ENGL., 2/4-6/86) PROC. 5/1-5/17 (1986) PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 412,693 V27 N.6 (2/7/87)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - #8002-05-9/N; ABSTRACT/N; CARGO/N; CONTINUOUS/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; CYCLE/N; DEEP WATER/N; *DEFECT/N; ECONOMIC FACTOR/N; INSPECTING/N; LEGAL CONSIDERATION/N; LOCATION/N; MAINTENANCE/N; MEETING PAPER/N; MONITORING/N; NATURAL GAS/N; *NORTH SEA/N; NORWAY/N; OFFSHORE/N; OIL AND GAS FIELDS/N; OPERATOR/N; PERSONNEL/N; *PIPELINE/N; PIPING SYSTEM/N; PREDICTION/N; SCANDINAVIA/N; SCOTLAND/N; *SEA/N; SUBSURFACE/N; UNDERWATER/N; UNITED KINGDOM/N; WESTERN EUROPE/N
RN - #8002-05-9/N
LT - #8002-05-9/N; CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N
LT - CONTINUOUS/N; MONITORING/N
LT - CYCLE/N; INSPECTING/N
LT - DEFECT/N; LOCATION/N
LT - OFFSHORE/N; OIL AND GAS FIELDS/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-96-
AN - 3450134
TI - PIPELINE MONITORING
AU - JAMIESON R M; MCDONALD J S; TRANSCANADA PIPELINES LTD
OS - TRANSCAN. PIPELINES LTD.
SO - J. ENERGY RESOURCES TECHNOL. (ISSN 0195-0738) V108 N.4 351-54 (DEC. 1986)
LA - ENGLISH
NU - ISSN 01950738
BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ACTIVITY/N; ANNUAL/N; CANADA/N; *CATHODIC PROTECTION/N; COATING MATERIAL/N; COMPUTER/N; COMPUTER PROGRAMING/N; CORROSION/N; *CORROSION CONTROL/N; CORROSIVITY/N; DATA PROCESSING/N; DEFORMATION/N; DIGITAL COMPUTER/N; EFFICIENCY/N; ELECTRIC POTENTIAL/N; ELECTRICITY/N; *ELECTROCHEMICAL PROTECTION/N; *INSPECTING/N; *INSTRUMENT/N; LINE PIPE/N; MAGNETIC FIELD/N; MAGNETISM/N; MATERIAL DEPLETION/N; MONITORING/N; NORTH AMERICA/N; ON STREAM/N; OPERATING CONDITION/N; PHYSICAL PROPERTY/N; PIPE/N; *PIPELINE/N; PROGRAMING/N; SCIENTIFIC RESEARCH/N; SIZE/N; SOIL (EARTH)/N; SUBSURFACE/N; SURFACE/N; SURVEYING/N; UNDERGROUND/N; USE/N
LT - ANNUAL/N; SURVEYING/N
LT - LINE PIPE/N; PIPE/N; SIZE/N
LT - PIPELINE/N; SUBSURFACE/N; SURFACE/N; UNDERGROUND/N

-112-
AN - 3350862
TI - INSPECTION AND MAINTENANCE TECHNIQUES FOR THE ALGERIA-ITALY TRANS-MEDITERRANEAN PIPELINE
AU - BENSALEM M T; TRANSMEDITERRANEAN PIPELINE CO/TMPC; SONATRACH; SNAM SPA
OS - MARICONSULT S.P.A.
SO - 3RD DEEP OFFSHORE TECHNOL. INT. CONF. (SORRENTO, ITALY 10/21-23/85) (ADAPT.) OIL GAS J. V84 N.27 54-58 (7/7/86)
LA - ENGLISH

NU - ISSN 00301388
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - AFRICA/N; AGGREGATE/N; ALGERIA/N; BUSINESS OPERATION/N; CARGO/N; CONTROL/N; DYNAMIC POSITIONING/N; FORCE/N; HORIZONTAL/N; *INSPECTING/N; ITALY/N; LENGTH/N; LINE PIPE/N; *MAINTENANCE/N; MAP/N; MEDITERRANEAN SEA/N; MEETING PAPER/N; MOUNTING/N; NATURAL GAS/N; ORGANIZATION/N; PIPE/N; *PIPELINE/N; PREVENTION/N; REMOTE/N; SEA/N; SHIP/N; SOIL (EARTH)/N; SUBSURFACE/N; *TRUNK PIPELINE/N; UNDERWATER/N; VERTICAL/N; WESTERN EUROPE/N
LT - CARGO/N; NATURAL GAS/N
LT - CONTROL/N; REMOTE/N
LT - HORIZONTAL/N; LENGTH/N; LINE PIPE/N; PIPE/N; VERTICAL/N
LT - SHIP/N; SUBSURFACE/N; UNDERWATER/N

-113-
AN - 3350736
TI - ADVANCES IN UNDERWATER CORROSION AND FLAW DETECTION
AU - SMITH C A; BAUGH & WEEDON; BUCKLEYS URAL LTD; R T LABORATORIES
SO - ANTI-CORROS. METHODS MATER. V33 N.4 12 (APR. 1986)
LA - ENGLISH
NU - ISSN 00035599
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - CAMERA/N; *CORROSION/N; DEEP WATER/N; *DEFECT/N; DETECTOR/N; ECONOMIC FACTOR/N; ENCAPSULATION/N; FLUID FLOW/N; INSTRUMENT/N; MECHANICAL WAVE/N; MONITORING/N; NEWS/N; PERSONNEL/N; PHOTOGRAPHIC EQUIPMENT/N; *PIPELINE/N; SOUND WAVE/N; SUBSURFACE/N; SURFACE/N; THICKNESS/N; TRANSMITTER/N; ULTRASONIC WAVE/N; UNDERWATER/N
LT - ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - PIPELINE/N; SUBSURFACE/N; SURFACE/N; THICKNESS/N; UNDERWATER/N

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USER:
prt fu 115 119 127 128 131 142 152-154

PROG:

-115-
AN - 3350592
TI - STONE DUMPING TO PROTECT PIPELINES
AU - OCEANO INSTRUMENTS; HOLLANDSCHE AANNEMING MIJ
SO - OCEAN IND. V21 N.4 229 (APR. 1986)
LA - ENGLISH
NU - ISSN 00298026
BH - PIPELINE CONSTRUCTION; TRANSPORTATION AND STORAGE
IT - ALIGNMENT/N; *ANCHORING/N; CABLE/N; COMMUNICATION SYSTEM/N; COMPUTER/N; COMPUTER CONTROL/N; COMPUTING/N; CONTROL/N; DATA RECORDING/N; DEEP WATER/N; DIGITAL COMPUTER/N; DREDGE/N; *DYNAMIC POSITIONING/N; INSPECTING/N; MARINE/N; MATERIAL HANDLING/N; MECHANICAL WAVE/N; MICROCOMPUTER/N; MONITORING/N; MOTION/N; NAVIGATION EQUIPMENT/N; NONE/N; NORTH SEA/N; OFFSHORE/N; OIL AND GAS FIELDS/N; PIPE/N; *PIPELINE/N; PROGRAMING/N; RADIO/N; REAL TIME/N; REMOTE/N; *ROCK/N; SEA/N; SEA FLOOR/N; SHIP/N; SOUND WAVE/N; SUBSURFACE/N; UNDERWATER/N; UNITED KINGDOM/N; USE/N; VELOCITY/N; WESTERN EUROPE/N
LT - ALIGNMENT/N; MARINE/N; OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

LT - CABLE/N; NONE/N
LT - CONTROL/N; REMOTE/N
LT - OFFSHORE/N; OIL AND GAS FIELDS/N
LT - ROCK/N; USE/N

-119-
AN - 3381375
TI - ACOUSTIC INSPECTION SURVEYS OF SUBMARINE PIPELINES.
AU - MCKENZIE I
SO - PIPELINE IND. GUILD J., (94) 4-9 (1985-1986) PET. ABSTR. ABSTR.NO. 399,844 V26 N.18 (5/3/86)
LA - ENGLISH
BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACOUSTICS/N; CONTRACTOR/N; COST/N; DAMAGE/N; DATA RECORDING/N; ECONOMIC FACTOR/N; EQUIPMENT/N; HAZARD/N; *INSPECTING/N; MAINTENANCE/N; NATURAL/N; OFFSHORE/N; OPERATING CONDITION/N; OPERATOR/N; OPTICAL DENSITY/N; OPTICAL PROPERTY/N; PERSONNEL/N; PHYSICAL PROPERTY/N; *PIPELINE/N; REMOTE/N; SAFETY/N; SEVERITY/N; SONAR/N; SUBSURFACE/N; *SURVEYING/N; UNDERWATER/N; VISIBILITY/N; WEAR/N
ST - SIDESCAN SONAR; SPANNING
LT - EQUIPMENT/N; REMOTE/N
LT - HAZARD/N; NATURAL/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-127-
AN - 3350040
TI - INSPECTION AND MAINTENANCE OF THE (NATURAL) GAS PIPELINE IN THE SICILIAN CHANNEL
AU - BENSALEM M T; TRANSMEDITERRANEAN PIPELINE CO
OS - MARICONSULT
SO - DOT 85 (ADAPT.) PET. INF. INT. N.1616 93-94 (OCT. 1985)
LA - ENGLISH
NU - ISSN 0755561X
BH - PIPELINE DESCRIPTIONS-PLANS; TRANSPORTATION AND STORAGE
IT - ACCURACY/N; AFRICA/N; AGGREGATE/N; ALGERIA/N; CAMERA/N; CARGO/N; CATHODIC PROTECTION/N; CHANNEL/N; COMMUNICATION SYSTEM/N; CONTROL/N; CORROSION CONTROL/N; DEPTH/N; DYNAMIC POSITIONING/N; ECONOMIC FACTOR/N; ELECTROCHEMICAL PROTECTION/N; EQUILIBRIUM/N; EQUIPMENT TESTING/N; *INSPECTING/N; INSTRUMENT/N; ITALY/N; LENGTH/N; LINE PIPE/N; *MAINTENANCE/N; MAP/N; MECHANICAL PROPERTY/N; MOUNTING/N; NATURAL GAS/N; NAVIGATION EQUIPMENT/N; PERSONNEL/N; PHOTOGRAPHIC EQUIPMENT/N; PHYSICAL PROPERTY/N; PIPE/N; *PIPELINE/N; *PIPELINE CROSSING/N; REMOTE/N; REVIEW/N; SHIP/N; SICILY/N; SOIL (EARTH)/N; SONAR/N; SUBSURFACE/N; SURVEYING/N; TELEVISION/N; TRENCH/N; *TRUNK PIPELINE/N; UNDERWATER/N; WESTERN EUROPE/N
LT - CARGO/N; NATURAL GAS/N
LT - CONTROL/N; REMOTE/N
LT - DEPTH/N; PIPELINE/N; TRUNK PIPELINE/N
LT - LENGTH/N; PIPELINE/N; PIPELINE CROSSING/N
LT - SHIP/N; SUBSURFACE/N; UNDERWATER/N

-128-
AN - 3251324
TI - CATHODIC PROTECTION MONITORING AND SURVEY REQUIREMENTS FOR OFFSHORE PLATFORMS AND PIPELINES--3

AU - WYATT B S; SINTEF
OS - GLOBAL CATHODIC PROT.
SO - ANTI-CORROS. METHODS MATER. V32 N.8 7-11 (AUG. 1985)
LA - ENGLISH
NU - ISSN 00035599
BH - PIPELINE CORROSION; TRANSPORTATION AND STORAGE
IT - ACCURACY/N; ANODE/N; *CATHODIC PROTECTION/N; COATING MATERIAL/N; *CORROSION CONTROL/N; DAMAGE/N; DETECTOR/N; DISTRIBUTION/N; ELECTRIC CURRENT/N; ELECTRIC FIELD/N; ELECTRICITY/N; *ELECTROCHEMICAL PROTECTION/N; ELECTRODE/N; ELECTROLYTE/N; EQUIPMENT TESTING/N; INSTRUMENT/N; LINE PIPE/N; LOCATION/N; MEASURING/N; METEOROLOGICAL PHENOMENON/N; MONITORING/N; NORWAY/N; *OFFSHORE STRUCTURE/N; OUTSIDE/N; PIPE/N; *PIPELINE/N; PROBE/N; REMOTE/N; REVIEW/N; RISER/N; SCANDINAVIA/N; SIMULTANEOUS/N; SOIL (EARTH)/N; SUBSURFACE/N; SURVEYING/N; TOWING/N; TRANSPORTATION/N; UNDERWATER/N; USE/N; WESTERN EUROPE/N; WIRE/N
LT - ELECTRODE/N; OUTSIDE/N; REMOTE/N
LT - LOCATION/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N
LT - MEASURING/N; SIMULTANEOUS/N

-131-
AN - 3284036
TI - LEAKAGE FROM RUPTURED SUBMARINE OIL PIPELINE.
AU - KRANENBURG C; VEGT E
OS - DELFT UNIV TECHNOL
SO - J. TRANSP. ENG., AMER. SOC. CIVIL ENG. 111(5) 570-581 (SEPT. 1985) PET. ABSTR. ABSTR.NO. 390,483 V25 N.43 (10/26/85) IN ENGLISH
LA - ENGLISH
BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; BUOYANCY/N; BURSTING/N; CARGO/N; COMPOSITION/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DENSITY/N; FAILURE/N; FLOW RATE/N; FLUID FLOW/N; FRICTION/N; GAS/N; INCLINATION/N; LABORATORY SCALE/N; LAMINAR FLOW/N; LAYERED/N; *LEAK/N; MATHEMATICS/N; MODEL/N; MOTION/N; NONE/N; OIL WASTE/N; OPERATING CONDITION/N; OPERATIONS RESEARCH/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PROTOTYPE/N; SALINE WATER/N; SPILL/N; SUBSURFACE/N; THEORETICAL STUDY/N; TURBULENT FLOW/N; UNDERWATER/N; VOLATILES CONTENT/N; WASTE MATERIAL/N; WATER/N; WATER POLLUTANT/N
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; LAYERED/N; LEAK/N; OIL WASTE/N; SPILL/N; WASTE MATERIAL/N; WATER POLLUTANT/N
LT - GAS/N; NONE/N
LT - INCLINATION/N; MODEL/N; PIPELINE/N; PROTOTYPE/N; SUBSURFACE/N; UNDERWATER/N
LT - MATHEMATICS/N; MODEL/N

-142-
AN - 3282329
TI - A FUNDAMENTAL STUDY ON FLAW DETECTION OF BURIED PIPELINES BY THE ACOUSTIC EMISSION METHOD.
AU - MIYAJIMA N; HANZAWA M; HASHIRAZAKI S; OHKUMA K TANAKA F
OS - NIPPON STEEL CORP
SO - CAN. SOC. NONDESTRUCTIVE TESTING ET. AL. INT. PIPELINE INSP. CONF. (EDMONTON, ALTA., 6/13-18/83) PROC. 503-528 (1984) PET. ABSTR. ABSTR.NO. 382,238 V25 N.23 (6/8/85)
LA - ENGLISH
BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE

AE

IT - ABSTRACT/N; ACOUSTICS/N; COMMUNICATION/N; *DEFECT/N; DETECTOR/N; ECONOMIC FACTOR/N; *EQUIPMENT TESTING/N; FEASIBILITY/N; FORCE/N; GENERATING/N; INSPECTING/N; INSTRUMENT/N; LOADING/N; LOCATION/N; *MAINTENANCE/N; MATERIAL HANDLING/N; MECHANICAL WAVE/N; MEETING PAPER/N; OPERATIONS RESEARCH/N; *PIPELINE/N; PRESSURE VESSEL/N; SCIENCE/TECHNOLOGY/N; STRESS/N; SUBSURFACE/N; UNDERGROUND/N
LT - DETECTOR/N; INSTRUMENT/N; LOCATION/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N

-152-
AN - 3281804
TI - 'SNURE' (ROV) AND SURVEY INSPECTION OF PIPELINES IN DEEP WATER.
AU - REY C
OS - INTERSUB SERVICES
SO - BRIT. MAR. EQUIP. COUNC. & BRIT. OCEAN IND. ASS. WORLDWIDE SUBSEA CHALLENGE PROGR. IN UNDERWATER TECHNOL. CONF. (AMSTERDAM, 6/22-24/83) TECHGROUP B PAP. (B4) (1984) 14P PET. ABSTR. ABSTR.NO. 377,775 V25 N.14 (4/6/85)
LA - ENGLISH
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ANNUAL/N; COMMERCIAL/N; COMMUNICATION/N; COMMUNICATION SYSTEM/N; COMPUTING/N; DATA PROCESSING/N; DEEP WATER/N; *DETECTOR/N; ELECTRIC CURRENT/N; ELECTRIC POTENTIAL/N; ELECTRICITY/N; EQUIPMENT/N; INFORMATION SERVICE/N; *INSPECTING/N; *INSTRUMENT/N; LEAK DETECTOR/N; LOCATION/N; MAINTENANCE/N; MEASURING/N; MEETING PAPER/N; PHOTOGRAPHY/N; *PIPELINE/N; PROCESS CONTROL/N; REAL TIME/N; REMOTE/N; REPORT WRITING/N; SEA FLOOR/N; SONAR/N; SUBSURFACE/N; *SURVEYING/N; TELEMETERING/N; TELEVISION/N; THEORETICAL STUDY/N; TOPOGRAPHY/N; *TRUNK PIPELINE/N; UNDERWATER/N
LT - ANNUAL/N; MAINTENANCE/N
LT - LOCATION/N; PIPELINE/N; SUBSURFACE/N; TRUNK PIPELINE/N; UNDERWATER/N
LT - PROCESS CONTROL/N; REMOTE/N

-153-
AN - 3250449
TI - (BUE SUBSEA) SURVEY SYSTEM IMPROVES OFFSHORE PIPE INSPECTION
AU - WESTWOOD J D; BUE SUBSEA LTD
OS - BUE SUBSEA, SCOTL.
SO - PIPE LINE IND. V62 N.3 49-51 (MAR. 1985)
LA - ENGLISH
NU - ISSN 00320145
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - CAMERA/N; COLOR/N; COMMERCIAL/N; COMMUNICATION SYSTEM/N; DETECTOR/N; EQUIPMENT/N; EXPOSURE/N; INCLINATION/N; *INSPECTING/N; INSTRUMENT/N; LIGHTING EQUIPMENT/N; MOBILITY/N; MODULAR/N; OPERATIONAL PROBLEM/N; OPTICAL PROPERTY/N; PHOTOGRAPHIC EQUIPMENT/N; PHYSICAL PROPERTY/N; *PIPELINE/N; REMOTE/N; SONAR/N; SUBSURFACE/N; SURVEYING/N; TELEVISION/N; UNDERWATER/N; WEAR/N; WHEEL/N
LT - CAMERA/N; INCLINATION/N; MOBILITY/N; PHOTOGRAPHIC EQUIPMENT/N
LT - EQUIPMENT/N; MODULAR/N
LT - INSPECTING/N; REMOTE/N
LT - PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-154-
AN - 3250445

TI - DETECT CORROSION WITH UNDERWATER RADIOGRAPHY
AU - HUNTER J; SONAT SUBSEA SERVICES; S & H DIVING
OS - S & H DIVING
SO - PIPE LINE IND. V62 N.3 45-46 (MAR 1985)
LA - ENGLISH
NU - ISSN 00320145
BH - PIPELINE CORROSION; PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - BUSINESS OPERATION/N; *CORROSION/N; DIAMETER/N; ECONOMIC FACTOR/N; EQUIPMENT TESTING/N; EXPOSURE/N; GULF/N; GULF OF MEXICO/N; *INSPECTING/N; LINE PIPE/N; MONITORING/N; NORTH AMERICA/N; OPERATING CONDITION/N; ORGANIZATION/N; PERSONNEL/N; PHOTOGRAPHY/N; PIPE/N; *PIPELINE/N; PIPELINE PIG/N; RADIATION/N; RADIOACTIVITY/N; RADIOGRAPHY/N; REMOTE/N; SAFETY/N; SUBSURFACE/N; SURFACE/N; TIME/N; UNDERWATER/N; VALVE/N; WATER/N; WELDING/N
LT - DIAMETER/N; LINE PIPE/N; PIPE/N
LT - ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - EXPOSURE/N; REMOTE/N; TIME/N
LT - PHOTOGRAPHY/N; RADIOGRAPHY/N; SUBSURFACE/N; UNDERWATER/N
LT - SURFACE/N; WATER/N

SS 18 /C?
USER:
his

PROG:
SS 1: NONDESTRUCTIVE (W) TEST: AND ULTRASONIC: (542)
SS 2: PIPE: OR PIPELINE: (34844)
SS 3: 1 AND 2 (281)
SS 4: 3 AND 82-90 (127)
SS 5: INSPECT: OR MONITOR: OR FAILURE: (29334)
SS 6: 2 AND 5 (5419)
SS 7: 6 AND 82-90 (2512)
SS 8: PIPE:/TI, IT OR PIPELINE:/TI, IT (33646)
SS 9: PIPE:/TI, IT (33646)
SS 10: CONSTRUCT: (33453)
SS 11: D HIST (0)
SS 12: 7 AND NOT 10 (1594)
SS 13: BUILDING: (2935)
SS 14: 12 AND NOT 13 (1578)
SS 15: 14 AND NOT 4 (1517)
SS 16: 15 AND (BURIED OR SUBTERRANEAN OR SUBMARINE OR UNDERWATER OR SUBSEA) (263)
SS 17: 16 AND 85-90 (162)

APILIT Citations, 2

Nondestructive Testing of Pipes
(Citations from the APILIT Database)

-3-
AN - 3683939
TI - Various Methods of Ultrasonic Pipeline Inspection: Free-Swimming and Cable-Operated Tools
AU - de Raad J A
SO - Pipes Pipelines Int. Pipeline Pigging Technol. Conf. (Houston, 2/21-23/89) Pap; Pipes Pipelines Int., 34(2) 17-25 (Mar.-Apr. 1989) Pet. Abstr. ABSTR. NO. 467,763 V29 N.36 (9/9/89) Pet. Abstr. 467,763
LA - English
NU - ISSN 0032020X; ISSN 00316423
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; CABLE/N; CARGO/N; COMMUNICATION SYSTEM/N; CONSTRUCTION MATERIAL/N; CORD/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DATA TRANSMISSION/N; DEFECT/N; FAILURE/N; FULL SCALE/N; GLASS FIBER/N; *INSPECTING/N; LENGTH/N; LIQUID/N; MATERIAL DEPLETION/N; MECHANICAL WAVE/N; MEETING PAPER/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; PIPE/N; *PIPELINE/N; *PIPELINE PIG/N; PROPELLANT/N; PROPULSION SYSTEM/N; REVIEW/N; RISER/N; SOUND WAVE/N; SPLITTING/N; SYNTHETIC FIBER/N; TRUNK PIPELINE/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; USE/N; WEIGHT/N; WHEEL/N; WIRE/N
RN - 8002-05-9/N
LT - CORD/N; GLASS FIBER/N; LENGTH/N; SYNTHETIC FIBER/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N
LT - CONSTRUCTION MATERIAL/N; USE/N; WEIGHT/N

-4-
AN - 3606901
TI - Finding below-surface defects with nondestructive testing
AU - Sattler F J
OS - Glitsch Field Serv./NDE Inc.
SO - Chem. Eng. (N.Y.) V96 N.9 161-67 (Sept. 1989)
LA - English
NU - ISSN 00092460
BH - CONSERV-TRANSP-STOR-ENG
BH - EQUIPMENT-MATERIALS-UTILITIES
BH - PETROLEUM REFINING AND PETROCHEM
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - CHEMICAL INDUSTRY/N; COATING MATERIAL/N; COLUMN/N; *DEFECT/N; DENSITY/N; EDDY CURRENT/N; ELECTRIC CURRENT/N; ELECTRICAL CONDUCTIVITY/N; ELECTRICAL PROPERTY/N; ELECTRICITY/N; ELECTROMAGNETIC WAVE/N; *EQUIPMENT TESTING/N; GAMMA RAY/N; HEAT EXCHANGER/N; INSPECTING/N; MECHANICAL WAVE/N; *NONDESTRUCTIVE TESTING/N; PETROLEUM INDUSTRY/N; *PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; PIPE/N; PIPELINE/N; RADIATION/N; RADIOACTIVITY/N; *RADIOGRAPHY/N; REVIEW/N; THICKNESS/N; TUBE/N; *ULTRASONIC TESTING/N; USE/N; VOID/N; WELDING/N; X RAY/N
LT - PIPE/N; THICKNESS/N

-5-
AN - 3606593

Mr. Richard Lyon
Senior Vice President, Operations
Oceaneering International, Incorporated
16001 Park Ten Pl., Suite 600, Box 218130
Houston, TX 77218
Phone: (713) 578-8868

Specialized inspection-offshore.
Sent the questionnaire and they sent back valuable information on offshore pipeline inspection and leak detection.
note: see Mr. Quintin Clark, Solus Schall which is the same company.

Mr. Robert Shumway
President
North American Inspection, Inc.
3906 Main St., Box 88
Laurys Station, Pa 18059
Phone: (215) 262-1100

NDT/NDE industrial inspection with radiography (gamma ray and x-ray) ultrasonics magnetic particle, dye penetrant, and visual inspections. (pipelines).
We sent him our questionnaire for any leak detection data or methods.

Mr. Peter J. Moss
Vice President and General Manager
Tulsa Gamma Ray, Inc.
1127 S. Lewis
Tulsa, OK 74104
Phone: (918) 585-3228

Industrial non-destructive testing company specializing in radiography, pentrant, magnetic particle, ultrasonic, thickness measurement.
Certified underground storage tank testors.

TI - An automated system monitors refinery pipe corrosion
AU - Cary J B; Liss J B
OS - Tosco Corp.; Viewsonics Inc.
SO - Natl. Pet. Refiners Assoc. Refinery Petrochem. Plant Maint. Conf. (San Antonio 5/23-26/89) Pap. (Adapt.) Oil Gas J. N.MC-89-75 V87 N.37 37-42 (9/11/89)
LA - English
NU - ISSN 00301388
BH - CONSERV-TRANSP-STOR-ENG
BH - CORROSION AND DETERIORATION
BH - PETROLEUM REFINING AND PETROCHEM
IT - ACCURACY/N; ASSOCIATION/N; *AUTOMATION/N; BUSINESS OPERATION/N; CHART/N; COMPUTER/N; COMPUTER PROGRAMING/N; *COMPUTING/N; CORROSION/N; DATA/N; DATA BASE/N; DATA RECORDING/N; *DESIGN/N; DIGITAL COMPUTER/N; *ENGINEERING/N; GAGE/N; *INDUSTRIAL PLANT/N; INFORMATION SERVICE/N; INSTRUMENT/N; MANAGEMENT/N; MEASURING/N; MEETING PAPER/N; MICROCOMPUTER/N; MONITORING/N; NONDESTRUCTIVE TESTING/N; NPRA/N; *OIL REFINERY/N; PHYSICAL SEPARATION/N; PIPE/N; *PIPING SYSTEM/N; PLANNING/N; PORTABILITY/N; PROGRAMING/N; RECORDS MANAGEMENT/N; RELIABILITY/N; SORTING/N; SPECIFICATION/N; THICKNESS/N; ULTRASONIC TESTING/N
LT - COMPUTER/N; DIGITAL COMPUTER/N; MICROCOMPUTER/N; PORTABILITY/N
LT - PIPE/N; THICKNESS/N
LT - DATA/N; RELIABILITY/N

-6-
AN - 3683590
TI - Remote Underwater MPI (Magnetic Particle Inspection), Radiography and Ultrasonic Inspection of In-Service Oil and Gas Risers
AU - Wyeth H T; Stagg N; van Agthoven R
OS - Sonsub Services; Rontgen Tech Dienst BV
SO - 8th ASME Et Al. Offshore Mech. & Arctic Eng. Int. Conf. (The Hague, Neth, 3/19-23/89) Proc., 1 345-351 (1989) Pet. Abstr. ABSTR. NO. 466,228 V29 N.32 (8/12/89) Pet. Abstr. 466,228
LA - English
NU - ISSN 00316423
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ASME/N; ASSOCIATION/N; CAMERA/N; CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DEEP WATER/N; ECONOMIC FACTOR/N; ELECTROMAGNETIC WAVE/N; FASTENER/N; GAMMA RAY/N; *INSPECTING/N; MAGNETIC PROPERTY/N; MEETING PAPER/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; NONE/N; ON STREAM/N; OPERATING CONDITION/N; PERSONNEL/N; PHOTOGRAPHIC EQUIPMENT/N; *PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; *PIPELINE/N; RADIATION/N; RADIOACTIVITY/N; *RADIOGRAPHY/N; REMOTELY OPERATED VEHICLE/N; REPRODUCIBILITY/N; RISER/N; SHUTDOWN/N; SUBSURFACE/N; TIME/N; TRANSDUCER/N; *ULTRASONIC TESTING/N; UNDERWATER/N
RN - 8002-05-9/N
LT - INSPECTING/N; NONDESTRUCTIVE TESTING/N; PHOTOGRAPHY/N; RADIOGRAPHY/N; SUBSURFACE/N; TIME/N; ULTRASONIC TESTING/N; UNDERWATER/N
LT - NONE/N; SHUTDOWN/N
LT - ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N

-7-
AN - 3650751

TI - OGJ ((Oil & Gas Journal)) special annual pipeline report/Magnetic inspection is the key to ensuring pipeline safety
AU - Atherton D L
OS - Queen's Univ.
SO - Oil Gas J. V87 N.32 52-53,56,58,61 (8/7/89)
LA - English
NU - ISSN 00301388
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - CARGO/N; CHANNEL/N; CIRCLE/N; CONSTRUCTION MATERIAL/N; CORROSION/N; CURVE/N; DEFECT/N; DETECTOR/N; DISTRIBUTION/N; EDDY CURRENT/N; EDGE/N; ELECTRIC CURRENT/N; ELECTRICITY/N; EQUIPMENT/N; FAILURE/N; FERROUS ALLOY/N; FINITE ELEMENT METHOD/N; FORCE/N; *INSPECTING/N; INSTRUMENT/N; LINE PIPE/N; MAGNETIC FIELD/N; *MAGNETIC PARTICLE TEST/N; MAGNETIC PROPERTY/N; MAGNETISM/N; MATHEMATICS/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; PERMEABILITY/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; PIPE/N; *PIPELINE/N; RADIOGRAPHY/N; REMOTE/N; REPORT/N; REVIEW/N; SAFETY/N; SPLITTING/N; STEEL/N; STRESS/N; STRESS CORROSION/N; STRESS CORROSION CRACKING/N; SUBSURFACE/N; SURFACE/N; TUBE/N; ULTRASONIC TESTING/N; UNDERGROUND/N; USE/N; WALL/N
LT - CARGO/N; NATURAL GAS/N
LT - CONSTRUCTION MATERIAL/N; FERROUS ALLOY/N; STEEL/N; USE/N
LT - PIPELINE/N; SUBSURFACE/N; SURFACE/N; UNDERGROUND/N
LT - CHANNEL/N; CIRCLE/N; CURVE/N; DEFECT/N; EDGE/N
LT - INSPECTING/N; REMOTE/N

SS 5 /C?
USER:
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PROG:

-9-
AN - 3682944
TI - Electromagnetic Ultrasonic Transducers and Systems for In-Service Inspection of Gas Pipelines
AU - Holler P; Salzburger H J; Wilbrand A
OS - Universitat Saarbrucken West Germany
SO - IEE Proc. A 134 279-82 (Mar. 1987) Gas Abstr. ABSTR. NO. 88-0487 V44 N.3 (March 1988) Gas Abstr. 88-0487
LA - English
NU - ISSN 00164844
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; BUTT WELDING/N; CARGO/N; DEFECT/N; ELECTROMAGNETISM/N; EQUIPMENT TESTING/N; INCLINATION/N; INSIDE/N; *INSPECTING/N; MAGNETISM/N; *MAINTENANCE/N; MECHANICAL WAVE/N; NATURAL GAS/N; NONDESTRUCTIVE TESTING/N; OPERATIONS RESEARCH/N; OPTIMIZATION/N; OUTSIDE/N; *PIPELINE/N; POLARIZATION/N; SOUND WAVE/N; STATE OF THE ART/N; SURFACE/N; *TRANSDUCER/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WALL/N; WELDING/N
ST - ELECTROMAGNETIC ULTRASONIC TRANSDUCER
LT - CARGO/N; NATURAL GAS/N
LT - INSIDE/N; OUTSIDE/N; PIPELINE/N; SURFACE/N
LT - INCLINATION/N; MECHANICAL WAVE/N; SOUND WAVE/N; ULTRASONIC WAVE/N

-12-
AN - 3603044
TI - Ultrasonic detection of hydrogen attack in steels
AU - Birring A S; Bartlett M L; Kawano K
OS - Southwest Res. Inst.; Idemitsu Eng. Co.
SO - Corrosion V45 N.3 259-63 (Mar. 1989)
LA - English
NU - ISSN 00109312
BH - CONSERV-TRANSP-STOR-ENG
BH - CORROSION AND DETERIORATION
BH - EQUIPMENT-MATERIALS-UTILITIES
BH - PETROLEUM REFINING AND PETROCHEM
IT - C1/N; DECARBURIZING/N; DEFECT/N; *DETERIORATION/N; ELEMENT/N; *EMBRITTLEMENT/N; FAILURE/N; *FERROUS ALLOY/N; FRACTURING/N; GAS/N; HYDROCARBON/N; HYDROGEN/N; *HYDROGEN EMBRITTLEMENT/N; IMPACT/N; MATERIALS TESTING/N; MEASURING/N; MECHANICAL PROPERTY/N; MECHANICAL WAVE/N; METHANE/N; MICRO/N; *NONDESTRUCTIVE TESTING/N; PHYSICAL PROPERTY/N; PIPE/N; REFLECTION/N; SATURATED CHAIN/N; SCATTERING/N; SINGLE STRUCTURE TYPE/N; SOUND WAVE/N; SPLITTING/N; *STEEL/N; SURFACE ROUGHNESS/N; THICKNESS/N; TOUGHNESS/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; VELOCITY/N; WALL/N
RN - 74-82-8/N
LT - ELEMENT/N; HYDROGEN/N
LT - C1/N; HYDROCARBON/N; METHANE/N; SATURATED CHAIN/N; SINGLE STRUCTURE TYPE/N; THICKNESS/N; WALL/N
LT - DEFECT/N; MICRO/N

-14-
AN - 3681202
TI - Flux Leakage Testing Applied to Operational Pipelines
AU - Shannon R W C; Jackson L
OS - British Gas plc
SO - Mater. Evaluation 46(12(, 1516-1518,1520-1522,1524 (Nov. 1988) Pet. Abstr. ABSTR. NO. 457,084 V29 N.11 (3/18/89) Pet. Abstr. 457,084
LA - English
NU - ISSN 00255327; ISSN 00316423
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ALLOY/N; CARGO/N; CONSTRUCTION/N; CONTACTING/N; CORROSION/N; CORROSION TEST/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DAMAGE/N; DETECTOR/N; DIAMETER/N; DIRECTION/N; ELECTRIC CIRCUIT/N; *EQUIPMENT TESTING/N; FORCE/N; INSIDE/N; INSTRUMENT/N; *LEAK/N; LEAK DETECTOR/N; MAGNETIC PROPERTY/N; MATERIAL DEPLETION/N; MATERIALS TESTING/N; MEASURING/N; MECHANICAL WAVE/N; MONITORING/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; OUTSIDE/N; PHYSICAL PROPERTY/N; PIPE/N; *PIPELINE/N; PRESSURE VESSEL/N; REFLECTION/N; SOUND WAVE/N; STRESS/N; SURFACE/N; THICKNESS/N; TRANSPORTATION/N; ULTRASONIC WAVE/N; WALL/N
RN - 8002-05-9/N
LT - DIAMETER/N; INSIDE/N; OUTSIDE/N; PIPELINE/N; SURFACE/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N
LT - THICKNESS/N; WALL/N
LT - DIRECTION/N; FORCE/N; STRESS/N
LT - ALLOY/N; CONSTRUCTION/N

-15-
AN - 3680795
TI - Leak testing of pipelines using pressure and acoustic velocity
AU - Hough J E
OS - SAIPEM Australia Pty Ltd
SO - 7th ASME et al. Offshore Mech. & Arctic Eng. Int. Conf. (Houston, Texas 2/7-12/88) Proc., 5 61-66 (1988) Pet. Abstr. ABSTR. NO. 455,727 V29 N.8 (2/25/89) Pet. Abstr. 455,727
LA - English
NU - ISSN 00316423
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACOUSTICS/N; ASME/N; ASSOCIATION/N; BURYING/N; CARGO/N; ECONOMIC FACTOR/N; *EQUIPMENT TESTING/N; FEASIBILITY/N; *LEAK/N; LIQUID/N; MECHANICAL WAVE/N; MEETING PAPER/N; *MONITORING/N; *NONDESTRUCTIVE TESTING/N; OFFSHORE/N; ONSHORE/N; OPERATING CONDITION/N; *PIPELINE/N; REVIEW/N; SOUND WAVE/N; SUBSURFACE/N; TEMPERATURE/N; THEORETICAL STUDY/N; TRANSPORTATION/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNDERGROUND/N; UNDERWATER/N; UNSTEADY STATE/N; VELOCITY/N
LT - OFFSHORE/N; ONSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N; UNDERWATER/N

-16-
AN - 3650165
TI - Why small (pipeline gas) leaks cannot always be detected
AU - U K National Engineering Laboratory
SO - Mar. Eng. Rev. 30-31 (Dec. 1988)
LA - English
NU - ISSN 00475955
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - *ASSOCIATED GAS/N; CARGO/N; COMPRESSIBILITY/N; CONDENSATION/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DETECTOR/N; *EQUIPMENT TESTING/N; FLOW RATE/N; FLOWMETER/N; FLUID FLOW/N; INSTRUMENT/N; *LEAK/N; LEAK DETECTOR/N; LIQUEFACTION/N; LIQUID/N; MEASURING/N; MECHANICAL PROPERTY/N; MECHANICAL WAVE/N; *MONITORING/N; MULTIPHASE/N; *NATURAL GAS/N; NONDESTRUCTIVE TESTING/N; OFFSHORE/N; OPERATING CONDITION/N; PHASE CHANGE/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PRESSURE/N; PRESSURE DROP/N; SIZE/N; SOUND WAVE/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; VAPORIZATION/N
RN - 8002-05-9/N
LT - ASSOCIATED GAS/N; CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N
LT - LEAK/N; SIZE/N
LT - OFFSHORE/N; PIPELINE/N

SS 5 /C?
USER:
prt fu 18 21-24 28-29 32

PROG:

-18-
AN - 3586537
TI - LOCATION OF LEAKS IN A GAS-TRANSPORT PIPELINE BY ACOUSTIC METHOD
AU - WATANABE K; KOYAMA H; OHNO H

OS - COLL ENG HOSEI UNIV TOKYO JAPAN 184
SO - ADV. INSTRUM., 42(2) 619-26 (1987) CHEM. ABSTR. ABSTR. NO. 152065 V109 N.18
LA - ENGLISH
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACOUSTICS/N; CARGO/N; *DETECTOR/N; EQUATION/N; *INSTRUMENT/N; LABORATORY SCALE/N; *LEAK/N; *LEAK DETECTOR/N; MATHEMATICS/N; MECHANICAL WAVE/N; *MONITORING/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; *PIPELINE/N; PROCESS TESTING/N; PUMP STATION/N; SOUND WAVE/N; THEORETICAL STUDY/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N
LT - CARGO/N; NATURAL GAS/N

-21-
AN - 3584030
TI - LEAK DETECTION IN PIPELINES AND PIPELINES REHABILITATION.
AU - BOSCHAT J R
OS - OMNIUM TECH TRANS PIPELINE
SO - 1ST ONSHORE OIL CONF. (ONSHORE CHINA "86) (GUANGZHOU (CANTON), CHINA, 12/9-13/86) PROC. 555-575 (1986) PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 438,706 V28 N.21 (5/21/88)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; AUTOMATION/N; CAMERA/N; CAPACITY/N; CLEANING/N; CLOGGING/N; CORROSION CONTROL/N; ECONOMIC FACTOR/N; ELECTROMAGNETIC WAVE/N; FLUID FLOW/N; INFRARED RADIATION/N; *LEAK/N; *MAINTENANCE/N; MATHEMATICS/N; MECHANICAL CLEANING/N; MEETING PAPER/N; MODEL/N; *MONITORING/N; NONDESTRUCTIVE TESTING/N; OPERATIONAL PROBLEM/N; OUTSIDE/N; PHOTOGRAPHIC EQUIPMENT/N; PHOTOGRAPHY/N; PIGGING/N; *PIPELINE/N; RADIATION/N; REVIEW/N; ULTRASONIC TESTING/N
LT - MATHEMATICS/N; MODEL/N
LT - OUTSIDE/N; PIPELINE/N

-22-
AN - 3583044
TI - CONDITION ASSESSMENT AND INSPECTION OF PIPELINES.
AU - BOKALRUD T; QVAM W; VERITAS OFFSHORE TECHNOLOGY & SERVIC
SO - NOROIL, 15 (SEPT. 1987) 1P BMT (BR. MAR. TECHNOL.) ABSTR. (ISSN 0268-9650) ABSTR.NO. 88010135 V43 N.1 (JAN. 1988)
LA - ENGLISH
NU - ISSN 02689650
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACCURACY/N; AUTOMATION/N; COMMERCIAL/N; CONTROL/N; CORROSION/N; CORROSION TEST/N; DAMAGE/N; DEFECT/N; DEPTH/N; ECONOMIC FACTOR/N; HIGH PRESSURE/N; *INSPECTING/N; MAPPING/N; MATERIALS TESTING/N; *MONITORING/N; *NONDESTRUCTIVE TESTING/N; NONE/N; OPERATING CONDITION/N; PERSONNEL/N; *PIPELINE/N; PRESSURE/N; REMOTE/N; REMOTELY OPERATED VEHICLE/N; RISER/N; ROBOT/N; SUBSURFACE/N; *ULTRASONIC TESTING/N; UNDERWATER/N; WATER/N; WELDING/N; WELL/N
ST - CORROSCAN SYSTEM; REMOTE CONTROL; ULTRASONIC IMAGING; WELDSCAN SYSTEM
LT - CONTROL/N; REMOTE/N

LT - DEPTH/N; WATER/N
LT - ECONOMIC FACTOR/N; NONE/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - INSPECTING/N; PIPELINE/N; RISER/N; SUBSURFACE/N; UNDERWATER/N; WELL/N

-23-
AN - 3581313
TI - INSPECTION PIG TECHNIQUE USING ULTRASONIC METHOD.
AU - UCHIDA Y; YAMADA H; AKUZAWA H
OS - NIPPON KOKAN KK
SO - 10TH ANNU. ASME ET AL. ENERGY-SOURCES TECHNOL. CONF. PIPELINE ENG. SYMP. (DALLAS 2/15-18/87) PROC. 115-120 (1987) PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 432,278 V28 N.6 (2/6/88)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ASME/N; ASSOCIATION/N; *CORROSION/N; CORROSION TEST/N; *INSPECTING/N; MATERIALS TESTING/N; MECHANICAL WAVE/N; MEETING PAPER/N; MODEL/N; *MONITORING/N; NONDESTRUCTIVE TESTING/N; *PIPELINE/N; *PIPELINE LOOP/N; *PIPELINE PIG/N; PROTOTYPE/N; SOUND WAVE/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WALL/N; WELDING/N
LT - MODEL/N; PIPELINE PIG/N; PROTOTYPE/N

-24-
AN - 3580612
TI - COMPARISON BETWEEN ULTRASONIC AND MAGNETIC FLUX PIGS FOR PIPELINE INSPECTION WITH EXAMPLES OF ULTRASONIC PIGS.
AU - DE RAAD J A
OS - ROTGEN TECHNISCHE DIENST BV NETHERLANDS
SO - PIPES PIPELINES INT., 3216 7-15 (1987) GAS ABSTR. (ISSN 0016-4844) ABSTR.NO. 87-2070 V43 N.12 (DEC. 1987)
LA - ENGLISH
NU - ISSN 00164844
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; CLEANING/N; CORROSION/N; CORROSION TEST/N; *EQUIPMENT TESTING/N; FAILURE/N; *INSPECTING/N; INSTRUMENT/N; MAGNETIC PROPERTY/N; MAINTENANCE/N; MATERIAL DEPLETION/N; MATERIALS TESTING/N; MECHANICAL CLEANING/N; MECHANICAL WAVE/N; *NONDESTRUCTIVE TESTING/N; PHYSICAL PROPERTY/N; PIGGING/N; *PIPELINE/N; *PIPELINE PIG/N; REPORT/N; SOUND WAVE/N; SPLITTING/N; THICKNESS/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WALL/N
ST - MAGNETIC FLUX; ULTRASONIC PIG
LT - THICKNESS/N; WALL/N

-28-
AN - 3550149
TI - BRITISH GAS (CORP.) DEVELOPS PIG TO DETECT PIPE CRACKS
AU - BRITISH GAS CORP; TRANSCANADA PIPELINES
SO - PIPE LINE IND. (ISSN 0032-0145) V68 N.1 73 (JAN. 1988)
LA - ENGLISH
NU - ISSN 00320145
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - BRITISH GAS CORP/N; CANADA/N; CARGO/N; CONSTRUCTION MATERIAL/N;

*DEFECT/N; *DETECTOR/N; EASTERN CANADA/N; EQUIPMENT TESTING/N; FERROUS ALLOY/N; *INSPECTING/N; *INSTRUMENT/N; LINE PIPE/N; MAGNETIC PARTICLE TEST/N; MATERIAL DEPLETION/N; MECHANICAL WAVE/N; MODEL/N; NATURAL GAS/N; NEWS/N; NONDESTRUCTIVE TESTING/N; NORTH AMERICA/N; PIPE/N; PIPELINE/N; *PIPELINE PIG/N; PROTOTYPE/N; REFLECTION/N; SOUND WAVE/N; STEEL/N; THICKNESS/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNITED KINGDOM/N; USE/N; WESTERN EUROPE/N

LT - CARGO/N; NATURAL GAS/N

LT - CONSTRUCTION MATERIAL/N; FERROUS ALLOY/N; STEEL/N; USE/N

LT - DEFECT/N; THICKNESS/N

LT - DETECTOR/N; INSTRUMENT/N; MODEL/N; PIPELINE PIG/N; PROTOTYPE/N

-29-

AN - 3580285

TI - CASE HISTORIES OF STRUCTURAL DAMAGES - LESSONS LEARNED.

AU - ROREN E M Q; SOLLIE T; CARLIN B

OS - DET NORSKE VERITAS

SO - 4TH DELFT UNIV. TECHNOL. ET AL. BEHAV. OF OFFSHORE STRUCT. (BOSS"85) INT. CONF. (DELFT, NETH. 7/1-5/85) PROC. (ELSEVIER DEVELOP. MAR. TECHNOL. VOL. 2) 1-6 (1985) PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 419,826 V27 N.25 (6/20/87)

LA - ENGLISH

NU - ISSN 00316423

BH - PIPELINE CORROSION

BH - PIPELINE MAINTENANCE

BH - TRANSPORTATION AND STORAGE

IT - ABSTRACT/N; ACCIDENT/N; CASE HISTORY/N; CONSTRUCTION/N; CONTROL/N; CORROSION/N; CORROSION RESISTANCE/N; *DAMAGE/N; DATA/N; DEFECT/N; DESIGN/N; DETERIORATION/N; ELECTRIC POTENTIAL/N; ELECTRICITY/N; ENGINEERING/N; INSPECTING/N; MAGNETIC PARTICLE TEST/N; MAPPING/N; MECHANICAL ENGINEERING/N; MEETING PAPER/N; MONITORING/N; NONDESTRUCTIVE TESTING/N; NORTH SEA/N; *OFFSHORE STRUCTURE/N; OPERATIONAL PROBLEM/N; PHYSICAL PROPERTY/N; *PIPELINE/N; SEA/N; STABILITY/N; SUBSURFACE/N; *TRUNK PIPELINE/N; ULTRASONIC TESTING/N; UNDERWATER/N

LT - PIPELINE/N; SUBSURFACE/N; TRUNK PIPELINE/N; UNDERWATER/N

-32-

AN - 3406507

TI - NDT ((NONDESTRUCTIVE TESTING)) EQUIPMENT AND METHODS IN PETROLEUM

AU - BROOK C

OS - WELLS KRAUTKRAMER

SO - PET. REV. (ISSN 0020-3076) V41 N.487 15,17 (AUG. 1987)

LA - ENGLISH

NU - ISSN 00203076

BH - CONSERV-TRANSP-STOR-ENG

BH - CORROSION AND DETERIORATION

BH - PETROLEUM REFINING AND PETROCHEM

BH - PIPELINE CORROSION

BH - TRANSPORTATION AND STORAGE

IT - ALTERNATING CURRENT/N; CASTING/N; COATING MATERIAL/N; COMPUTER/N; *CORROSION/N; CORROSION TEST/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DATA RECORDING/N; DEFECT/N; DIGITAL COMPUTER/N; EDDY CURRENT/N; ELECTRIC CURRENT/N; ELECTRICITY/N; ELECTROMAGNETIC WAVE/N; EQUIPMENT TESTING/N; FAILURE/N; FERROUS ALLOY/N; FORMING/N; FULL SCALE/N; GAGE/N; HIGH TEMPERATURE/N; *INSPECTING/N; INSTRUMENT/N; MAGNETIC PROPERTY/N;

MATERIALS TESTING/N; MECHANICAL WAVE/N; MICROPROCESSOR/N; *MONITORING/N; *NONDESTRUCTIVE TESTING/N; OFFSHORE/N; OPERATING CONDITION/N; PAINT/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PRINTING/N; RADIATION/N; REVIEW/N; SOUND WAVE/N; SPLITTING/N; TEMPERATURE/N; TEMPERATURE 200 TO 300 C/N; THICKNESS/N; TRANSDUCER/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNITED KINGDOM/N; USE/N; WALL/N; WELDING/N; WESTERN EUROPE/N; X RAY/N
RN - 8002-05-9/N
LT - COATING MATERIAL/N; PAINT/N; THICKNESS/N; USE/N
LT - FERROUS ALLOY/N; OFFSHORE/N; THICKNESS/N
LT - THICKNESS/N; WALL/N

SS 5 /C?
USER:
prt fu 35-36 28 40-42 46-48

PROG:
ILLEGAL USE OF RANGING PARAMETERS. PRINT COMMAND IGNORED.

SS 5 /C?
USER:
prt fu 35-36

PROG:

-35-
AN - 3450728
TI - **LE CONTROLE DE L"ETANCHEITE DES PIPELINES/DETECTION DE FUITES PAR RACLEUR INSTRUMENTES.**MONITORING THE TIGHTNESS OF PIPELINES/DETECTION OF LEAKS BY INSTRUMENTED PIGS
AU - VILTARD P; SOCIETE DES TRANSPORTS PETROLIERS PA; TRAPIL
OS - TRAPIL
SO - PET. TECH. (ISSN 0152-5425) N.331 36 37-40 (MAR. 1987)
LA - FRENCH
NU - ISSN 01525425
BH - PIPELINE OPERATING PROBLEMS
BH - TRANSPORTATION AND STORAGE
IT - CARGO/N; CONTROL/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DEFECT/N; *DETECTOR/N; ECONOMIC FACTOR/N; EQUIPMENT TESTING/N; FRANCE/N; HYDROSTATIC TESTING/N; *INSTRUMENT/N; LEAK/N; *LEAK DETECTOR/N; *MONITORING/N; NATURAL GAS/N; NOISE/N; NONDESTRUCTIVE TESTING/N; OPERATING CONDITION/N; OPERATOR/N; PERSONNEL/N; *PIPELINE/N; *PIPELINE PIG/N; PRESSURE/N; PROPULSION SYSTEM/N; *TRUNK PIPELINE/N; ULTRASONIC TESTING/N; WALL/N; WESTERN EUROPE/N
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N

-36-
AN - 3450552
TI - PIG DETECTS (INTERNAL AND EXTERNAL) CORROSION IN 10 TO 24 IN. PIPELINES
AU - SYMINEX
SO - OCEAN IND. (ISSN 0029-8026) V22 N.4 108 (APR. 1987)
LA - ENGLISH
NU - ISSN 00298026

BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ADHESION/N; CLEANING/N; COLLOID/DISPERSION/N; COMPUTER/N; *CORROSION/N; CORROSION TEST/N; DEFORMATION/N; DIAMETER/N; DIGITAL COMPUTER/N; ELECTRIC CIRCUIT COMPONENT/N; ELECTRICAL CONDUCTIVITY/N; ELECTRICAL PROPERTY/N; ELECTRONICS/N; FLUID FLOW/N; FOAM/N; GROUP VIA/N; IDE/N; INSIDE/N; INSTRUMENT/N; LINE PIPE/N; MAGNETIC FIELD/N; MAGNETISM/N; MATERIALS TESTING/N; MEASURING/N; MECHANICAL CLEANING/N; MECHANICAL WAVE/N; METAL/N; MICROCOMPUTER/N; MICROPROCESSOR/N; NONDESTRUCTIVE TESTING/N; OUTSIDE/N; OXYGEN/N; PHYSICAL PROPERTY/N; PIGGING/N; PIPE/N; *PIPELINE/N; *PIPELINE PIG/N; SEMICONDUCTOR DEVICE/N; SOUND WAVE/N; STORAGE/N; SURFACE/N; THICKNESS/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WALL/N
LT - CORROSION/N; DIAMETER/N; INSIDE/N; OUTSIDE/N; SURFACE/N
LT - GROUP VIA/N; IDE/N; METAL/N; OXYGEN/N
LT - THICKNESS/N; WALL/N

SS 5 /C?
USER:
prt fu 38 40-42 46-48

PROG:

-38-
AN - 3403759
TI - ACOUSTIC EMISSION TESTING OF VESSELS AND PIPING
AU - FOWLER T J
OS - MONSANTO CHEM. CO.
SO - CHEM. MANUF. ASSOC. INSPECTION & MAINT. MEET. (ATLANTA 10/8-10/86) (ADAPT.) CHEM. ENG. PROG. (ISSN 0360-7275) V83 N.5 25-32 (MAY 1987)
LA - ENGLISH
NU - ISSN 03607275
BH - CONSERV-TRANSP-STOR-ENG
BH - EQUIPMENT-MATERIALS-UTILITIES
BH - PETROLEUM REFINING AND PETROCHEM
IT - ALLOY/N; COMPOUNDS/N; CONSTRUCTION MATERIAL/N; CORROSION/N; DEFECT/N; DETECTOR/N; *EQUIPMENT TESTING/N; FAILURE/N; FORCE/N; GLASS FIBER/N; GROUP IVB/N; GROUP VA/N; GROUP VIA/N; IMPURITY/N; INSTRUMENT/N; MECHANICAL WAVE/N; MEETING PAPER/N; MONSANTO/N; NITROGEN/N; NOISE/N; *NONDESTRUCTIVE TESTING/N; NONFERROUS ALLOY/N; OXYGEN/N; *PIPING SYSTEM/N; PLASTIC/N; *REACTOR/N; REINFORCING AGENT/N; REVIEW/N; SOUND WAVE/N; SPLITTING/N; STORAGE FACILITY/N; STRESS/N; STRESS CORROSION/N; STRESS CORROSION CRACKING/N; SYNTHETIC FIBER/N; TANK/N; TITANIUM/N; *ULTRASONIC TESTING/N; USE/N; WELDING/N; ZIRCONIUM/N
LT - ALLOY/N; CONSTRUCTION MATERIAL/N; USE/N
LT - COMPOUNDS/N; GROUP VIA/N; IMPURITY/N; OXYGEN/N
LT - COMPOUNDS/N; GROUP VA/N; IMPURITY/N; NITROGEN/N
LT - CONSTRUCTION MATERIAL/N; PLASTIC/N; USE/N
LT - CONSTRUCTION MATERIAL/N; GROUP IVB/N; NONFERROUS ALLOY/N; TITANIUM/N; USE/N; ZIRCONIUM/N
LT - GLASS FIBER/N; REINFORCING AGENT/N; SYNTHETIC FIBER/N; USE/N

-40-
AN - 3481277

TI - COMPARISON BETWEEN ULTRASONIC AND MAGNETIC FLUX PIGS FOR PIPELINE INSPECTION.
AU - DERAAD J A
OS - RONTGEN TECH DIENST BV
SO - PIPES PIPELINES INT. SUBSEA PIGGING CONF. (HAUGESUND, NORWAY, 9/23-25/86) PROC. (1986) 22P PET. ABSTR. (ISSN 0031-6423) ABSTR.NO. 417,755 V27 N.20 (5/16/87)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; EQUIPMENT TESTING/N; *INSPECTING/N; *MAGNETIC PARTICLE TEST/N; MEETING PAPER/N; *NONDESTRUCTIVE TESTING/N; PIPELINE/N; *PIPELINE PIG/N; PROPULSION SYSTEM/N; RISER/N; *ULTRASONIC TESTING/N; WALL/N
ST - FLUX PIG

-41-
AN - 3450230
TI - A NEW PIPELINE INTEGRITY PROGRAM IS OFFERED
AU - GULF SPECIALTY CONTRACTORS INC
SO - PIPELINE (ISSN 0148-4443) V59 N.1 25 (JAN. 1987)
LA - ENGLISH
NU - ISSN 01484443
BH - PIPELINE CORROSION
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - ACCIDENT/N; BLOWOUT/N; COATING MATERIAL/N; *CORROSION/N; DEFECT/N; DEPTH/N; DETECTOR/N; *FAILURE/N; FLUID FLOW/N; *INSPECTING/N; INSTRUMENT/N; JET FLOW/N; LINE PIPE/N; *MAGNETIC PARTICLE TEST/N; *NONDESTRUCTIVE TESTING/N; PIPE/N; *PIPELINE/N; SANDBLASTING/N; SCRAPER/N; *SPLITTING/N; *STRESS CORROSION/N; *STRESS CORROSION CRACKING/N; SUBSURFACE/N; THICKNESS/N; *ULTRASONIC TESTING/N; UNDERGROUND/N; USE/N; WALL/N; WATER/N
LT - DEPTH/N; PIPELINE/N; SUBSURFACE/N; UNDERGROUND/N
LT - INSPECTING/N; SUBSURFACE/N; UNDERGROUND/N
LT - THICKNESS/N; WALL/N

-42-
AN - 3480714
TI - INSPECTION PIG SYSTEM FOR OFFSHORE PIPELINE (2ND REPORT).
AU - YAMADA Y; UCHIDA Y; HOSOE T; ANDO S; AKUZAWA H; YAMADA H
OS - PLANT & ENG DEP ENG SHIPBUILD RES CENT JAPAN
SO - NIPPON KOKAN TECH. REP. OVERSEAS, 46 147-54 (1986) CHEM. ABSTR. ABSTR.NO. 36721 V106 N.6
LA - ENGLISH
BH - PIPELINE MAINTENANCE
BH - TRANSPORTATION AND STORAGE
IT - #8002-05-9/N; ABSTRACT/N; CARGO/N; CONSTRUCTION MATERIAL/N; CORROSION CONTROL/N; CORROSION TEST/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; EDDY CURRENT/N; ELBOW/N; ELECTRIC CURRENT/N; ELECTRICITY/N; FERROUS ALLOY/N; FITTING/N; INSIDE/N; *INSPECTING/N; MAINTENANCE/N; MATERIAL HANDLING/N; MATERIALS TESTING/N; MOTOR VEHICLE/N; NONDESTRUCTIVE TESTING/N; *PIPELINE/N; *PIPELINE PIG/N; REPORT/N; STEEL/N; SUBSURFACE/N; SURFACE/N; ULTRASONIC TESTING/N; UNDERWATER/N; UNLOADING/N; USE/N
RN - #8002-05-9/N

LT - #8002-05-9/N; CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N
LT - CONSTRUCTION MATERIAL/N; FERROUS ALLOY/N; STEEL/N; USE/N
LT - INSIDE/N; PIPELINE/N; SUBSURFACE/N; SURFACE/N; UNDERWATER/N

-46-
AN - 3350743
TI - CORROSCAN...AUTOMATED ULTRASONIC EQUIPMENT FOR CORROSION INSPECTION
AU - HOEGMOEN K; VEIERLAND S E; NORSKE VERITAS; PHILLIPS PETROLEUM CO
OS - NORSKE VERITAS
SO - CANMET - CAN. SOC. NONDESTRUCTIVE TEST. - CAN. COUNC. AM. SOC. MET. JT. INT. PIPELINE INSPECTION CONF. (EDMONTON, ALBERTA JUNE 1983) CAN., CENT. MINER. ENERGY TECHNOL., PUBL. 545-53 (1984)
LA - ENGLISH
BH - PIPELINE CORROSION; TRANSPORTATION AND STORAGE
IT - AIME/N; ASSOCIATION/N; AUTOMATIC/N; AUTOMATION/N; BEAM/N; CABLE/N; CONTROL EQUIPMENT/N; *CORROSION/N; DEFECT/N; DETECTOR/N; ECONOMIC FACTOR/N; EQUIPMENT TESTING/N; FAILURE/N; *INSPECTING/N; INSTRUMENT/N; MAPPING/N; MECHANICAL WAVE/N; MEETING PAPER/N; *NONDESTRUCTIVE TESTING/N; NORTH SEA/N; OFFSHORE/N; PERSONNEL/N; PHILLIPS PETROLEUM/N; PIPE/N; *PIPELINE/N; PROBE/N; RISER/N; SCANNER/N; SEA/N; SOUND WAVE/N; SPLITTING/N; SUBSURFACE/N; TRANSDUCER/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNDERWATER/N
LT - AUTOMATIC/N; SCANNER/N
LT - ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N

-47-
AN - 3350712
TI - A REVIEW OF SOME RECENT R&D ((RESEARCH & DEVELOPMENT)) FOR (PIPELINE) TRANSMISSION ENGINEERING IN BRITISH GAS (CORP.)
AU - TOWNSEND N A; BRITISH GAS CORP
OS - BR. GAS CORP.
SO - INST. GAS ENG. NORTH ENGL. SECT. MEET. (1/12/85) (ADAPT.) GAS ENG. MANAGE. V26 N.4 98-110 (APR. 1986)
LA - ENGLISH
NU - ISSN 03066444
BH - METERING; PIPELINE CONSTRUCTION; PIPELINE MAINTENANCE; SAFETY; TRANSPORTATION AND STORAGE
IT - AUTOMATIC/N; BRITISH GAS CORP/N; *COATING MATERIAL/N; COMPOUNDS/N; COMPRESSOR/N; *COMPUTER AIDED DESIGN/N; *COMPUTING/N; *DESIGN/N; EFFICIENCY/N; ELECTRICAL PROPERTY/N; *ENGINEERING/N; EPOXY RESIN/N; EQUIPMENT TESTING/N; FAILURE/N; FITTING/N; FLUID FLOW/N; GAS/N; *INSPECTING/N; LABORATORY/N; LABORATORY SCALE/N; LINE PIPE/N; MAINTENANCE/N; MAP/N; MEASURING/N; MECHANICAL WAVE/N; MEETING PAPER/N; MOBILITY/N; NOISE/N; NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; PIPE/N; *PIPELINE/N; PITCH/N; POLLUTION CONTROL/N; POLYURETHANE/N; RADIOGRAPHY/N; REAL TIME/N; RESISTIVITY/N; REVIEW/N; SAFETY/N; SCANNER/N; SCIENTIFIC RESEARCH/N; SOUND WAVE/N; SPLITTING/N; SYNTHETIC RESIN/N; ULTRASONIC WAVE/N; *USE/N; WELDED PIPE/N; *WELDING/N
LT - AUTOMATIC/N; SCANNER/N
LT - COATING MATERIAL/N; EPOXY RESIN/N; SYNTHETIC RESIN/N; USE/N
LT - COATING MATERIAL/N; COMPOUNDS/N; POLYURETHANE/N; USE/N
LT - LABORATORY/N; MOBILITY/N

-48-
AN - 3304869
TI - DESIGN (AND) OPERATING IDEAS/(A TECHNIQUE FOR) LOCAT(ING) FLAWS IN STEAM PIPING WITHOUT REMOVING INSULATION
AU - REASON J; HEXI; APTECH ENGINEERING SERVICES INC; SCHONBERG RADIATION CORP
SO - POWER V130 N.6 124 (JUNE 1986)
LA - ENGLISH
NU - ISSN 00325929
BH - CONSERV-TRANSP-STOR-ENG; EQUIPMENT-MATERIALS-UTILITIES; PETROLEUM REFINING AND PETROCHEM
IT - COMMERCIAL/N; *DEFECT/N; DESIGN/N; ELECTROMAGNETIC WAVE/N; ENERGY STATE/N; ENGINEERING/N; EQUIPMENT TESTING/N; FULL SCALE/N; INSPECTING/N; *INSULATING MATERIAL/N; LOCATION/N; NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; PHOTOGRAPHIC EQUIPMENT/N; PHOTOGRAPHY/N; *PIPING SYSTEM/N; PRESSURE/N; PROCESS TESTING/N; RADIATION/N; RADIOGRAPHY/N; *STEAM TRACING/N; *THERMAL INSULATION/N; THICKNESS/N; TIME/N; ULTRASONIC TESTING/N; *USE/N; WALL/N; WELDING/N; X RAY/N
LT - DEFECT/N; LOCATION/N
LT - PHOTOGRAPHY/N; TIME/N
LT - THICKNESS/N; WALL/N

SS 5 /C?
USER:
prt fu 50 54-55 59

PROG:

-50-
AN - 3350580
TI - ULTRASONIC FLAW-DEPTH MEASUREMENTS IN PIPELINE WELDS
AU - MACECEK M
OS - TECHNO SCI. INC.
SO - CANMET - CAN. SOC. NONDESTRUCTIVE TEST. - CAN. COUNC. AM. SOC. MET. JT. INT. PIPELINE INSPECTION CONF. (EDMONTON, ALBERTA JUNE 1983) CAN., CENT. MINER. ENERGY TECHNOL., PUBL. 341-57 (1984)
LA - ENGLISH
BH - PIPELINE CONSTRUCTION; TRANSPORTATION AND STORAGE
IT - ACCURACY/N; COMPUTING/N; CORROSION/N; DAMPING/N; *DEFECT/N; DEPTH/N; DETERIORATION/N; FATIGUE/N; FOCUSING/N; IMMERSION/N; *INSPECTING/N; LABORATORY SCALE/N; MEASURING/N; MECHANICAL PROPERTY/N; MECHANICAL WAVE/N; MEETING PAPER/N; MONITORING/N; *NONDESTRUCTIVE TESTING/N; PHYSICAL PROPERTY/N; PIPE/N; *PIPELINE/N; REAL TIME/N; SOUND WAVE/N; STRESS CORROSION/N; TRANSDUCER/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WELDED PIPE/N; WELDING/N
LT - DEFECT/N; DEPTH/N

-54-
AN - 3350575
TI - NONDESTRUCTIVE TESTING TECHNIQUES FOR THE FIELD INSPECTION OF LARGE-DIAMETER LINEPIPE
AU - EHLINGER A O; CASTRO E
OS - TUBACERO S.A.
SO - CANMET - CAN. SOC. NONDESTRUCTIVE TEST. - CAN. COUNC. AM. SOC. MET. JT. INT. PIPELINE INSPECTION CONF. (EDMONTON, ALBERTA JUNE 1983) CAN., CENT.

MINER. ENERGY TECHNOL., PUBL. 239-61 (1984)
LA - ENGLISH
BH - PIPELINE CONSTRUCTION; TRANSPORTATION AND STORAGE
IT - ALLOY/N; CONSTRUCTION MATERIAL/N; DEFECT/N; DIAMETER/N; ELECTRICAL PROPERTY/N; ELECTROMAGNETIC WAVE/N; EQUIPMENT TESTING/N; HARDNESS/N; HEAT TREATMENT/N; *INSPECTING/N; LARGE DIAMETER/N; *LINE PIPE/N; LIQUID/N; MAGNETIC PARTICLE TEST/N; MECHANICAL PROPERTY/N; MEETING PAPER/N; METALLOGRAPHIC STRUCTURE/N; MICROSTRUCTURE/N; *NONDESTRUCTIVE TESTING/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; *PIPE/N; PIPELINE/N; POROSITY/N; RADIATION/N; RADIOGRAPHY/N; RESISTIVITY/N; SLAG/N; SUBMERGED ARC WELDING/N; ULTRASONIC TESTING/N; USE/N; WASTE MATERIAL/N; *WELDED PIPE/N; WELDING/N; X RAY/N
LT - ALLOY/N; CONSTRUCTION MATERIAL/N; METALLOGRAPHIC STRUCTURE/N; MICROSTRUCTURE/N; USE/N
LT - DIAMETER/N; LARGE DIAMETER/N; LINE PIPE/N; PIPE/N; WELDED PIPE/N

-55-
AN - 3350572
TI - ACOUSTIC LENSES...FOCUSING IN ON (PIPELINE) DEFECTS
AU - KITTMER C A
OS - AT. ENERGY CAN. LTD.
SO - CANMET - CAN. SOC. NONDESTRUCTIVE TEST. - CAN. COUNC. AM. SOC. MET. JT. INT. PIPELINE INSPECTION CONF. (EDMONTON, ALBERTA JUNE 1983) CAN., CENT. MINER. ENERGY TECHNOL., PUBL. 161-80 (1984)
LA - ENGLISH
BH - PIPELINE CONSTRUCTION; TRANSPORTATION AND STORAGE
IT - ACOUSTICS/N; COMBINATION/N; *DEFECT/N; DESIGN/N; DIAMETER/N; ENGINEERING/N; FLAT/N; FOCUSING/N; INSTRUMENT/N; LENS/N; MECHANICAL WAVE/N; *NONDESTRUCTIVE TESTING/N; *PIPELINE/N; SIZE/N; SOUND WAVE/N; TRANSDUCER/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WELDING/N
LT - COMBINATION/N; FLAT/N; INSTRUMENT/N; LENS/N; TRANSDUCER/N
LT - DEFECT/N; SIZE/N
LT - DIAMETER/N; PIPELINE/N

-59-
AN - 3350567
TI - THE REGULATORY ASPECTS OF THE OPERATION AND IN-SERVICE INSPECTION OF PIPELINES ON CANADA LANDS
AU - MINHAS K M; SMITH R J; CANADA OIL & GAS LANDS ADMINISTRATIO
OS - CAN. OIL GAS LANDS ADMIN.
SO - CANMET - CAN. SOC. NONDESTRUCTIVE TEST. - CAN. COUNC. AM. SOC. MET. JT. INT. PIPELINE INSPECTION CONF. (EDMONTON, ALBERTA JUNE 1983) CAN., CENT. MINER. ENERGY TECHNOL., PUBL. 25-40 (1984)
LA - ENGLISH
BH - PIPELINE CONSTRUCTION; PIPELINE CORROSION; PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - BUSINESS OPERATION/N; CANADA/N; CATHODIC PROTECTION/N; CORROSION/N; CORROSION CONTROL/N; COST/N; DATA PROCESSING/N; *ECONOMIC FACTOR/N; ELECTRICAL PROPERTY/N; ELECTROCHEMICAL PROTECTION/N; ENERGY SOURCE/N; EQUIPMENT TESTING/N; GOVERNMENT/N; INSIDE/N; *INSPECTING/N; INVESTMENT/N; *LEGAL CONSIDERATION/N; MAGNETIC PROPERTY/N; MANAGEMENT/N; MONITORING/N; *NONDESTRUCTIVE TESTING/N; NORTH AMERICA/N; NORTH SEA/N; NUCLEAR POWER/N; OFFSHORE/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PIPELINE PIG/N; PLANNING/N; RADIOGRAPHY/N; REVIEW/N; SEA/N; ULTRASONIC TESTING/N
LT - INSIDE/N; INSPECTING/N

LT - OFFSHORE/N; PIPELINE/N

SS 5 /C?
USER:
prt fu 63 65-67 70 73

PROG:

-63-
AN - 3301770
TI - HARWELL HELPS WITH TRANSDUCERS...(A BREAKTHROUGH IN NONDESTRUCTIVE-TESTING TRANSDUCER TECHNOLOGY)
AU - U K ATOMIC ENERGY AUTHORITY
SO - IND. LUBR. TRIBOL. V37 N.6 235 (NOV.-DEC. 1985)
LA - ENGLISH
NU - ISSN 00368792
BH - CONSERV-TRANSP-STOR-ENG; CORROSION AND DETERIORATION; EQUIPMENT-MATERIALS-UTILITIES; PETROLEUM REFINING AND PETROCHEM
IT - ALLOY/N; ASSOCIATION/N; BOILER/N; CANADA/N; COAL FIRED BOILER/N; COATING MATERIAL/N; CONSTRUCTION MATERIAL/N; *CORROSION/N; DATA PROCESSING/N; ELECTROMAGNETIC WAVE/N; ENGLAND/N; GOVERNMENT/N; HEATING EQUIPMENT/N; INDUSTRIAL PLANT/N; *INSPECTING/N; INSTRUMENT/N; LABORATORY/N; LAYERED/N; MECHANICAL WAVE/N; *NONDESTRUCTIVE TESTING/N; NORTH AMERICA/N; OIL FIRED BOILER/N; PIPING SYSTEM/N; PORTABILITY/N; POWER PLANT/N; RADIATION/N; REFLECTION/N; SOUND WAVE/N; SURFACE/N; THICKNESS/N; *TRANSDUCER/N; TUBE/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNITED KINGDOM/N; USE/N; WALL/N; WASTE DEPOSIT/N; WASTE MATERIAL/N; WESTERN EUROPE/N
LT - ALLOY/N; CONSTRUCTION MATERIAL/N; THICKNESS/N; USE/N
LT - COATING MATERIAL/N; THICKNESS/N; USE/N
LT - CORROSION/N; SURFACE/N
LT - INSTRUMENT/N; PORTABILITY/N
LT - LAYERED/N; WASTE DEPOSIT/N; WASTE MATERIAL/N

-65-
AN - 3206476
TI - ACOUSTIC EMISSION NONDESTRUCTIVE TESTING ((NDT)) MOVES ON-STREAM
AU - KRIGMAN A
SO - INTECH V32 N.8 7-8,10,12,15-16 (AUG. 1985)
LA - ENGLISH
NU - ISSN 0192303X
BH - CONSERV-TRANSP-STOR-ENG; CORROSION AND DETERIORATION; EQUIPMENT-MATERIALS-UTILITIES; PETROLEUM REFINING AND PETROCHEM; PLANT SAFETY
IT - CASING/N; COMPUTING/N; CORROSION TEST/N; CYLINDER/N; ENGINE/N; EQUIPMENT/N; HIGH TEMPERATURE/N; HYDRAULIC SYSTEM/N; INDUSTRIAL PLANT/N; INSPECTING/N; LEAK/N; MAINTENANCE/N; MATERIALS TESTING/N; MONITORING/N; *NONDESTRUCTIVE TESTING/N; OPERATING CONDITION/N; PIPELINE/N; PUMP/N; REAL TIME/N; SAFETY/N; STORAGE FACILITY/N; TANK/N; TEMPERATURE/N; TURBINE ENGINE/N; *ULTRASONIC TESTING/N; VALVE/N
LT - CYLINDER/N; EQUIPMENT/N

-66-
AN - 3206306
TI - (ULTRASONIC AND OTHER) INSPECTION EQUIPMENT AND TECHNIQUES...PAST,

PRESENT, FUTURE
AU - COLEY J W
OS - TEXACO U.S.A.
SO - 50TH API REFINING DEP. MIDYEAR MEET. (KANS. CITY, MO. 5/13-16/85) PROC. V64 137-55 (1985)
LA - ENGLISH
BH - CONSERV-TRANSP-STOR-ENG; CORROSION AND DETERIORATION; EQUIPMENT-MATERIALS-UTILITIES; PETROLEUM REFINING AND PETROCHEM; PIPELINE CORROSION; STORAGE TANK CORROSION; TRANSPORTATION AND STORAGE
IT - API/N; ASSOCIATION/N; BOTTOM/N; COMMUNICATION/N; COMPUTER/N; CONSTRUCTION MATERIAL/N; CORROSION/N; DAMAGE/N; DEFECT/N; DETERIORATION/N; DIGITAL COMPUTER/N; EDDY CURRENT/N; ELECTRIC CURRENT/N; ELECTRICITY/N; ELECTROMAGNETISM/N; EMBRITTLEMENT/N; EQUIPMENT/N; FERROUS ALLOY/N; HEAT EXCHANGER/N; HOLOGRAPHY/N; HYDROGEN EMBRITTLEMENT/N; *INSPECTING/N; *INSTRUMENT/N; INSULATING MATERIAL/N; MAGNETISM/N; MECHANICAL WAVE/N; MEETING PAPER/N; MICROPROCESSOR/N; *NONDESTRUCTIVE TESTING/N; PHOTOGRAPHY/N; PIPE/N; SOUND WAVE/N; STORAGE FACILITY/N; TANK/N; TEXACO/N; THERMAL INSULATION/N; THICKNESS/N; TRANSDUCER/N; TUBE/N; *ULTRASONIC TESTING/N; USE/N
LT - BOTTOM/N; STORAGE FACILITY/N; TANK/N
LT - CONSTRUCTION MATERIAL/N; FERROUS ALLOY/N; USE/N
LT - THICKNESS/N; TUBE/N

-67-
AN - 3282825
TI - INSPECTION PIG SYSTEMS FOR OFFSHORE PIPELINES.
AU - YAMADA Y; SUGAYA N
SO - PIPES & PIPELINES INTERNATIONAL, 30 7 (JAN./FEB. 1985) B.S.R.A. (BR. SHIP RES. ASSOC.) J. ABSTR. ABSTR.NO. 65,446 V40 N.6 (JUNE 1985)
LA - ENGLISH
BH - PIPELINE CORROSION; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; CARGO/N; CLEANING/N; CORROSION TEST/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; DEFECT/N; EDDY CURRENT/N; ELECTRIC CURRENT/N; ELECTRICITY/N; *INSPECTING/N; LEAK/N; MAINTENANCE/N; MATERIAL DEPLETION/N; MATERIALS TESTING/N; MECHANICAL CLEANING/N; NONDESTRUCTIVE TESTING/N; OFFSHORE/N; PIGGING/N; PIPELINE/N; *PIPELINE PIG/N; PREVENTION/N; PROCESS TESTING/N; STANDARDIZATION/N; SUBSURFACE/N; SURFACE/N; THICKNESS/N; ULTRASONIC TESTING/N; UNDERWATER/N; WALL/N; WATER POLLUTION/N; WELDING/N
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; SURFACE/N; UNDERWATER/N
LT - THICKNESS/N; WALL/N

-70-
AN - 3282371
TI - ACOUSTIC LENSES - FOCUSING IN ON DEFECTS.
AU - KITTMER C A
OS - ATOMIC ENERGY CANADA LTD
SO - CAN. SOC. NONDESTRUCTIVE TESTING ET AL. INT. PIPELINE INSP. CONF. (EDMONTON, ALTA., 6/13-16/83) PROC. 161-180 (1984) PET. ABSTR. ABSTR.NO. 382,293 V25 N.23 (6/8/85)
LA - ENGLISH
BH - PIPELINE CONSTRUCTION; PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; *ACOUSTICS/N; CYLINDER/N; DEFECT/N; DETECTOR/N; EQUIPMENT/N;

FLAT/N; *FOCUSING/N; FORMING/N; IMMERSION/N; INCLINATION/N; INSPECTING/N; INSTRUMENT/N; *LENS/N; LINE PIPE/N; MACHINING/N; MAINTENANCE/N; MECHANICAL WAVE/N; MEETING PAPER/N; NONDESTRUCTIVE TESTING/N; OPTICAL PROPERTY/N; PHYSICAL PROPERTY/N; PIPE/N; PIPELINE/N; PROGRAMING/N; SHEET/N; SIZE/N; SOUND WAVE/N; SPHERE/N; SURFACE/N; THEORETICAL STUDY/N; THICKNESS/N; *TRANSDUCER/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; *ULTRASONICS/N; WELDING/N

LT - CYLINDER/N; LENS/N; SPHERE/N; SURFACE/N

LT - DEFECT/N; SIZE/N

LT - EQUIPMENT/N; FLAT/N; SHEET/N; THICKNESS/N

LT - INCLINATION/N; MECHANICAL WAVE/N; SOUND WAVE/N; ULTRASONIC WAVE/N

-73-

AN - 3282365

TI - INSPECTION PIG TECHNIQUES USING THE EDDY-CURRENT METHOD.

AU - UCHIDA Y; SUGAYA N; KOYANAGI M

OS - NIPPON KOKAN KK

SO - CAN. SOC. NONDESTRUCTIVE TESTING ET AL. INT. PIPELINE INSP. CONF. (EDMONTON, ALTA., 6/13-16/83) PROC. 489-502 (1984) PET. ABSTR. ABSTR.NO. 382,282 V25 N.23 (6/8/85)

LA - ENGLISH

BH - PIPELINE CORROSION; PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE

IT - ABSTRACT/N; CLEANING/N; CORROSION/N; *CORROSION TEST/N; DEFECT/N; DEPTH/N; DETECTOR/N; EDDY CURRENT/N; ELECTRIC CURRENT/N; ELECTRICITY/N; *EQUIPMENT TESTING/N; INSIDE/N; *INSPECTING/N; INSTRUMENT/N; *MATERIALS TESTING/N; MECHANICAL CLEANING/N; MEETING PAPER/N; MODEL/N; NONDESTRUCTIVE TESTING/N; PIGGING/N; PIPELINE/N; *PIPELINE PIG/N; PROTOTYPE/N; ULTRASONIC TESTING/N; WALL/N; WELDING/N

LT - DEFECT/N; DEPTH/N

LT - INSIDE/N; PIPELINE/N

LT - MODEL/N; PIPELINE PIG/N; PROTOTYPE/N

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USER:

prt fu 82 86 88-90 102-105

PROG:

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THE FOLLOWING FILES WILL BE UNAVAILABLE TODAY (2/12/90) FROM 5-7 PM (CENTRAL):
CIN, CLAIMS, FEDREG, ICONDA, INFORM, LITALERT, METADEX, PNI, USPA.

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-82-

AN - 3184087

TI - CONTRIBUTION TO THE ULTRASONIC DETECTION AND SIZING OF INNER WALL SURFACE-BREAKING CRACKS IN PIPES.

AU - WUESTENBERG H; HAUFE U; ERHARD A

SO - MATER. EVALUATION 42(9) 1142-1149 (AUG. 1984) PET. ABSTR. ABSTR.NO. 368,212 V24 N.45 (11/10/84)

LA - ENGLISH

NU - ISSN 00255327; ISSN 00316423

BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE

IT - ABSTRACT/N; ACOUSTICS/N; BURSTING/N; CHARACTERIZATION/N; DATA PROCESSING/N; *DEFECT/N; DEPTH/N; FAILURE/N; HOLOGRAPHY/N; INCLINATION/N;

LINE PIPE/N; MATHEMATICS/N; MODEL/N; *NONDESTRUCTIVE TESTING/N; PHOTOGRAPHY/N; PIPE/N; *PIPELINE/N; REFLECTION/N; RELIABILITY/N; SIZE/N; SPLITTING/N; SURFACE/N; *ULTRASONIC TESTING/N; ULTRASONICS/N; WALL/N

LT - DEFECT/N; DEPTH/N; INCLINATION/N; SIZE/N

LT - LINE PIPE/N; PIPE/N; SURFACE/N

LT - MATHEMATICS/N; MODEL/N

LT - PIPELINE/N; RELIABILITY/N

-86-

AN - 3151280

TI - A BETTER WAY TO DETERMINE METAL DEFECTS (IN PIPELINES)

AU - SOUTHWEST RESEARCH INSTITUTE

SO - PIPE LINE IND. V61 N.2 5 (AUG. 1984)

LA - ENGLISH

NU - ISSN 00320145

BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE

IT - ACADEMIC/N; ALLOY/N; CARGO/N; COMMUNICATION SYSTEM/N; CONSTRUCTION MATERIAL/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; *DEFECT/N; DETECTOR/N; ECONOMIC FACTOR/N; INSTRUMENT/N; LEGAL CONSIDERATION/N; *MAINTENANCE/N; NATURAL GAS/N; NEWS/N; NONDESTRUCTIVE TESTING/N; PATENT/N; *PIPELINE/N; PROBE/N; PULSE/N; ULTRASONIC TESTING/N; USE/N

RN - 8002-05-9/N

LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N

LT - ALLOY/N; CONSTRUCTION MATERIAL/N; USE/N

-88-

AN - 3183192

TI - RADIOGRAPHIC DETECTION OF CRACK-LIKE DEFECTS IN THICK SECTIONS.

AU - LAPIDES M E

OS - ELECTRIC POWER RES INST

SO - MATER. EVALUATION, 42(6) 788-792 (MAY 1984) PET. ABSTR. ABSTR.NO. 362,965 V24 N.33 (8/18/84)

LA - ENGLISH

NU - ISSN 00255327; ISSN 00316423

BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE

IT - ABSTRACT/N; ALLOY/N; ALLOY STEEL/N; AUSTENITIC STEEL/N; BIMETALLIC/N; CASTING/N; CENTRIFUGAL/N; COMPOUNDS/N; CONSTRUCTION MATERIAL/N; DEFECT/N; *DETECTOR/N; EQUIPMENT TESTING/N; FAILURE/N; FERROUS ALLOY/N; FORMING/N; INSPECTING/N; *INSTRUMENT/N; ISOTOPE/N; *LEAK/N; *LEAK DETECTOR/N; MAINTENANCE/N; NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; PARTICLE ACCELERATOR/N; *PHOTOGRAPHY/N; *PIPELINE/N; PIPING SYSTEM/N; PORTABILITY/N; PRIOR TREATMENT/N; *RADIOGRAPHY/N; SIZE/N; SPLITTING/N; STEEL/N; THICKNESS/N; ULTRASONIC TESTING/N; USE/N; WALL/N; WELDING/N

LT - ALLOY/N; BIMETALLIC/N; CONSTRUCTION MATERIAL/N; USE/N

LT - ALLOY STEEL/N; AUSTENITIC STEEL/N; CONSTRUCTION MATERIAL/N; FERROUS ALLOY/N; STEEL/N; USE/N

LT - CASTING/N; CENTRIFUGAL/N; FORMING/N; PRIOR TREATMENT/N

LT - COMPOUNDS/N; ISOTOPE/N

LT - PARTICLE ACCELERATOR/N; PORTABILITY/N; SIZE/N

LT - THICKNESS/N; WALL/N

-89-

AN - 3150932

TI - INTERNAL CORROSION IN SUBMARINE PIPELINES...METHODS OF DETECTION, MAPPING

OF ATTACKS AND PROCEDURES TO PREDICT THE LIFETIME AND ALLOWABLE OPERATING PRESSURE
AU - KRISTOFFERSEN K; TABERNER D; NORSKE VERITAS
OS - NORSKE VERITAS
SO - 5TH SPE (SOC. PET. ENG. AIME) - SOUTHEAST ASIA PET. EXPLORATION SOC. - SOC. NAV. ARCHIT. MAR. ENG. 'OFFSHORE SOUTHEAST ASIA' CONF. (SINGAPORE 2/21-24/84) PAP. N.12442 26P
LA - ENGLISH
BH - PIPELINE CONSTRUCTION; TRANSPORTATION AND STORAGE; PIPELINE CORROSION
IT - ADDITIVE/N; AIME/N; ASSOCIATION/N; AUTOMATION/N; CARGO/N; COMMERCIAL/N; CONSTRUCTION MATERIAL/N; *CORROSION/N; *CORROSION CONTROL/N; CORROSION INHIBITOR/N; CORROSION TEST/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; INSIDE/N; INSPECTING/N; MAPPING/N; MATERIALS TESTING/N; MECHANICAL WAVE/N; MEETING PAPER/N; MONITORING/N; NATURAL GAS/N; NONDESTRUCTIVE TESTING/N; OPERATING CONDITION/N; *PIPELINE/N; PRESSURE/N; REVIEW/N; SERVICE LIFE/N; SOUND WAVE/N; SUBSURFACE/N; THRESHOLD/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNDERWATER/N; USE/N
RN - 8002-05-9/N
LT - CARGO/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; NATURAL GAS/N
LT - AUTOMATION/N; CORROSION TEST/N; MATERIALS TESTING/N; MONITORING/N; NONDESTRUCTIVE TESTING/N; ULTRASONIC TESTING/N
LT - INSIDE/N; PIPELINE/N; SERVICE LIFE/N; SUBSURFACE/N; UNDERWATER/N
LT - OPERATING CONDITION/N; PRESSURE/N; THRESHOLD/N

-90-
AN - 3150923
TI - A LEAK DETECTION SURVEY OF A 36 INCH DIAMETER, 78 MILE LONG SUBMARINE PIPELINE
AU - MAREL M VAN DER; SLUYTER E A
OS - SARAWAK SHELL BHD.; SHELL RES. B.V.
SO - 5TH SPE (SOC. PET. ENG. AIME) - SOUTHEAST ASIA PET. EXPLORATION SOC. - SOC. NAV. ARCHIT. MAR. ENG. 'OFFSHORE SOUTHEAST ASIA' CONF. (SINGAPORE 2/21-24/84) PAP. N.12446 4P
LA - ENGLISH
BH - PIPELINE OPERATING PROBLEMS; TRANSPORTATION AND STORAGE
IT - AIME/N; API/N; ASSOCIATION/N; CAMERA/N; COLOR/N; COMMERCIAL/N; COMMUNICATION SYSTEM/N; CONSTRUCTION MATERIAL/N; CONTINUOUS/N; CONTROL/N; DEEP WATER/N; DETECTOR/N; DYE/N; EQUIPMENT TESTING/N; FAILURE/N; FERROUS ALLOY/N; *HYDROSTATIC TESTING/N; INSTRUMENT/N; LAMP/N; *LEAK/N; LEAK DETECTOR/N; LIGHTING EQUIPMENT/N; LUMINESCENCE/N; MALAYSIA/N; MECHANICAL WAVE/N; MEETING PAPER/N; *MONITORING/N; MOUNTING/N; NONDESTRUCTIVE TESTING/N; OCEANIA/N; OFFSHORE/N; OIL AND GAS FIELDS/N; OPERATING CONDITION/N; OPTICAL COMMUNICATION SYSTEM/N; OPTICAL PROPERTY/N; PHOTOGRAPHIC EQUIPMENT/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PLUME/N; PRESSURE/N; PRESSURE DROP/N; REFLECTOR/N; REMOTE/N; SHELL OIL/N; SHIP/N; SOUND WAVE/N; SPECIFICATION/N; SPLITTING/N; STEEL/N; SUBSURFACE/N; TELEVISION/N; THICKNESS/N; TOP/N; *TRUNK PIPELINE/N; ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNDERWATER/N; USE/N; PRIOR TREATMENT/N; WELDING/N
LT - CONSTRUCTION MATERIAL/N; FERROUS ALLOY/N; STEEL/N; THICKNESS/N; USE/N
LT - CONTINUOUS/N; OPERATING CONDITION/N; PRESSURE DROP/N
LT - CONTROL/N; REMOTE/N
LT - DYE/N; PLUME/N; USE/N
LT - OFFSHORE/N; OIL AND GAS FIELDS/N
LT - PIPELINE/N; SHIP/N; SUBSURFACE/N; TOP/N; TRUNK PIPELINE/N; UNDERWATER/N

LT - PRIOR TREATMENT/N; WELDING/N

-102-
AN - 3006683
TI - ULTRASONIC TESTING ENHANCES PIPE CORROSION MONITORING
AU - BURKLE W S
OS - PHILLIPS PET. CO.
SO - OIL GAS J. V81 N.36 135-37 (9/5/83)
LA - ENGLISH
NU - ISSN 00301388
BH - CORROSION AND DETERIORATION; PETROLEUM REFINING AND PETROCHEM
IT - CATHODE RAY TUBE/N; CAVITATION/N; CERAMIC/N; *CORROSION/N; CRYSTAL/N; DETECTOR/N; ELECTRIC CIRCUIT COMPONENT/N; ELECTRIC CURRENT/N; ELECTRICITY/N; ELECTRON TUBE/N; ENTRAINMENT/N; FAILURE/N; FAST/N; FLUID FLOW/N; GAGE/N; IMPACT/N; INSTRUMENT/N; INTERGRANULAR CORROSION/N; MECHANICAL WAVE/N; MONITORING/N; *NONDESTRUCTIVE TESTING/N; PARTICLE/N; PHILLIPS PETROLEUM/N; PHYSICAL PROPERTY/N; *PIPE/N; POLARIZATION/N; SEVERITY/N; SOLID/N; SOUND WAVE/N; SPLITTING/N; THICKNESS/N; TRANSDUCER/N; TURBULENT FLOW/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; VELOCITY/N; VIBRATION/N; VISCOSITY/N; WALL/N; WEAR/N
LT - CERAMIC/N; CRYSTAL/N
LT - PARTICLE/N; SOLID/N
LT - THICKNESS/N; WALL/N

-103-
AN - 3051145
TI - THE DEVELOPMENT OF AN ULTRASONIC INSPECTION PIG FOR IN-SERVICE WALL THICKNESS MEASUREMENTS OF GAS PIPELINES
AU - HAUGEN R; DALBERG P; HOEGMOEN K; NORSKE VERITAS; ELF AQUITAINE NORGE A/S
OS - NORSKE VERITAS
SO - 15TH OFFSHORE TECHNOL. ANNU. CONF. (HOUSTON 5/2-5/83) PROC. N.4568 V2 465-74 (1983)
LA - ENGLISH
BH - PIPELINE CORROSION; TRANSPORTATION AND STORAGE; PIPELINE MAINTENANCE
IT - ACCURACY/N; BUSINESS OPERATION/N; CARGO/N; CORROSION TEST/N; DEFECT/N; ELASTOMER/N; ELF AQUITAINE/N; *EQUIPMENT TESTING/N; INSIDE/N; INSPECTING/N; INSTRUMENT/N; *MAINTENANCE/N; MATERIALS TESTING/N; MEASURING/N; MECHANICAL WAVE/N; MEETING PAPER/N; NATURAL GAS/N; *NONDESTRUCTIVE TESTING/N; OPERATING CONDITION/N; ORGANIZATION/N; OUTSIDE/N; *PIPELINE/N; *PIPELINE PIG/N; PRESSURE/N; PULSE/N; REFLECTION/N; RELIABILITY/N; SOUND WAVE/N; SURFACE/N; THICKNESS/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; WALL/N; WHEEL/N
LT - CARGO/N; NATURAL GAS/N
LT - INSIDE/N; OUTSIDE/N; PIPELINE/N; SURFACE/N
LT - PIPELINE PIG/N; RELIABILITY/N
LT - THICKNESS/N; WALL/N

-104-
AN - 3051143
TI - NEW ULTRASONIC SYSTEM FOR NONDESTRUCTIVE TESTING (OF PIPELINES)
AU - PHILLIPS J; S & H INTERNATIONAL
OS - JOYCE PHILLIPS ASSOC.
SO - OCEAN IND. V18 N.6 52-53 (JUNE 1983)
LA - ENGLISH
NU - ISSN 00298026

BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - ACCURACY/N; ALIGNMENT/N; ALLOY/N; CABLE/N; CAMERA/N; COMMERCIAL/N; COMMUNICATION SYSTEM/N; CONSTRUCTION MATERIAL/N; CONTINUOUS/N; CONTROL EQUIPMENT/N; DATA RECORDING/N; DATA STORAGE MEDIUM/N; DETECTOR/N; ECONOMIC FACTOR/N; EFFICIENCY/N; ELECTROMAGNETIC WAVE/N; INSIDE/N; *INSPECTING/N; INSTRUMENT/N; LIGHT/N; MAGNETIC TAPE/N; MAINTENANCE/N; MATERIAL DEPLETION/N; MECHANICAL WAVE/N; MONITORING/N; *NONDESTRUCTIVE TESTING/N; PERSONNEL/N; PHOTOGRAPHIC EQUIPMENT/N; *PIPELINE/N; PROBE/N; RADIATION/N; SOUND WAVE/N; STANDARDIZATION/N; SUBSURFACE/N; TELEVISION/N; TRANSDUCER/N; *ULTRASONIC TESTING/N; ULTRASONIC WAVE/N; UNDERWATER/N; PRIOR TREATMENT/N; WELDING/N
LT - ALIGNMENT/N; TRANSDUCER/N
LT - ALLOY/N; CONSTRUCTION MATERIAL/N; ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - CONTINUOUS/N; DATA RECORDING/N
LT - INSIDE/N; PIPELINE/N
LT - PRIOR TREATMENT/N; WELDING/N

-105-
AN - 3051117
TI - ULTRASONIC FLAW DEPTH MEASUREMENTS IN PIPELINE WELDS.
AU - MACECEK M
OS - TECHNO SCI. INC.
SO - 1ST CAN. CENT. MINER. ENERGY TECHNOL. - CAN. SOC. NONDESTRUCTIVE TEST. - CAN. COUNC. AM. SOC. MET. JT. INT. OILWEEK (CALGARY, ALBERTA) V34 N.23 12-14,16,18 (7/11/83) PIPELINE INSPECTION CONF. (EDMONTON 6/13-16/83)
LA - ENGLISH
NU - ISSN 00301515
BH - PIPELINE CONSTRUCTION; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; DEFECT/N; DEPTH/N; MEASURING/N; MEETING PAPER/N; *NONDESTRUCTIVE TESTING/N; *PIPELINE/N; *ULTRASONIC TESTING/N; WELDING/N
LT - DEFECT/N; DEPTH/N

SS 5 /C?
USER:
prt fu 110-112 121 123-125

PROG:

-110-
AN - 3084888
TI - CONDITION MONITORING USING MECHANISED ULTRASONICS.
AU - CONSTANTINIS D A; BROWNE W; YOUNG I
OS - SGS SONOMATIC LTD; SHELL (UK) EXPOR LTD
SO - OFFSHORE INSPECTION REPAIR & MAINTENANCE CONF. (EDINBURGH, 11/2-4/82) PROC. PT. 1 (1982) 50P PET. ABSTR. ABSTR.NO. 337,718 V23 N.18 (4/30/83)
LA - ENGLISH
NU - ISSN 00316423
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ACCURACY/N; ANALYTICAL METHOD/N; CONSTRUCTION MATERIAL/N; *CORROSION/N; CORROSION TEST/N; DETECTOR/N; ECONOMIC FACTOR/N; INSIDE/N; INSTRUMENT/N; LEAK/N; *MAINTENANCE/N; MATERIAL DEPLETION/N; MATERIALS TESTING/N; MEETING PAPER/N; *MONITORING/N; NONDESTRUCTIVE TESTING/N; *OFFSHORE STRUCTURE/N; *PIPELINE/N; PIPELINE PIG/N; PREVENTION/N;

PROBE/N; RISK/N; SHELL OIL/N; STRIP/N; ULTRASONIC TESTING/N; WALL/N
LT - CONSTRUCTION MATERIAL/N; STRIP/N
LT - INSIDE/N; PIPELINE/N

-111-
AN - 3003934
TI - MICROCOMPUTERS SMARTEN UP ULTRASONIC TESTING
AU - KRAUTKRAMER-BRANSON INC; DSI TRANSPORTS; U E SYSTEMS INC; AMOCO OIL CO; MATEC INC; DU PONT DE NEMOURS E I & CO
SO - CHEMICALWEEK V132 N.20 23-24 (5/18/83)
LA - ENGLISH
NU - ISSN 0009272X
BH - EQUIPMENT-MATERIALS-UTILITIES; PETROLEUM REFINING AND PETROCHEM; RAIL AND TRUCK TRANSPORT; TRANSPORTATION AND STORAGE
IT - ACOUSTICS/N; BEARING/N; COLLOID/DISPERSION/N; COMMERCIAL/N; COMPOSITION/N; *COMPUTER/N; CONCENTRATION/N; CORROSION TEST/N; COST/N; COST REDUCTION/N; DEFECT/N; *DETECTOR/N; *DIGITAL COMPUTER/N; DISTRICT 3/N; DROP/N; DU PONT/N; ECONOMIC FACTOR/N; EMULSION/N; ENGINE/N; EQUIPMENT TESTING/N; *GAGE/N; HEAT EXCHANGER/N; INDUSTRIAL PLANT/N; INDUSTRIAL WATER/N; *INSTRUMENT/N; INVESTMENT/N; LEAK/N; *LEAK DETECTOR/N; LIQUID/N; MAINTENANCE/N; MATERIALS TESTING/N; *MICROCOMPUTER/N; *NONDESTRUCTIVE TESTING/N; NORTH AMERICA/N; OIL REFINERY/N; PIPE/N; PROBE/N; PULSE/N; SEPARATION EQUIPMENT/N; STANDARD OIL (INDIANA)/N; STEAM/N; SUBSURFACE/N; SUSPENSION/N; TEXAS/N; TEXAS CITY/N; THICKNESS/N; TRAILER/N; TRANSPORTATION/N; TRAP/N; *ULTRASONIC TESTING/N; UNDERGROUND/N; USA/N; VALVE/N; WALL/N; WATER/N; WATER VAPOR/N
LT - DROP/N; LIQUID/N; THICKNESS/N; WALL/N
LT - PIPE/N; SUBSURFACE/N; UNDERGROUND/N

-112-
AN - 3050474
TI - THE STATE OF THE ART OF UNDERWATER INSPECTION (OF STORAGE/LOADING FIXED-PLATFORM FACILITIES AND PIPELINES)
AU - BOSSELAAR H
OS - K./SHELL EXPLORATIE PROD. LAB.
SO - 1982 SOC. PET. ENG. (U.K.) LTD. EUR. PET. CONF. (LOND. 10/25-28/82) PROC. N.EUR 334 543-54 (1982)
LA - ENGLISH
BH - PIPELINE CORROSION; TRANSPORTATION AND STORAGE; PIPELINE MAINTENANCE; WATER TERMINALS
IT - ACOUSTICS/N; CABLE/N; CASING/N; CATHODIC PROTECTION/N; CERTIFICATION/N; CONSTRUCTION MATERIAL/N; CONTINUOUS/N; CORROSION/N; CORROSION CONTROL/N; CYCLE/N; DATA RECORDING/N; DEFECT/N; DEFORMATION/N; DEPTH/N; DETECTOR/N; DETERIORATION/N; ECONOMIC FACTOR/N; ELECTROCHEMICAL PROTECTION/N; EXPERIENCE/N; FAILURE/N; FATIGUE/N; GROWTH/N; *INSPECTING/N; INSTRUMENT/N; LEAK/N; LEAK DETECTOR/N; LEGAL CONSIDERATION/N; LOADING/N; MAINTENANCE/N; MARINE/N; MATERIAL HANDLING/N; MEETING PAPER/N; MONEL METAL/N; MONITORING/N; MOTION/N; NONDESTRUCTIVE TESTING/N; NONFERROUS ALLOY/N; OFFSHORE/N; *OFFSHORE STRUCTURE/N; OPTICAL DENSITY/N; OPTICAL PROPERTY/N; PERSONNEL/N; PHYSICAL PROPERTY/N; *PIPELINE/N; PROBE/N; REDOX POTENTIAL/N; REVIEW/N; SALINE WATER/N; SHELL OIL/N; SPLITTING/N; STATE OF THE ART/N; STATIC/N; STORAGE FACILITY/N; STRAIN/N; SUBSURFACE/N; THICKNESS/N; TRANSDUCER/N; ULTRASONIC TESTING/N; UNDERWATER/N; VISIBILITY/N; WALL/N; WATER/N; WEAR/N
LT - CONSTRUCTION MATERIAL/N; MONEL METAL/N; NONFERROUS ALLOY/N

LT - CONTINUOUS/N; DATA RECORDING/N
LT - CYCLE/N; MAINTENANCE/N
LT - DEFECT/N; DEPTH/N
LT - ECONOMIC FACTOR/N; PERSONNEL/N; SUBSURFACE/N; UNDERWATER/N
LT - GROWTH/N; MARINE/N
LT - OFFSHORE/N; PIPELINE/N; SUBSURFACE/N; UNDERWATER/N
LT - THICKNESS/N; WALL/N

-121-
AN - 2906712
TI - CORROSION MONITORING...GUIDELINES TO APPLICATION
AU - BRITTON C F
OS - CORROS. MONITORING CONSULT.
SO - CORROS. PREV. CONTROL - PIPES PIPELINES INT. 'PREV. REMOVAL CORROS. SCALE IND. WATER PIPEWORK' CONF. (LOND. 4/6/82) CORROS. PREV. CONTROL V29 N.3 11-15,23 (JUNE 1982)
LA - ENGLISH
NU - ISSN 00109371
BH - AIR POLLUTION CONTROL; AIR AND WATER CONSERVATION; CORROSION AND DETERIORATION; PETROLEUM REFINING AND PETROCHEM; PIPELINE CORROSION; TRANSPORTATION AND STORAGE
IT - ACTIVITY/N; ADSORBENT/N; ADSORPTION PROCESS/N; AIR POLLUTANT/N; AROMATIZATION/N; CASE HISTORY/N; CATALYTIC REFORMING/N; CHEMICAL INDUSTRY/N; CHEMICAL PLANT/N; COOLANT/N; COOLING EQUIPMENT/N; *CORROSION/N; *CORROSION TEST/N; CORROSIVITY/N; CRUDE DISTILLATION/N; CRUDE OIL/N; CRUDE OIL (WELL)/N; C4/N; DATA/N; DESULFURIZATION/N; DETERIORATION/N; DISTILLATION/N; EDDY CURRENT/N; ELECTRIC CURRENT/N; ELECTRIC POTENTIAL/N; ELECTRICAL PROPERTY/N; ELECTRICITY/N; EMBRITTLEMENT/N; ENHANCED OIL RECOVERY/N; GALVANIC CORROSION/N; GAS TREATING/N; HEAT TRANSFER MEDIUM/N; HYDROGEN EMBRITTLEMENT/N; INDUSTRIAL PLANT/N; INDUSTRIAL PROCESS/N; INDUSTRIAL WATER/N; INJECTION/N; INSPECTING/N; KETONE/N; LIMESTONE/N; LUBRICANT/INDUSTRIAL OIL/N; MAINTENANCE/N; *MATERIALS TESTING/N; MEETING PAPER/N; MONITORING/N; NATURAL GAS/N; NONDESTRUCTIVE TESTING/N; OIL REFINERY/N; PETROCHEMICAL INDUSTRY/N; PETROLEUM INDUSTRY/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; PHYSICAL SEPARATION/N; *PIPELINE/N; POLLUTION CONTROL/N; POWERFORMING/N; PROCESS STREAM/N; RECOVERY/N; RESISTIVITY/N; REVIEW/N; ROCK/N; SATURATED CHAIN/N; SCRUBBING/N; SECONDARY RECOVERY/N; SINGLE STRUCTURE TYPE/N; SLURRY/N; SORBENT/N; SORPTION PROCESS/N; STACK GAS/N; STRAIGHT CHAIN/N; SUSPENSION/N; THERMOGRAPHY/N; TREATING/N; ULTRASONIC TESTING/N; WASHING/N; WATER/N; WAVE POLARIZATION/N; 2-BUTANONE/N
RN - 8002-05-9/N; 1317-65-3/N; 78-93-3/N
LT - ADSORBENT/N; LIMESTONE/N; ROCK/N; SORBENT/N
LT - COOLANT/N; HEAT TRANSFER MEDIUM/N; INDUSTRIAL WATER/N; WATER/N
LT - C4/N; KETONE/N; SATURATED CHAIN/N; SINGLE STRUCTURE TYPE/N; STRAIGHT CHAIN/N; 2-BUTANONE/N

-123-
AN - 2905455
TI - CONDITION MONITORING BOOSTS PRODUCTIVITY
AU - EVANS R K
SO - PROCESS ENG. (LOND.) V63 N.6 59,61,63 (JUNE 1982)
LA - ENGLISH
NU - ISSN 03701859
BH - EQUIPMENT-MATERIALS-UTILITIES; PETROLEUM REFINING AND PETROCHEM

IT - ANALYTICAL METHOD/N; AXIAL/N; COMPRESSOR/N; DEFECT/N; DETECTOR/N; DETERIORATION/N; DIELECTRIC PROPERTY/N; DISPLACEMENT/N; DYE/N; ECCENTRIC/N; EDDY CURRENT/N; EFFICIENCY/N; ELECTRIC CURRENT/N; ELECTRIC GENERATOR/N; ELECTRIC MOTOR/N; ELECTRIC POWER SOURCE/N; ELECTRICAL EQUIPMENT/N; ELECTRICAL INSULATION/N; ELECTRICAL PROPERTY/N; ELECTRICITY/N; ENGINE/N; EQUIPMENT/N; *EQUIPMENT TESTING/N; FERROGRAPHY/N; FLUID FLOW/N; FUNCTIONAL FLUID/N; GAGE/N; GAS TURBINE/N; GEAR OIL/N; HEATING EQUIPMENT/N; HYDRAULIC FLUID/N; HYDRAULIC SYSTEM/N; INSTRUMENT/N; INSULATING MATERIAL/N; LINER/N; LUBRICANT/INDUSTRIAL OIL/N; *MAINTENANCE/N; MATERIALS TESTING/N; MEASURING/N; *MONITORING/N; NONDESTRUCTIVE TESTING/N; OPERATING CONDITION/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; PIPE/N; PIPELINE/N; PRESSURE/N; PRESSURE VESSEL/N; RECIPROCATING/N; REFRACTORY/N; SHAFT/N; STRAIN GAGE/N; THERMOGRAPHY/N; TRANSDUCER/N; TRANSMISSION/N; TURBINE ENGINE/N; ULTRASONIC TESTING/N; VIBRATION/N; WEAR/N; WEAR TEST/N; WELDING/N
ST - CONDITION MONITORING; CONDITION-BASED MAINTENANCE; MACHINE-HEALTH MONITORING
LT - AXIAL/N; DISPLACEMENT/N
LT - ECCENTRIC/N; SHAFT/N
LT - EQUIPMENT/N; RECIPROCATING/N
LT - LINER/N; REFRACTORY/N

-124-
AN - 2985015
TI - PIGS WILL FLY.
AU - THOMAS V; BRITISH GAS CORP
SO - GAS WORLD 186 336-37 (SEPT. 1981) GAS ABSTR. ABSTR.NO. 82-0465 V38 N.3 (MAR. 1982)
LA - ENGLISH
NU - ISSN 00164844
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - ABSTRACT/N; ALLOY/N; AUTOMATION/N; BRITISH GAS CORP/N; COMPARISON/N; COMPUTING/N; CONSTRUCTION MATERIAL/N; CONTROL CENTER/N; DATA PROCESSING/N; DATA RECORDING/N; DATA STORAGE MEDIUM/N; DEFECT/N; DEFORMATION/N; *INSPECTING/N; LINE PIPE/N; MAGNET/N; MAGNETIC TAPE/N; MATERIAL DEPLETION/N; NONDESTRUCTIVE TESTING/N; ON STREAM/N; OPERATING CONDITION/N; PIPE/N; *PIPELINE/N; *PIPELINE PIG/N; SURVEYING/N; ULTRASONIC TESTING/N
LT - ALLOY/N; CONSTRUCTION MATERIAL/N
LT - AUTOMATION/N; DATA RECORDING/N; INSPECTING/N

-125-
AN - 2950760
TI - (PIPELINE) INSPECTION INSTRUMENTS FOR RUSSIA AND ITALY
AU - BIX INDUSTRIAL TESTING LTD; SAIPEM SPA
SO - ANTI-CORROS. METHODS MATER. V29 N.4 20 (APR. 1982)
LA - ENGLISH
NU - ISSN 00035599
BH - PIPELINE MAINTENANCE; TRANSPORTATION AND STORAGE
IT - BARGE/N; CARGO/N; CONSTRUCTION/N; CONTRACT/N; DIAMETER/N; EASTERN EUROPE/N; ECONOMIC FACTOR/N; ELECTROMAGNETIC WAVE/N; EXPOSURE/N; HIGH PRESSURE/N; IMPACT RESISTANCE/N; *INSPECTING/N; ITALY/N; LABORATORY/N; LARGE DIAMETER/N; LEGAL CONSIDERATION/N; LENGTH/N; *MATERIALS TESTER/N; MECHANICAL PROPERTY/N; *NATURAL GAS/N; NEWS/N; NONDESTRUCTIVE TESTING/N; OPERATING CONDITION/N; PHOTOGRAPHY/N; PHYSICAL PROPERTY/N; PIPE/N;

*PIPELINE/N; PIPELINE PIG/N; PORTABILITY/N; PRESSURE/N; RADIATION/N; RADIOGRAPHY/N; RUSSIA/N; SHIP/N; TENSILE STRENGTH/N; TIME/N; TOUGHNESS/N; *TRUNK PIPELINE/N; ULTRASONIC TESTING/N; WELDED PIPE/N; WELDING/N; WESTERN EUROPE/N; X RAY/N

ST - BIX X RAY PIPELINE CRAWLER; FLUOROMETALLIC SCREEN; FILM PROCESSING; DARKROOM; GIRTH WELD

LT - CARGO/N; NATURAL GAS/N

LT - DIAMETER/N; LARGE DIAMETER/N; LENGTH/N; PIPELINE/N; TRUNK PIPELINE/N

LT - EXPOSURE/N; TIME/N

LT - LABORATORY/N; PORTABILITY/N

A.3 Compendex Citations, 1

Monitoring or Leak Detection in Subsea Pipelines
(Citations from the Compendex Database)

4/7/18
02229986 E.I. Monthly No: EIM8702-011289
Title: STRUCTURAL MONITORING CONCEPTS FOR ARCTIC PIPELINES.
Author: Nyman, Kenneth J.; Lara, Pedro
Corporate Source: ARCO Pipe Line Co, Long Beach, CA, USA
Conference Title: Research on Transportation Facilities in Cold Regions. (Proceedings of a Session in Conjunction with the ASCE Convention.)
Conference Location: Boston, MA, USA Conference Date: 1986 Oct 27
Sponsor: ASCE, Technical Council on Cold Regions Engineering, New York, NY, USA
E.I. Conference No.: 08926
Source: Publ by ASCE, New York, NY, USA p 47-66
Publication Year: 1986
ISBN: 0-87262-568-0
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8702
Abstract: Terrain instabilities producing differential soil movements are the predominant features affecting the structural integrity and design of buried pipeline systems in the arctic. Current design limitations tend to increase requirements for special pipeline construction configurations thus escalating project capital costs. Development and application of advanced structural monitoring systems to evaluate pipeline distortions continuously along the alignment can significantly impact design requirements, maximize conventional pipeline burial and improve operational reliability. A review of current arctic pipeline design practice with discussion of theoretical aspects and applied concepts for structural monitoring are presented. (Author abstract) 38 refs.

4/7/23
02103797 E.I. Monthly No: EIM8607-046233
Title: ELECTRICAL AND ELECTROMAGNETIC SURVEY TECHNIQUES FOR CORROSION MONITORING OF BURIED PIPELINES.
Author: Frost, N. J.
Corporate Source: Electrolocation Ltd, Bristol, Engl
Conference Title: U. K. Corrosion '85. (Corrosion Science, Corrosion Protection, Bacterial Corrosion.)
Conference Location: Harrogate, Engl Conference Date: 1985 Nov 4-6
Sponsor: Inst of Corrosion Science & Technology, Birmingham, Engl; NACE, Houston, TX, USA
E.I. Conference No.: 07949
Source: v 1. Publ by Inst of Corrosion Science & Technology, Birmingham, Engl p 177-185
Publication Year: 1985
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8607
Abstract: If a voltage is applied to a pipeline and the resultant current flow measured at discrete points along the line, a profile of the current gradient can be plotted which will highlight areas where current is escaping from the pipe through defective coating. By using alternating current, the magnitude of the current can be measured inductively from the

surface, requiring no further contact either with the ground or the pipe. The measurements can be made through asphalt, rock or water. (Edited author abstract) 2 refs.

4/7/25
02018650 E.I. Monthly No: EI8609087798 E.I. Yearly No: EI86087718
Title: INTERNAL CORROSION MONITORING OF SUBSEA PIPELINES.
Author: Britton, C. F.
Corporate Source: Corrosion Monitoring Consultancy, Wantage, Engl
Source: Corrosion Prevention & Control v 33 n 3 Jun 1986 p 57-63
Publication Year: 1986
CODEN: CRPCAK ISSN: 0010-9371
Language: ENGLISH
Document Type: JA; (Journal Article) Treatment: G; (General Review)
Journal Announcement: 8609
Abstract: Subsea lines represent a high investment in offshore development. The assessment of the internal 'corrosion risk' or internal 'corrosion hazard analysis' is not an easy task from the data available when a field is developed. The paper considers the available techniques for corrosion monitoring and methods for installation. Reference is made to developing techniques and possible trends for future developments. 13 refs.

4/7/27
01981111 E.I. Monthly No: EI8606050914 E.I. Yearly No: EI86087841
Title: CONTROLLING THE INTERNAL CORROSION OF SUBSEA PIPELINES.
Author: King, R. A.; Geary, D.
Source: Adv in Offshore Oil & Gas Pipeline Technol Publ by Gulf Publ Co, Houston, TX, USA, 1985 p 107-116
Publication Year: 1985
ISBN: 0-87201-035-X
Language: ENGLISH
Document Type: MC; (Monograph Chapter)
Journal Announcement: 8606
Abstract: Because of their inaccessibility, normal corrosion monitoring, measurement of chemical additive concentrations and discrete spot-testing cannot be done on offshore lines. Routine monitoring is restricted to their ends and, instead of injection at regular distances along the pipeline, chemical treatment can only be effected offshore using continuous dosing, the efficacy of which is often questionable. Internal corrosion monitoring of offshore pipelines using instrumented pigs is feasible but this involves a considerable risk should the pig get stuck. Moreover, in their current state of development these pigs can only detect corrosion at relatively abrupt changes of pipewall section so more insidious general corrosion may escape detection. (Edited author abstract) 2 refs.

4/7/28
01906473 E.I. Monthly No: EIM8511-070007
Title: USE OF SULFUR HEXAFLUORIDE AS A TRACER GAS FOR LEAK DETECTION ON BURIED PIPELINE.
Author: Thornton, Loyd
Corporate Source: US Leak Detection Inc
Conference Title: INTERPIPE '85, 13th International Pipeline Technology Conference: Conference Papers.
Conference Location: Houston, TX, USA Conference Date: 1985 Feb 5-7
E.I. Conference No.: 06936

Source: INTERPIPE, International Pipeline Technology Exhibition & Conference 13th. Publ by Industrial Presentations Inc, Houston, TX, USA p 241-244

Publication Year: 1985

CODEN: IPTCDR

Language: English

Document Type: PA; (Conference Paper)

Journal Announcement: 8511

Abstract: The sulfur hexafluoride (SF6) leak detection technique has proven, in the past several years, to be the most effective means of pin-pointing leaks on buried pipelines. There are several physical properties of SF6 that make it an excellent tracer gas, which the paper describes. SF6 will mix in a solution with air, water and most hydrocarbons in both liquid and gaseous states. This property allows the SF6 detection method to be used in virtually any situation. The SF6 leak detection technique is especially valuable in urban or paved areas, in-plant situations and in pipeline corridors where multiple pipelines are laid. SF6 leak detection can be used on pipelines while they are still flowing product or when they are in a static condition.

4/7/30

01821895 E.I. Monthly No: EI8511106571 E.I. Yearly No: EI85082241

Title: Leak Warning System for Flexible Underwater Oil Pipelines.

Title: EIN LECK-WARN-SYSTEM FUER FLEXIBLE UNTERWASSER-OEL-PIPELINES.

Author: Moeller E.; Bernstein, L.

Corporate Source: Fachhochschule Aachen, Lab fuer Nachrichtentechnik, Aachen, West Ger

Source: Erdoel und Kohle, Erdgas, Petrochemie vereinigt mit Brennstoff-Chemie v 38 n 8 Aug 1985 p 347-355

Publication Year: 1985

CODEN: EKVBAK ISSN: 0367-0716

Language: GERMAN

Document Type: JA; (Journal Article) Treatment: A; (Applications)

Journal Announcement: 8511

Abstract: Underwater pipelines for unloading oil tankers, e. g. in 30 km distance from the harbour site, are required to be flexible and require supervision. This is done by implementation of oil sensitive sensors between the inner rubber tube and the impregnated textile layer. The generated sensor signals, influenced by leak oil, have to be transmitted from 150 meters under water to the supervisory station at the coast. Sensor configurations are described, to derive the point of the leakage from the topologized warning signals. (Edited author abstract) In German.

4/7/33

01738518 E.I. Monthly No: EI8503023977 E.I. Yearly No: EI85122958

Title: RECENT DEVELOPMENTS IN LEAK NOISE CORRELATION TECHNIQUES.

Author: Oliver, J.

Corporate Source: TAC

Source: Water Services v 88 n 1066 Dec 1984 p 512-513

Publication Year: 1984

CODEN: WTSVAK ISSN: 0301-7028 ISBN: 0-471-88102-3

Language: ENGLISH

Document Type: JA; (Journal Article) Treatment: A; (Applications)

Journal Announcement: 8503

Abstract: Correlators use not sound intensity but sound similarity

involving the properties of noise production, propagation and permanence in time as the basis of their operation. The permanence in time of leak noises allows the correlator processing period to discriminate against parasitic and transitory noises. Correlators determine the time difference between similar noise patterns reaching two sensors positioned at opposite ends of a section of pipeline in which leakage has been identified. With the input of the measured distance between the sensors and a value for the velocity of sound for particular pipeline, the correlator then computes the leak position. The latest correlator types tend to use parallel or real time processing in preference to the serial method used in the first UK commercial correlators. Where correlators have in the past tended to be used for locating leaks usually detected by meter checks or from listenings on fittings, the operation speed of the modern correlator makes feasible the systematic checking or surveying of buried pipelines. The flexibility of correlator systems has greatly increased with the advances made in the types of sensors now available and in use.

4/7/36
01443148 E.I. Monthly No: EIM8309-065488
Title: EVALUATION OF ACOUSTIC EMISSION MONITORING OF BURIED PIPELINES.
Author: Stulen, F. B.; Kiefner, J. F.
Corporate Source: Battelle's Columbus Lab, Columbus, Ohio, USA
Conference Title: 1982 Ultrasonics Symposium Proceedings.
Conference Location: San Diego, Calif, USA Conference Date: 1982 Oct 27-29
Sponsor: IEEE Group on Sonics & Ultrasonics, New York, NY, USA; Andersen Lab Inc, Bloomfield, Conn, USA; Crystal Technology Inc, Palo Alto, Calif, USA; Panametrics Inc, Waltham, Mass, USA; RF Monolithics Inc, Dallas, Tex, USA; et al
E.I. Conference No.: 02599
Source: Ultrasonics Symposium Proceedings 1982 v 2. Publ by IEEE, New York, NY, USA. Available from IEEE Service Cent (Cat n 82CH1823-4), Piscataway, NJ, USA p 898-903
Publication Year: 1982
CODEN: ULSPDT ISSN: 0090-5607
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8309

4/7/41
01353685 E.I. Monthly No: EI8305036674 E.I. Yearly No: EI83069303
Title: CORROSION MONITORING IN SUBSEA PIPELINES.
Author: Anon
Corporate Source: AERE, Harwell, Oxfs, Engl
Source: Corrosion Prevention & Control v 29 n 6 Dec 1982 p 8, 17
Publication Year: 1982
CODEN: CRPCAK ISSN: 0010-9371
Language: ENGLISH
Journal Announcement: 8305
Abstract: Monitoring the internal corrosion of sub-sea oil pipelines is, at present, restricted by problems of access and the shortage of suitable equipment in which absolute confidence can be placed. Control is usually limited to removing brine and corrosive gases from the oil before it enters the pipeline and adding corrosion inhibitors and biocides selected from laboratory tests. The study has examined the methods used to monitor

pipeline corrosion and to select inhibitors and biocides. In addition, the program has looked at ways of improving selection and monitoring techniques, and also at the interaction of platform and pipeline cathodic protection used to control external corrosion.

4/7/44

01082493 E.I. Monthly No: EI8112102416 E.I. Yearly No: EI81069954

Title: INTERPIPE 80, INTERNATIONAL PIPELINE TECHNOLOGY EXHIBITION & CONFERENCE, 8TH, VOLUME 1: ONSHORE DESIGN AND CONSTRUCTION, ONSHORE OPERATIONS; VOLUME 2: OFFSHORE DESIGN AND CONSTRUCTION, OFFSHORE OPERATIONS, 1980.

Author: Anon

Source: Interpipe 80, Int Pipeline Technol Exhib & Conf, 8th, Houston, Tex, Feb 5-7 1980 Publ by Interpipe 80 Conf, Houston, Tex, 1980 var pagings

Publication Year: 1980

Language: ENGLISH

Journal Announcement: 8112

Abstract: This conference proceedings contains 46 papers on advances in onshore and offshore pipeline construction. Topics dicussed include Arctic and winter pipeline construction, insulation and corrosion protection of pipelines, the welding of pipelines and weld testing, fuel control of a gas turbine prime mover, axial movement of buried pipelines, detection of leakage in buried pipelines, pipeline transportation of heavy oils, transportation of carbon dioxide by pipeline, the conversion of a crude oil pipeline to natural gas transmission, the remote supervisory system of the Orenburg/western Soviet border gas pipeline, cathodic protection of offshore structures, deep ocean pipeline installation, the handling of slugged liquid hydrocarbons, offshore crude oil gathering systems, leak detection in underwater pipelines, an offshore telecommunications sytem, hyperbaric welding development and application, in situ structural reinforcement of an in-service offshore platform, and the challenge of deep-water pipelaying in the Strait of Messina.

4/7/46

00950146 E.I. Monthly No: EI8009069392 E.I. Yearly No: EI80063062

Title: ANALYSES OF ULTRASONIC FLOWMETERS FOR LEAK DETECTION IN LIQUID HYDROCARBON PIPELINES.

Author: Gehman, Stacy E.; Holmes, Allen B.

Corporate Source: Harry Diamond Lab, Adelphi, Md

Source: Harry Diamond Lab Tech Rep HDL TR n 1907 Dec 1979 25 p

Publication Year: 1979

CODEN: USAHDW

Language: ENGLISH

Journal Announcement: 8009

Abstract: A program was conducted to determine repeatability and linearity of the ultrasonic time-delay types of flowmeters, so that their applicability to leak detection on underwater pipelines could be assessed. Field tests using merchantable crude oil were conducted on two off-the-shelf, commercially available flowmeters at a refinery meter proving station. These tests showed a short-term repeatability of 0. 2% for both meters. Long-term (7 hours) repeatability was 0. 6% for one meter and 2. 5% for the other. For a leak detection system in which line balance is continually computed and line packing is compensated for, slow drifts in line balance due to drifts of meter factors can be compensated for by periodically adjusting meter factors. For a meter with drift

characteristics similar to those measured, a computerized simulation indicates that the probability of detecting a leak greater than 0. 6% of the total flow in 10 minutes is greater than 99%. The probability of a false alarm for the same conditions is about once per week.

4/7/48

00636272 E.I. Monthly No: EI7707048861 E.I. Yearly No: EI77036067

Title: USE OF STATISTICAL METHODS TO IMPROVE THE SAFETY OF GAS DISTRIBUTION SYSTEMS.

Author: Doerfler, Thomas E.

Corporate Source: Arthur D. Little, Inc, Cambridge, Mass

Source: Am Gas Assoc Oper Sect Proc 1976, Distrib Conf, Boston, Mass, May 24-26 1976 Pap 76-D-29, 2 p

Publication Year: 1976

CODEN: POAGAB ISSN: 0099-7250

Language: ENGLISH

Journal Announcement: 7707

Abstract: It is demonstrated that a simple statistical model can be used to assist in identifying, classifying and ranking leak-prone areas in the underground pipeline system. Based on a statistical analysis of physical characteristics, leak frequency and other relevant data descriptive of individual service lines, the model provides an objective technique for determining the likelihood of leak occurrence for individual services or any combination of services in a specified location. Using known quantitative and qualitative system characteristics contained in the company's service record file, the model is used to predict leak-prone neighborhoods. Subsequent detection surveys conducted in these areas reveal a strong agreement between actual and predicted leak occurrence.

4/7/49

00591935 E.I. Monthly No: EI7701004874 E.I. Yearly No: EI77063605

Title: NEW PIPELINE LEAK DETECTION PIG.

Author: Anon

Source: Pipes and Pipelines International v 21 n 4 Aug 1976 p 26-28

Publication Year: 1976

CODEN: PPIIAU ISSN: 0370-1204

Language: ENGLISH

Journal Announcement: 7701

Abstract: A useful tool which simplifies the tracing of leaks in buried pipelines from above ground is described. It is inserted into the line in the same manner as an ordinary pig and, if desired, may be used during hydrostatic tests.

Compendex Citations, 2

Inspection of Subsea Pipelines
(Citations from the ~~NASA Recon~~ Compendex Database)

3/7/2
02765712 E.I. Monthly No: EI8908077118
Title: Assessing the coating condition of buried pipelines.
Author: Anon
Source: Process Engineering (London) v 69 n 12 Dec 1988 p 47
Publication Year: 1988
CODEN: PSEGAP ISSN: 0370-1859
Language: English
Document Type: JA; (Journal Article) Treatment: G; (General Review)
Journal Announcement: 8908
Abstract: Assessing the coating condition and possible corrosion risk of buried pipework is a familiar problem within the petrochemcial industry. A survey technique originally developed to monitor coating conditions and locate defects on cross-country pipelines has recently been modified to suit plant situations. The procedure employs C-SCAN, a computerized system manufactured by Dynalog Electronics of Bristol, to monitor the variations in magnetic flux produced by changes in coating condition. The technique has proved successful in detecting cracking due to aging of coating materials, tears due to machine damage during pipe laying, indentations due to settlement of pipeline or use of unsuitable backfill materials, and coating disbondment due to poor surface preparation or poor control of applied cathodic protection.

3/7/3
02755354 E.I. Monthly No: EI8907064484
Title: Offshore corrosion surveys.
Author: Weldon, Clark
Corporate Source: Corrpro Companies Inc, Medina, OH, USA
Source: Pipeline and Gas Journal v 216 n 2 Feb 1989 4p
Publication Year: 1989
CODEN: PLGJAT ISSN: 0032-0188
Language: English
Document Type: JA; (Journal Article) Treatment: X; (Experimental)
Journal Announcement: 8907
Abstract: Construction and operation of subsea pipelines and offshore production facilities are tremendously expensive. Because of this, cathodic protection has become a universally applied technique for mitigating corrosion on marine pipelines and production facilities. Whatever the method of applying cathodic protection, the primary concern is arresting corrosion. For cathodic protection to be effective, a properly planned program of monitoring, inspection and maintenance is essential. This paper discusses various corrosion control practices and methods of evaluating cathodic protection for marine pipelines. Surveys using towed vehicles and trailing wires are described.

3/7/6
02580588 E.I. Monthly No: EIM8805-028539
Title: TESTING AND EXPERIENCE COLLECTED WITH AN ULTRASONIC RISER PIPE INSPECTION TOOL.
Author: de Raad, J. A.; Ligthart, M.; Labrujere, J.
Corporate Source: Roentgen Technische Dienst B. V. RTD, Rotterdam, Neth
Conference Title: OMAE 1988 Houston, Proceedings of the Seventh

International Conference on Offshore Mechanics and Arctic Engineering.
Conference Location: Houston, TX, USA Conference Date: 1988 Feb 7-12
Sponsor: ASME, New York, NY, USA; ASCE, New York, NY, USA; Soc of Naval Architects of Japan, Jpn; JSME, Tokyo, Jpn; Inst of Mechanical Engineers, London, Engl; et al
E.I. Conference No.: 11083
Source: Proceedings of the International Offshore Mechanics and Arctic Engineering Symposium 7th v 1. Publ by ASME, New York, NY, USA p 61-69
Publication Year: 1988
CODEN: PIOSEB
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8805
Abstract: For the increasing demand to establish accurately the condition of subsea pipelines in particular the riser part at platforms, a fluid propelled ultrasonic inspection tool was developed. The recently completed tools for 16 in. (400 mm), and 20 in. (500 mm), risers are capable of performing onstream inspection without disturbing the operational conditions. The ultrasonic method of measuring metal loss, which is a highly accurate and reliable technique does eliminate the need for verification of the results. This is attractive in particular for offshore applications. This paper describes in particular the various and numerous demanding tests of the tool, which were successfully passed prior to field deployment of the tool. It is assumed that the actual offshore field test on a 20 in. riser has been completed at the time of the conference. After completion of all tests the tools will be commercially available. (Edited author abstract) 2 refs.

3/7/8
02359333 E.I. Monthly No: EIM8712-086805
Title: HIGH RESOLUTION METHODS FOR INSPECTION OF UNBURIED AND PARTLY BURIED PIPELINES.
Author: Meister, H.; Nording, I.
Corporate Source: Danish Hydraulic Inst, Horsholm, Den
Conference Title: International Conference on Measuring Techniques of Hydraulics Phenomena in Offshore, Coastal & Inland Waters.
Conference Location: London, Engl Conference Date: 1986 Apr 9-11
Sponsor: BHRA, Cranfield, Engl; ASCE, New York, NY, USA; Int Assoc for Hydraulic Research, Delft, Neth
E.I. Conference No.: 10156
Source: Publ by BHRA, Cranfield, Engl p 257-274
Publication Year: 1986
ISBN: 0-947711-12-0
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8712
Abstract: Submarine hydrocarbon transmission pipelines are essential for the oilgas exploitation in the North Sea and in other major offshore regions. The integrity of these lines is closely matched by means of on-line monitoring systems and regular submarine inspections. The protection level is influenced by the occurrence of free spanning pipe sections and the degree of pipeline trench backfilling. Over the last decade much emphasis has therefore been put on developing accurate and economic-in-use sensors for determining these two parameters in particular. The present paper discusses the principles of two sensors recently

developed for use in submarine pipeline inspection: The Triple Head Sonar Systems (THSS) and The High Resolution Trench Profiler (HRTP). Both systems have been used extensively in practice and proceed their value in several inspection projects in the North Sea and in the Mediterranean.

3/7/7
02573708 E.I. Monthly No: EI8805046870
Title: UNDERWATER OPERATIONS FOR DECOMMISSIONING OF SUBSEA PIPELINES AND RELATED FACILITIES.
Author: Smith, C. J.
Corporate Source: John Brown Engineers & Constructiors Ltd
Source: Pipes and Pipelines International v 32 n 6 Nov-Dec 1987 p 7-13
Publication Year: 1987
CODEN: PPIIAU ISSN: 0370-1204
Language: English
Document Type: JA; (Journal Article) Treatment: A; (Applications)
Journal Announcement: 8805
Abstract: This paper considers the underwater operations required for decommissioning pipelines installed in the North Sea Continental Shelf areas. The type of work is described under the areas of survey/inspection/measurement, valve/mechanical manipulation, cutting/weldi ng and lateral/vertical movement. The subject of excavation is also discussed in the paper. Work requirements, methods and techniques available are defined within three groups: divers (saturation), remotely operated vehicles (ROVs) and manned submersibles. Consideration is given to the difficulties that may occur on the seabed for decommissioning and removal of pipelines. To illustrate this, a number of typical problems are described. They are complete pipeline burial, fixed seabed pipeline structures, connecting pipelines, seized pipeline end connectors, damaged/buckled pipelines, severe internal corrosion and crossing pipelines. It is then proposed that specialized equipment may need to be designed and developed for particular recovery operations. Such equipment could be a pipe-lift seabed crawler, a de-burial plough, a de-burial jetting sled and special re-reeling equipment. (Edited author abstract)

3/7/10
02254691 E.I. Monthly No: EIM8706-040481
Title: COMPUTERIZATION HELPS ANALYSIS OF UNDERWATER PIPELINE INSPECTION.
Author: Taudin, P.
Corporate Source: Compagnie Francaise des Petroles
Conference Title: Offshore Oil and Gas Pipeline Technology.
Conference Location: Amsterdam, Neth Conference Date: 1985 Jan 24-25
E.I. Conference No.: 09172
Source: Publ by Oyez Scientific & Technical Services Ltd 13p
Publication Year: 1985
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8706
Abstract: Computerized techniques as aids for underwater pipeline inspection are discussed. As the contractors in charge of inspection use computer files more and more frequently, it is more convenient and efficient to store the information on a Data Base System. Then, the inspection data can be sorted, looked up and compared much more easily. Intelligible graphic and report summaries can be produced in a short time. Three objective are: (1) storing pipe data so as to obtain information more

easily; (2) making an automatic diagnosis of the faults to point out the major damages and classify the others; and (3) working out easy calculations of the maintenance operations.

3/7/12
02252476 E.I. Monthly No: EIM8706-038134
Title: OFFSHORE AND ARCTIC PIPELINES - 1987.
Author: Chung, Jin S. (Ed.); Karal, K. (Ed.)
Corporate Source: Colorado Sch of Mines, Golden, CO, USA
Conference Title: Offshore and Arctic Pipelines - 1987. (Presented at the Sixth (1987) International Symposium & Exhibit on Offshore Mechanics and Arctic Engineering.)
Conference Location: Houston, TX, USA Conference Date: 1987 Mar 1-6
Sponsor: ASME, New York, NY, USA; Soc of Naval Architects of Japan, Jpn; Inst of Mechanical Engineers, London, Engl; London Cent for Marine Technology, London, Engl; Norwegian Soc of Chartered Engineers, Oslo, Norw; et al
E.I. Conference No.: 09565
Source: Publ by ASME, New York, NY, USA 199p
Publication Year: 1987
Language: English
Document Type: CP; (Conference Proceedings)
Journal Announcement: 8706
Abstract: This conference proceedings contains 23 papers. Topics presented include pipeline inspection and condition reporting systems; pipeline protection, support and installation structures; towed pipelines; scour below pipelines; wave-induced pressures below pipelines; pipe collapse due to pressure, loading, and bending; pipeline buckling; pipeline collapse pressure; pipeline structural criteria; high impact pipeline welding, pipeline free span analysis; pipeline frost heaves; arctic pipeline probabilistic design; parametric study of structural response of buried arctic pipelines; pipe quality and standards; pipeline girth welding; hyperbaric orbital TIG welding for underwater pipelines; stainless steel pipelines for Arctic use; automatic welding of microalloyed steel pipelines; duplex and clad pipelines; and pipeline stability prediction.

3/7/14
02199880 E.I. Monthly No: EI8705050293
Title: INTERNAL CORROSION MONITORING OF SUBSEA PIPELINES.
Author: Britton, C. F.
Corporate Source: Corrosion Monitoring Consultancy, Wantage, Engl
Source: Pipes and Pipelines International v 31 n 6 Nov-Dec 1986 p 12-18
Publication Year: 1986
CODEN: PPIIAU ISSN: 0370-1204
Language: ENGLISH
Document Type: JA; (Journal Article)
Journal Announcement: 8705
Abstract: Corrosion monitoring of pipelines is becoming an increasingly-important aspect of operations, and more especially for the offshore systems, some of which have been in operation for up to 20 years in the North Sea. This paper describes the various systems available, and details some of the requirements of the inspection authorities. Reference is made to developing techniques and possible trends for future developments. The factors affecting the internal corrosion of subsea lines are also evaluated. (Edited author abstract) 13 refs.

3/7/18

01909953 E.I. Monthly No: EIM8511-073975

Title: INSPECTION/CONDITION ANALYSES OF LARGE UNDERGROUND PIPELINES.

Author: Noble, Glenn E.

Corporate Source: Jenny Engineering Corp, Pontiac, MI, USA

Conference Title: Advances in Underground Pipeline Engineering, Proceedings of the International Conference.

Conference Location: Madison, WI, USA Conference Date: 1985 Aug 27-29

Sponsor: ASCE, Pipeline Div, New York, NY, USA; ASCE, Madison Branch, Madison, WI, USA; ASCE, Wisconsin Section, WI, USA; Wisconsin Hazardous Waste Management Center, WI, USA; Univ of Wisconsin-Madison, Dep of Civil & Environmental Engineering, Madison, WI, USA; Univ of Wisconsin-Madison, Coll of Engineering, Madison, WI, USA

E.I. Conference No.: 06949

Source: Publ by ASCE, New York, NY, USA p 477-486

Publication Year: 1985

ISBN: 0-87262-471-4

Language: English

Document Type: PA; (Conference Paper)

Journal Announcement: 8511

Abstract: Inspection/Condition Analyses of Underground Pipelines (sewers and conduits) will be a necessary function of the pipeline Owner/Operator. The Condition Analyses and Inspection phases are both critical if rehabilitation procedures are to be specified to extend the useful life of the pipeline. Observations should be detailed for further analysis and to develop a comparison base for future inspections. The cause of the observed abnormalities, found during the Inspection phase, should be reviewed as they relate to each other, construction methods and the geo-structure. Unit cost indexed in dollars per lineal feet of conduit vary from $3. 60 to $16. 00 for conduit lengths of 29,000 to 1000 lineal feet respectively. Support mobilization plus inspection unit costs range from sixty to eighty percent of the total Inspection/Condition Report Cost.

3/7/19

01876777 E.I. Monthly No: EIM8506-034385

Title: PROCEEDINGS OF THE FOURTH INTERNATIONAL OFFSHORE MECHANICS AND ARCTIC ENGINEERING SYMPOSIUM.

Author: Chung, Jin S. (Ed.); Lunardini, Virgil J. (Ed.); Chakrabarti, S. K. (Ed.); Wang, Y. S. (Ed.); Sodhi, D. S. (Ed.); Karal, K. (Ed.)

Corporate Source: Colorado Sch of Mines, Golden, CO, USA

Conference Title: Proceedings of the Fourth International Offshore Mechanics and Arctic Engineering Symposium. (Presented at the 1985 ASME Energy-Sources Technology Conference & Exhibition.)

Conference Location: Dallas, TX, USA Conference Date: 1985 Feb 17-21

Sponsor: ASME, New York, NY, USA; Inst of Mechanical Engineers, London Cent for Marine Technology; London, Engl; Norwegian Soc of Chartered Engineers, Oslo, Norw; Soc of Naval Architects of Japan, Japan Ocean Engineering Div, Tokyo, Jpn; Conseil de Liaison de Assoc de Recherche sur les Ouvrages en Mer, Fr; et al

E.I. Conference No.: 06296

Source: Proceedings of the International Offshore Mechanics and Arctic Engineering Symposium 4th. Publ by ASME, New York, NY, USA 2 vol, 1380p

Publication Year: 1985

CODEN: PIOSEB

Language: English
Document Type: CP; (Conference Proceedings)
Journal Announcement: 8506
Abstract: This conference proceedings contains 168 papers. Twenty session topics include: deep water structures, offshore structure construction techniques and operations, wave-structure-soil interactions, fatigue and structural mechanics, offshore loading and control, riser mechanics and mooring systems, submarine pipelines, ocean energy, arctic thermal design and analysis, permafrost engineering, arctic design and operations, ice mechanics and properties, ice-structure interactions, ships in ice, arctic materials, NDT and offshore inspection, structural damage and detection, and new computer technology for offshore automation. Papers discussed techniques and ideas on tension leg platforms, wind loads, sea floor dynamics, deep water compliant structures, random ocean wave simulations, motions of structures, wave forces, fatigue and fracture control, structural mechanics, deep water oil and gas drilling, riser analysis, ice plug anchors, shell deep water pipelines, mooring systems, buckling, loads and vibrations, subsea pipelines, heat transfer, mudslides, exploratory drilling, uniaxial ice deformation, ice scour, ice breakers, non-destructive testing, and expert systems.

3/7/21
01693485 E.I. Monthly No: EIM8410-082991
Title: CORROSION CONTROL ON HIGH PRESSURE GAS PIPELINES.
Author: Gray, D.; Brown, A.; Argent, C. J.
Corporate Source: British Gas Corp, Engineering Research Station, Newcastle upon Tyne, Engl
Conference Title: Papers presented at the 5th International Conference on the Internal & External Protection of Pipes.
Conference Location: Innsbruck, Austria Conference Date: 1983 Oct 25-27
Sponsor: BHRA Fluid Engineering, Cranfield, Bedford, Engl
E.I. Conference No.: 04472
Source: Papers presented at the International Conference on the Internal & External Protection of Pipes 5th. Publ by BHRA Fluid Engineering, Cranfield, Bedford, Engl p 337-363
Publication Year: 1983
CODEN: PIPPD6 ISSN: 0144-0772 ISBN: 0-906085-88-8
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8410

3/7/22
01691227 E.I. Monthly No: EIM8410-080537
Title: FUNDAMENTAL STUDY ON FLAW DETECTION OF BURIED PIPELINES BY THE ACOUSTIC EMISSION METHOD.
Author: Miyajima, N.; Hanzawa, M.; Hashirazaki, S.; Ohkuma, F.; Tanaka, K.
Corporate Source: Nippon Steel Corp, Jpn
Conference Title: Proceedings - The International Conference on Pipeline Inspection.
Conference Location: Edmonton, Alberta, Can Conference Date: 1983 Jun
Sponsor: Canadian Soc for Nondestructive Testing, Hamilton, Ont, Can; Canadian Council of the ASM, Can; CANMET, Physical Metallurgy Research Lab, Ottawa, Ont, Can
E.I. Conference No.: 05030

Source: Publ by Canadian Government Publ Cent, Ottawa, Ont, Can and CANMET, Ottawa, Ont, Can p 503-528
Publication Year: 1984
ISBN: 0-660-11601-4
Language: English
Document Type: PA; (Conference Paper)
Journal Announcement: 8410

3/7/25
01319181 E.I. Monthly No: EI8301005141 E.I. Yearly No: EI83069317
Title: TRACKING SYSTEM USED IN PIPELINE BURIAL AND INSPECTION.
Author: Anon
Source: Ocean Industry v 17 n 9 Sep 1982 p 226-228, 230
Publication Year: 1982
CODEN: OCIDAF ISSN: 0029-8026
Language: ENGLISH
Journal Announcement: 8301
Abstract: A tracking system developed recently by Innovatum, Inc., Houston, is providing enhanced capabilities for charting the course of subsea pipelines and cables. The only requirement essential for use of the system is that the object to be tracked has a magnetic field. The system senses either the natural magnetic field of a ferromagnetic object, such as a pipeline, or the magnetic field produced by the flow of electric current. Analysis of the measured field permits calculation of the position of the object.

3/7/27
01098636 E.I. Monthly No: EI8203026016 E.I. Yearly No: EI82111968
Title: PREVENTIVE MAINTENANCE SURVEY AND INSPECTION OF PIPELINE RIVER CROSSINGS AND UNDERWATER PIPELINES.
Author: Logan, C. F.
Corporate Source: Logan Eng & Contract Co, Jacksonville, Fla, USA
Source: Journal of Pipelines v 1 n 1 Jan 1981 p 93-99
Publication Year: 1981
CODEN: JOPIDT ISSN: 0166-5324
Language: ENGLISH
Journal Announcement: 8203
Abstract: River crossings are the weakest link in most major transmission systems. This paper deals with the following subjects pertinent to the submerged crossing: (a) primary causes of failure; (b) recognition of common defects; (c) suggested preventive measures; (d) inspection procedures; and (e) methods of repair.

3/7/29
00966217 E.I. Monthly No: EI8011084426 E.I. Yearly No: EI80058151
Title: FEASIBILITY OF FLAW DETECTION IN UNDERGROUND PIPELINES BY THE ULTRASONIC PULSE-ECHO METHOD.
Author: Polyakov, G. A.; Shagimuratov, G. I.; Parechin, V. I.
Source: Soviet Journal of Nondestructive Testing (English translation of Defektoskopiya) v 15 n 5 May 1979 p 447-449
Publication Year: 1979
CODEN: SJNTAB ISSN: 0038-5492
Language: ENGLISH
Journal Announcement: 8011
Abstract: By introducing a delay time in the reception of the

flaw-reflected waves in pulsed ultrasonic sounding, it is possible in principle to inspect different zones along the length of the line and to estimate their states. The laboratory experiments evince the conceptual feasibility of using the ultrasonic pulse-echo method to detect flaws in the walls of pipelines by longitudinal insonification of the latter over distances up to several meters. The fundamental results of the laboratory experiments have been confirmed in tests on real pipelines of heat-conduit networks with diameters of 150 to 600 mm. 4 refs.

3/7/28

00983348 E.I. Monthly No: EI8101008813 E.I. Yearly No: EI81093002

Title: INTEGRITY MONITORING OF PRESSURE VESSELS, PIPE SYSTEMS AND STEEL FABRICATIONS BY ACOUSTIC EMISSION ANALYSIS.

Author: Rogers, Len

Corporate Source: Br Steel Corp, Engl

Source: Natl Conf on Cond Monit, 2nd, Pap, London, Engl, Feb 27-28 1979 Sponsored by Br Counc of Maint Assoc, High Wycombe, Bucks, Engl, 1979 p 7. c. 1-7. c. 31

Publication Year: 1979

Language: ENGLISH

Journal Announcement: 8101

Abstract: This paper describes work undertaken by the Unit Inspection Company developing acoustic emission analysis for the integrity monitoring of: pressure vessels, the location of water leaks in buried pipelines, the detection of fatigue cracks in screw-jointed conductor tubes by a novel technique using sensors freely suspended in the oil-filled tube, the location and characterization of propagating fatigue cracks in the tubular branch connections (nodes) of a production platform jacket, and the continuous monitoring of stress corrosion cracking in blast furnace stoves. Practical examples of in-service monitoring of the integrity of production platform jackets are used to illustrate acoustic emission data acquisition and processing for continuous monitoring of structural integrity. 28 refs.

3/7/31

00771242 E.I. Monthly No: EI7804023754

Title: DIVING RECONNAISSANCE AND UNDERWATER INSPECTION

Author: Layton, Jeffrey A.

Corporate Source: CH2M Hill, Bellevue, Wash

Source: Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of the American Society of Civil Engineers v 104 n 1 Feb 1978 p 39-51

Publication Year: 1978

CODEN: JWPCDX ISSN: 0148-9895

Language: ENGLISH

Journal Announcement: 7804

Abstract: Emphasis is placed on integrating the diving engineer into the coastal engineering design process to demonstrate how his special knowledge can become a key factor in designing and constructing underwater structures. The diving engineer has two basic functions: (1)Diving reconnaissance to obtain basic first-hand knowledge of a project site's environmental and physical characteristics; and (2)construction inspection to ensure quality underwater construction work. Specific diving procedures for conducting underwater reconnaissance surveys and inspecting subaqueous construction are described. The relationship between manned diving systems and remote controlled underwater reconnaissance vehicles is examined.

Diving safety and training are also presented. 16 refs.

3/7/34
00666532 E.I. Monthly No: EI7711083706 E.I. Yearly No: EI77056119
Title: MAGNETIZING FLAW-DETECTION SYSTEM FOR THE INSPECTION OF UNDERGROUND PIPELINES.
Author: Grigor'ev, P. A.; Fridman, L. A.; Khalileev, P. A.
Corporate Source: Inst of Met Phys, Ural Sci Cent, Acad of Sci of the USSR
Source: Soviet Journal of Nondestructive Testing (English translation of Defektoskopiya) v 12 n 4 Jul-Aug 1976 p 351-359
Publication Year: 1976
CODEN: SJNTAB ISSN: 0038-5492
Language: ENGLISH
Journal Announcement: 7711
Abstract: A magnetizing flaw-detection system has been developed for the detection of corrosion defects and transverse cracks in pipelines with a diameter of 300 mm; the system incorporates barium ferrite permanent magnets. It is used to magnetize the wall (9 mm thick) of the tested pipe to an induction of 1. 6 T, which is sufficient for the exposure of unsafe defects. 5 refs.

3/7/37
00427698 E.I. Monthly No: EI7502011133 E.I. Yearly No: EI75049532
Title: SUBMARINES INSPECT SUBSEA PIPELINE.
Author: Ewing, Robert C.
Source: Oil and Gas Journal v 72 n 50 Dec 16 1974 p 45-47
Publication Year: 1974
CODEN: OIGJAV ISSN: 0030-1388
Language: ENGLISH
Journal Announcement: 7502
Abstract: Unpressurized minisub carries inspectors right to the ocean floor (up to 1000-ft depths) for closeup visual inspection and for making a video tape as a permanent record.

A.4 NASA Recon Citations, 1

Leak Detection in Pipelines
(Citations from the NASA Recon Database)

TYPE 44/2/1

71B10513* CATEGORY 6 MFS-15162 71/12/00 UNCLASSIFIED DOCUMENT
DOMESTIC

UTTL: Optical inspection tool for interior surfaces of fluid lines

UNOC: (Specialized tool enables visual inspection of interior bore surfaces of pipe lines having sharp bends and blind runs. Adjustable, hinged optical head permits viewing of bore surfaces at angles from 0 deg to 115 deg to the principal axis of the sight tube.)

AUTH: A/MITCHELL, D. K.

MAJS: /*ANGULAR RESOLUTION/*CAVITIES/*CONICAL SCANNING/*FLUID FLOW/*GAS INJECTION/*INSPECTION/*MIRRORS/*OPTICAL MEASURING INSTRUMENTS/*PIPELINES/*REFLECTORS/*SPRINGS (ELASTIC)/*TELESCOPES/*TOOLS

TYPE 44/2/2

68B10303* CATEGORY 1 MFS-14713 68/08/00 UNCLASSIFIED DOCUMENT
DOMESTIC

UTTL: Conceptual apparatus for detecting leaks of nonconductive liquids

UNOC: (Apparatus detects leaks at joints in lines carrying electrically nonconductive liquids. The proposed apparatus could include a panel that would give a visual or audible indication of a leak /to permit manual shutdown/ and/or an electromechanical actuator that would automatically cut off the flow when a leak occurs.)

AUTH: A/WALSH, G. D.

MAJS: /*ACTUATORS/*AUDITORY SIGNALS/*ELECTRICAL INSULATION/*ELECTROMECHANICAL DEVICES/*HYDRAULIC EQUIPMENT/*INDICATORS/*JOINTS (JUNCTIONS)/*LEAKAGE/*LIQUID FLOW/*OILS/*PIPELINES/*VISUAL SIGNALS

TYPE 44/2/3

66B10412* CATEGORY 1 MFS-888 66/09/00 UNCLASSIFIED DOCUMENT
DOMESTIC

UTTL: Leak locator for vacuum jacketed pipelines eliminates need for removal of outer jacket

UNOC: (Device for locating leaks in a vacuum-jacketed liquid-hydrogen transfer line consists of two Mylar discs, a source of nitrogen and helium gas, and a mass spectrometer. The outer jacket of the pipeline does not need to be removed for the locator to be used.)

AUTH: A/WELLS, G. H.

MAJS: /*CRYOGENIC FLUIDS/*DISKS (SHAPES)/*FLUID TRANSMISSION LINES/*HELIUM/*INDICATING INSTRUMENTS/*JACKETS/*LEAKAGE/*LIQUID HYDROGEN/*MASS SPECTROMETERS/*MYLAR (TRADEMARK)/*NITROGEN/*PIPELINES/*VACUUM

TYPE 44/2/4

66B10099* CATEGORY 1 MFS-478 66/03/00 UNCLASSIFIED DOCUMENT
DOMESTIC

UTTL: Capacitive system detects and locates fluid leaks

UNOC: (Electronic monitoring system automatically detects and locates minute leaks in seams of large fluid storage tanks and pipelines covered with thermal insulation. The system uses a capacitive tape-sensing element that is adhesively bonded over seams where fluid leaks are likely to occur.)

MAJS: /*CAPACITANCE/*DIELECTRIC PERMEABILITY/*ELECTROMAGNETIC FIELDS/*ELECTRONIC

TRANSDUCERS/*LEAKAGE/*MONITORS/*PIPELINES/*POLYTETRAFLUOROETHYLENE/*SEALS (STOPPERS)/*SEMICONDUCTING FILMS/*SILICONE RUBBER/*STORAGE TANKS/*TAPES/* THERMAL INSULATION/*VACUUM DEPOSITION/*WELDED JOINTS

TYPE 44/2/5

78X73137# CATEGORY 26 RPT#: AD-B024264L PAS-77-26 78/01/00 34 PAGES UNCLASSIFIED DOCUMENT US GOV AGENCIES

UTTL: Long-term corrosion evaluation of seawater flexible pipe connections (RISIC)

AUTH: A/PAXSON, R. C.

CORP: Naval Ship Research and Development Center, Annapolis, MD. CSS: (Propulsion and Auxiliary Systems Dept.)

CIO: UNITED STATES

TYPE 44/2/6

76X76214# CATEGORY 98 RPT#: AD-B007688L CEL-TN-1400 CNT#: YF53534006 75/09/00 67 PAGES UNCLASSIFIED DOCUMENT US GOV AGENCIES

UTTL: Evaluation of the linalog pipeline inspection system for the detection of corrosion in Navy POL pipelines TLSP: Final Report, Jul. 1972 - Aug. 1973

AUTH: A/HOLLAN, M. E.

CORP: Naval Civil Engineering Lab., Port Hueneme, CA.

CIO: UNITED STATES

TYPE 44/2/7

89A42852 ISSUE 18 PAGE 2833 CATEGORY 38 89/06/00 344 PAGES UNCLASSIFIED DOCUMENT COPYRIGHT

UTTL: World Meeting on Acoustic Emission, Charlotte, NC, Mar. 20-23, 1989, Extended Summaries of Papers

CIO: UNITED STATES

Meeting sponsored by the Acoustic Emission Working Group. Journal of Acoustic Emission (ISSN 0730-0050), vol. 8, Jan.-June 1989, 344 p. For individual items see A89-42853 to A89-42874.

MAJS: /*ACOUSTIC EMISSION/*CONFERENCES/*NONDESTRUCTIVE TESTS

MINS: / COMPOSITE MATERIALS/ CRACK PROPAGATION/ DAMAGE ASSESSMENT/ DEFORMATION/ IMPACT TESTS/ KEVLAR (TRADEMARK)/ MONITORS/ NEURAL NETS/ PIPELINES/ PRESSURE VESSELS/ ROCK MECHANICS/ ROLLER BEARINGS/ STEEL STRUCTURES/ TRIBOLOGY/ WEAR TESTS

ABA: K.K.

ABS: The conference presents papers on intelligent systems, monitoring structures, monitoring pressure vessels, deformation studies, and developments in AE source/materials characterization. Consideration is also given to tribology, impact, and wear; machinery diagnostics; MONPAC technology; geotechnical applications; composite materials; and natural/synthetic composites. Other topics include acoustic emission detection of crack presence and crack advance during flight, time-frequency domain analysis of AE signals using simple instrumentation techniques, the linear location of AE simulated sources on steel pipelines with waveguides, and the detectability of defects in reactor pressure components by location and interpretation of AE-sources.

TYPE 44/2/8

88A32918# ISSUE 13 PAGE 2111 CATEGORY 43 87/00/00 8 PAGES UNCLASSIFIED DOCUMENT

UTTL: After exploration, what? - Case histories of seven diverse production,

development and distribution applications of remote sensing
AUTH: A/FEDER, ALLEN M.; B/SHEEHAN, CYNTHIA A.; C/VIXO, DARCY L. PAA: C/(Western Geophysical Company of America, Houston, TX)
CIO: UNITED STATES
IN: Thematic Conference on Remote Sensing for Exploration Geology, 5th, Reno, NV, Sept. 29-Oct. 2, 1986, Proceedings. Volume 1 (A88-32901 13-43). Ann Arbor, MI, Environmental Research Institute of Michigan, 1987, p. 317-324.
MAJS: /*HYDROCARBON FUEL PRODUCTION/*OIL EXPLORATION/*REMOTE SENSING
MINS: / CASE HISTORIES/ GROUND WATER/ PIPELINES/ WATER RESOURCES
ABA: Author
ABS: The paper describes seven diverse case histories in successful postexploration applications of remote sensing. The first three case histories involve 8-14-micrometer remote sensing for locating groundwater for drilling, for determining geologic conditions suitable for drilling-waste disposal, and for mapping the advance of a steam-flood front in secondary recovery. The fourth case history involves aeromagnetometry for the measure of the areal extent of a reservoir, and 'stepping-off' production from producing fields. The next two case histories center on Landsat imagery processing and interpretation for pipeline routing in Arctic permafrost and humid tropics terrains. The last case history returns to 8-14 micrometer scanning for efficacious pipeline ** leak detection. ** As a suite, these case histories provide examples of innovative applications of remote sensing, with its unique advantages, that make if possible to bridge the critical activities between exploration and final marketing.

TYPE 44/2/9
85A40543 ISSUE 19 PAGE 2757 CATEGORY 9 84/08/00 11 PAGES
UNCLASSIFIED DOCUMENT COPYRIGHT
UTTL: Pipeline control system with high safety reliability --- for transportation of aviation fuels
AUTH: A/DOI, K.; B/SUGAYA, S.; C/ISHIYAMA, T.; D/MINATO, H. PAA: D/(Nippon Kokan Co., Ltd., Tokyo, Japan)
CIO: JAPAN
Nippon Kokan Technical Report - Overseas Edition (ISSN 0546-1731), Aug. 1984, p. 52-62.
MAJS: /*AIRCRAFT FUELS/*CONTROL SYSTEMS DESIGN/*FUEL FLOW REGULATORS/*PIPELINES /*RELIABILITY ANALYSIS/*SAFETY FACTORS
MINS: / AIRPORTS/ COMPUTER TECHNIQUES/ CONTROL SIMULATION/ FAULT TREES/ FLUID TRANSMISSION LINES/ FUEL TANKS/ LEAKAGE
ABA: Author
ABS: The control system for the aviation fuel pipeline extending to New Tokyo International Airport has been completed and its performance confirmed through operation. Since it is specified in Japan that every pipeline system should be installed with special attention paid to its safety and reliability, high reliability of the present pipeline was achieved by adoption of a duplex computer system and two-directional telemeters and telecontrollers. As for the ** leak detection ** system, a new system configuration was introduced for pressure detection and flow difference detection to be made during operation to improve the detectability, and its performance was confirmed by leak simulation using the actual fluid. In order to quantitatively determine the reliability of the completed system, its availability was calculated by the FTA method. As a result, this system was found highly reliable.

TYPE 44/2/10

81A44330 ISSUE 21 PAGE 3694 CATEGORY 38 81/00/00 11 PAGES
UNCLASSIFIED DOCUMENT COPYRIGHT

UTTL: Applications of electromagnetic acoustic transducers /EMATs/

AUTH: A/ALERS, G. A. PAA: A/(New Mexico, University, Albuquerque, NM)

CIO: UNITED STATES

In: Material and process applications - Land, sea, air, space; Proceedings of the Twenty-sixth National Symposium and Exhibition, Los Angeles, CA, April 28-30, 1981. (A81-44326 21-23) Azusa, CA, Society for the Advancement of Material and Process Engineering, 1981, p. 34-44.

MAJS: /*ELECTROMAGNETISM/*MAGNETIC INDUCTION/*NONDESTRUCTIVE TESTS/*QUALITY CONTROL/*ULTRASONIC FLAW DETECTION/*ULTRASONIC WAVE TRANSDUCERS

MINS: / PIPELINES/ PROJECTILES/ RAILS/ STRESS MEASUREMENT/ TECHNOLOGY UTILIZATION/ TUBE HEAT EXCHANGERS

ABA: G.R.

ABS: A review is provided of recent developments regarding a new class of ultrasonic transducers that operates by electromagnetic induction across an air gap and hence eliminates many of the restrictions found in other devices. Because it is electromagnetic, it only operates on conducting materials, and the air gap should be kept as small as possible. The principles of operation are considered and questions of application are discussed, taking into account ** buried ** gas pipelines, railroad track inspection, artillery projectile inspection, heat exchanger tube inspection, cracks in hidden fastener holes, aluminum tube welds, field welds in pipelines, hot billet inspection, the detection of bending in pipelines, and thickness measurement.

TYPE 44/2/11

81A20131# ISSUE 7 PAGE 1090 CATEGORY 38 80/00/00 8 PAGES
UNCLASSIFIED DOCUMENT

UTTL: Dimensioning, identification and evaluation of weld defects with ultrasonics

AUTH: A/PAWLOWSKI, Z.; B/SZELAZEK, J.; C/GORZNY, J. PAA: C/(Polska Akademia Nauk, Instytut Podstawowych Problemow Techniki; Energopol, Warsaw, Poland)

CIO: POLAND

In: World Conference on Non-destructive Testing, 9th, Melbourne, Australia, November 19-23, 1979, Sessions 1C(1-6), 3B(1-6), and 4A(1-7). (A81-20104 07-38) Parkville, Victoria, Australia, Australian Institute for Nondestructive Testing, 1980. (3B-1). 8 p.

MAJS: /*BUTT JOINTS/*NONDESTRUCTIVE TESTS/*PIPELINES/*RECORDING INSTRUMENTS/* ULTRASONIC FLAW DETECTION/*WELD TESTS

MINS: / DATA ACQUISITION/ DEFECTS/ INSPECTION/ PUNCHED CARDS/ QUALITY CONTROL/ TEST EQUIPMENT/ WELDED JOINTS

ABA: B.J.

ABS: The procedure adopted in the new Polish standard on ultrasonic butt weld testing is described. Attention is given to the recording system, the philosphy of weld defect evaluation, and the collection of punched cards containing weld defects. Examples relating to circumferential-weld evaluation in the Orenburg pipeline are examined.

TYPE 44/2/12

76A46514 ISSUE 24 PAGE 3768 CATEGORY 26 76/00/00 11 PAGES
UNCLASSIFIED DOCUMENT COPYRIGHT

UTTL: Transportation of hydrogen in pipelines - Interaction of NDE and material

requirements
AUTH: A/THOMPSON, R. B.; B/THOMPSON, A. W.; C/THOMPSON, D. O. PAA: C/(Rockwell International Science Center, Thousand Oaks, Calif.)
CIO: UNITED STATES
In: Effect of hydrogen on behavior of materials; Proceedings of the International Conference, Moran, Wyo., September 7-11, 1975. (A76-46476 24-26) New York, Metallurgical Society of AIME, 1976, p. 612-621; Discussion, p. 622. Research sponsored by the Rockwell Research and Development Program.
MAJS: /*HYDROGEN-BASED ENERGY/*MATERIALS TESTS/*NONDESTRUCTIVE TESTS/*PIPELINES
MINS: / CRACKING (FRACTURING)/ ENERGY TECHNOLOGY/ FRACTURE STRENGTH/ INDUSTRIAL SAFETY/ SAFETY MANAGEMENT/ STEELS
ABA: G.R.
ABS: The mechanical properties of existing and proposed pipe materials in a high-pressure hydrogen environment are considered, taking into account aspects of crack resistance as a function of time, the characteristics of crack types, and a calculation of the critical values of crack length. A description is presented of the methods of nondestructive evaluation which can be used for the inspection of natural gas lines. Basic problems regarding an examination of the gas lines are related to the length of the lines and the fact that they are ** buried. ** Problems related to the possibility of an occurrence of catastrophic failures in the case of natural gas will be even more severe in the case of high-pressure hydrogen. The use of steels with improved resistance to hydrogen is recommended for the construction of hydrogen pipe lines.

TYPE 44/2/13
74A36137# ISSUE 17 PAGE 2409 CATEGORY 11 73/00/00 160 PAGES In RUSSIAN UNCLASSIFIED DOCUMENT
UTTL: Operational and accidental petroleum product losses and their control and prevention /2nd revised and enlarged edition/ --- Russian book
AUTH: A/IVANOV, N. D.
CIO: UNKNOWN
Leningrad, Izdatel'stvo Nedra, 1973. 160 p. In Russian.
MAJS: /*ACCIDENT PREVENTION/*CRUDE OIL/*INDUSTRIAL MANAGEMENT/*MATERIALS HANDLING/*OPERATIONAL HAZARDS
MINS: / EVAPORATION/ INDUSTRIAL SAFETY/ INVENTORY MANAGEMENT/ LEAKAGE/ PIPELINES / QUALITY CONTROL/ RAIL TRANSPORTATION/ SAFETY MANAGEMENT/ SPILLING/ STORAGE TANKS/ THERMAL STABILITY/ VISCOUS FLUIDS
ABA: V.Z.
ABS: This book discusses petroleum product losses during storage, transportation, delivery and handling as such losses take place according to experience in concerned Soviet industries. Vaporization, leakage, spillage, oxidation, and accidental losses are covered, pointing out their significant level in the Soviet Union. Indicated as measures for control and prevention of losses are the reduction of the gas-filled space in storage tanks, the use of tanks with floating covers, the reduction of storage temperature fluctuation, the use of high pressure containers; and improved pumping system designs.

TYPE 44/2/14
85N73937# CATEGORY 73 RPT#: DE85-900961 BARC-1189 83/00/00 12 PAGES UNCLASSIFIED DOCUMENT
UTTL: Pipeline leak location using radiotracer technique
AUTH: A/EAPEN, A. C.; B/AJMERA, R. L.; C/AGASHE, S. M.

CORP: Bhabha Atomic Research Centre, Bombay (India). CSS: (Isotope Div.)
SAP: (US Sales Only) HC A02/MF A01; DOE Depository Libraries
CIO: INDIA
MAJS: /*DEFECTS/*DETECTION/*LEAKAGE/*PIPELINES/*RADIOACTIVE ISOTOPES/*TRACE ELEMENTS
MINS: / EXAMINATION/ LOSSES/ NONDESTRUCTIVE TESTS/ RADIOACTIVE MATERIALS/ RADIOACTIVITY/ SEEPAGE

TYPE 44/2/15
83N70134 CATEGORY 37 RPT#: PAPER-12 82/00/00 5 PAGES UNCLASSIFIED DOCUMENT DCAF F002907
UTTL: Condition monitoring and repair of pipelines
AUTH: A/FEARNEHOUGH, G. D.
CORP: British Gas Corp., London (England). CSS: (Research Station.)
AVAIL.NTIS
In Welding Inst. Fitness for Purpose Validation of Welded Construct., Vol. 1 5 p (SEE N83-70105 01-37)
CIO: UNITED KINGDOM
MAJS: /*DEFECTS/*FAILURE ANALYSIS/*INSPECTION/*MAINTENANCE/*PIPELINES/*STANDARDS
MINS: / COATINGS/ CRITERIA/ FATIGUE (MATERIALS)/ MICROCRACKS/ SAFETY FACTORS/ STRESS CORROSION CRACKING/ SURVEYS

TYPE 44/2/16
83N70129 CATEGORY 37 RPT#: PAPER-20 82/00/00 8 PAGES UNCLASSIFIED DOCUMENT DCAF F002907
UTTL: Nondestructive evaluation of large diameter girth welds using electromagnetic-acoustic transducers
AUTH: A/FORTUNKO, C. M.; B/SCHRAMM, R. E.
CORP: National Bureau of Standards, Boulder, CO. AVAIL.NTIS
In Welding Inst. Fitness for Purpose Validation of Welded Construct., Vol. 1 8 p (SEE N83-70105 01-37)
CIO: UNITED STATES
MAJS: /*BUTT JOINTS/*MAGNETIC TRANSDUCERS/*NONDESTRUCTIVE TESTS/*ULTRASONIC TESTS
MINS: / CHARACTERIZATION/ DEFECTS/ NONDESTRUCTIVE TESTS/ PIPELINES/ QUALITY CONTROL/ S WAVES/ STRESS DISTRIBUTION

TYPE 44/2/17
89N26428# ISSUE 20 PAGE 2892 CATEGORY 61 RPT#: AD-A206628 SA/TR-2/89-VOL-2 CNT#: N00019-86-C-0219 89/01/20 151 PAGES UNCLASSIFIED DOCUMENT
UTTL: Computer algorithms and architectures for three-dimensional eddy-current nondestructive evaluation, volume 2, chapters 1-5 TLSP: Final Report, 2 Dec. 1986 - 20 Jan. 1989
CORP: Sabbagh Associates, Inc., Bloomington, IN.
SAP: Avail: NTIS HC A08/MF A01
CIO: UNITED STATES
MAJS: /*ALGORITHMS/*ARCHITECTURE (COMPUTERS)/*COMPUTER PROGRAMS/*COMPUTER SYSTEMS PERFORMANCE/*EDDY CURRENTS/*NONDESTRUCTIVE TESTS/*PIPELINES/*RUN TIME (COMPUTERS)
MINS: / CHIPS (ELECTRONICS)/ CONJUGATE GRADIENT METHOD/ DATA BASES/ ELECTROMAGNETIC RADIATION/ ELECTROMAGNETIC SCATTERING/ FREQUENCIES/ INTEGRAL EQUATIONS/ INVERSIONS/ MATHEMATICAL MODELS/ SEQUENCING
ABA: GRA
ABS: An electromagnetic model for three-dimensional inversion of eddy-current

data, an inversion algorithm based on the conjugate gradient technique, and a special purpose computer that we estimate can execute this algorithm in times comparable to high speed main-frames was developed. This computer has a pipe architecture and is designed around our parallel implementation of the inversion algorithm and makes use of high-speed DSP chips. The inversion process achieves a higher performance measure when more than one data set is inverted. The sequential order of the inversion scheme restricts the number of active elements in the pipeline for a single problem. When more than one inversion problem enters the pipe, then more than one element could be active to improve the overall performance of the system. The basic electromagnetic model starts with the integral equations for electromagnetic scattering, which are then discretized by means of the method of moments. This gives us the fundamental inversion model, which is then solved using the conjugate gradient algorithm. In order to accomplish the three-dimensional inversion, we acquire data at a number of frequencies; therefore, our inversion process is called a multifrequency method. The choice of frequencies, and the number of frequencies to be used, depend upon the conductivity of the host material, and the depth resolution sought. This volume contitutes chapters 1 through 5.

TYPE 44/2/18
89N26427# ISSUE 20 PAGE 2891 CATEGORY 61 RPT#: AD-A206627
SA/TR-2/89-VOL-1 CNT#: N00019-86-C-0219 89/01/20 13 PAGES
UNCLASSIFIED DOCUMENT

UTTL: Computer algorithms and architectures for three-dimensional eddy-current nondestructive evaluation. Volume 1: Executive summary TLSP: Final Report, 2 Dec. 1986 - 20 Jan. 1989

CORP: Sabbagh Associates, Inc., Bloomington, IN.

SAP: Avail: NTIS HC A03/MF A01
CIO: UNITED STATES
MAJS: /*ALGORITHMS/*ARCHITECTURE (COMPUTERS)/*COMPUTER SYSTEMS PERFORMANCE/*EDDY CURRENTS/*NONDESTRUCTIVE TESTS/*PIPELINES/*RUN TIME (COMPUTERS)
MINS: / COMPUTER PROGRAMS/ CONJUGATE GRADIENT METHOD/ DATA BASES/ ELECTROMAGNETIC RADIATION/ ELECTROMAGNETIC SCATTERING/ FREQUENCIES/ INTEGRAL EQUATIONS/ INVERSIONS/ MATHEMATICAL MODELS/ SEQUENCING
ABA: GRA

ABS: This report develops an electromagnetic model for three-dimensional inversion of eddy-current data, an inversion algorithm based on the conjugate gradient technique, and a special purpose computer that we estimate can execute this algorithm in times comparable to high speed main-frames. This computer has a pipeline architecture and is designed around our parallel implementation of the inversion algorithm and makes use of high-speed DSP chips. The inversion process achieves a higher performance measure when more than one data set is inverted. The sequential order of the inversion scheme restricts the number of active elements in the pipe for a single problem. When more than one inversion problem enters the pipe, then more than one element could be active to improve the overall performance of the system. The basic electromagnetic model starts with integral equations for electromagnetic scattering, which are then discretized by means of the method of moments. This gives us the fundamental inversion model, which is then solved using the conjugate gradient algorithm. In order to accomplish the three-dimensional inversion, we acquire data at a number of frequencies; therefore, our inversion process is called a multifrequency method. The choice of frequencies, and the number of frequencies to be used, depend upon the

conductivity of the host material, and the depth resolution sought.

TYPE 44/2/19

88N26714# ISSUE 20 PAGE 2817 CATEGORY 43 RPT#: PB88-202668
GRI-87/0346 CNT#: GRI-5087-271-1520 87/10/00 138 PAGES UNCLASSIFIED DOCUMENT

UTTL: Remote sensing and satellite applications to the needs of the gas and pipeline industry
AUTH: A/MOURAD, A. G.; B/KUZMA, T. J.
CORP: Battelle Columbus Labs., OH.
SAP: Avail: NTIS HC A07/MF A01
CIO: UNITED STATES
MAJS: /*GAS FLOW/*GAS PIPES/*LEAKAGE/*REMOTE SENSING/*SATELLITE OBSERVATION
MINS: / COMMUNICATION SATELLITES/ PIPELINES/ TRANSMISSION LINES
ABA: Author
ABS: A survey of gas industry needs was made along with a literature search involving remote sensing techniques with possible applications to gas industry needs. A questionnaire was developed covering the areas of leak detection, right of way ** monitoring, ** pipeline location, pipeline conditions, exploration, and communications. The questionnaire was used to interview personnel from the gas industry, the Gas Research Institute, and consulting firms. The results from these inteviews indicate the most active areas of concern are monitoring the right of way, detecting leaks and pipeline conditions, and upgrading communication systems. The literature search indicated that many aspects of remote sensing and satellite technology could be applicable to the gas industry's needs. An overview of remote sensing was prepared, and specific techniques were outlined that could be utilized by the gas and pipeline industry. Some qualitive analyses of the remote sensing and satellite applications to the industry's needs were performed.

TYPE 44/2/20

88N10351# ISSUE 1 PAGE 55 CATEGORY 37 RPT#: PB87-209979
GRI-86/0254 CNT#: GRI-5086-271-1226 86/09/22 186 PAGES UNCLASSIFIED DOCUMENT

UTTL: Technology survey for a robot which will investigate the condition of underground pipe TLSP: Topical Report, Jun. - Sep. 1986
AUTH: A/FIREY, B.; B/ZINSMEYER, C.; C/COOSE, J. P.
CORP: BDM Corp., Austin, TX.
SAP: Avail: NTIS HC A09/MF A01
CIO: UNITED STATES
MAJS: /*GAS PIPES/*INSPECTION/*REMOTE CONTROL/*ROBOTS/*UNDERGROUND TRANSMISSION LINES
MINS: / MINIATURIZATION/ NAVIGATION AIDS/ PIPELINES/ TECHNOLOGY ASSESSMENT/ UNDERGROUND STRUCTURES
ABA: GRA
ABS: The feasibility of a robotic device to operate within underground gas distribution pipe systems and investigate the condition of the pipe is considered. The device is defined to consist of seven subsystems: locomotion, steering and articulation, power, navigation, inspection, communication and control. Existing and emerging technologies appropriate to each of the subsystems are surveyed and candidate technologies showing promise of achieving the necessary functionality, subject to the constraints, resulting from the operating environment, are identified. The robot is found to present major challenges in robotic control,

miniaturized packaging, and autonomous navigation: it appears that these difficulties are surmountable with present day technology. Several technological areas are identified in which future developments should be monitored, since progress is expected which could improve the projected performance of the inspection device.

TYPE 44/2/21

85N18433# ISSUE 9 PAGE 1341 CATEGORY 39 RPT#: ERS-E.367 83/08/00
18 PAGES UNCLASSIFIED DOCUMENT DCAF E090874

UTTL: Recent studies of the significance of mechanical damage in pipelines
AUTH: A/HOPKINS, P.; B/JONES, D.; C/CLYNE, A.
CORP: British Gas Corp., Newcastle-upon-Tyne (England). CSS: (Engineering Research Station.) AVAIL.NTIS
SAP: HC A02/MF A01
CIO: UNITED KINGDOM Presented at 5th Amer. Gas Assoc. and European Pipeline Res. Group Res. Seminar, San Francisco, Sep. 1983
MAJS: /*CUMULATIVE DAMAGE/*FRACTURE MECHANICS/*IMPACT DAMAGE/*PIPELINES/*YIELD POINT
MINS: / CRACK INITIATION/ DAMAGE ASSESSMENT/ FAILURE ANALYSIS/ INSPECTION/ MECHANICAL PROPERTIES
ABA: Author (ESA)
ABS: It is shown that significant cracking below a gouge is associated with denting of gas pipes and all field damage must be inspected for cracking. When assessing the damage the full defect depth must be considered, i.e. gouge and cracking, otherwise assessments might be nonconservative. In certain circumstances shallow cracking may be repaired by grinding but cracking deeper than 0.7 mm requires major repair. Combined dent and gouge is a particularly severe form of mechanical damage that can cause pipeline failure at low stress levels. This type of damage is sensitive to fatigue cycling and should be treated with caution if detected in pipelines subjected to pressure fluctuations.

TYPE 44/2/22

85N18323# ISSUE 9 PAGE 1324 CATEGORY 35 RPT#: ERS-E.380 84/08/00
5 PAGES UNCLASSIFIED DOCUMENT DCAF E090874

UTTL: Low power microprocessor based measurements system for determining the integrity of coatings on buried pipelines
AUTH: A/TOOMER, R.
CORP: British Gas Corp., Newcastle-upon-Tyne (England). CSS: (Engineering Research Station.) AVAIL.NTIS
SAP: HC A02/MF A01
CIO: UNITED KINGDOM Presented at IEE Colloq. on Low Power Microprocessor Appl., London, 11 Nov. 1983
MAJS: /*MAGNETIC MEASUREMENT/*PIPELINES/*PROTECTIVE COATINGS/*REMOTE SENSING/* SURFACE DEFECTS
MINS: / MAGNETIC FLUX/ MICROPROCESSORS/ NICKEL CADMIUM BATTERIES/ SIGNAL GENERATORS
ABA: Author (ESA)
ABS: A hand held, low power consumption instrument (GASCOPLEX) for finding faults in coatings on underground pipelines was developed. It comprises a signal generator which supplies a crystal controlled, low frequency alternating current to the pipeline, and the receiver which is carried along the pipeline route. The receiver measures magnetic field strength due to the signal current in the pipe. The magnetic field values allow the magnitude of local pipe current, current gradient and pipe depth to be

obtained. The values of current gradient are automatically compared with a preset threshold and values greater than this threshold initiate an audible warning to the operator, signifying a coating defect. An integral guidance system is incorporated in the receiver to keep the operator within an acceptable band over the pipeline.

TYPE 44/2/23

84N26788# ISSUE 17 PAGE 2623 CATEGORY 26 RPT#: AD-A140633
CERL-TR-M-337 CNT#: DA PROJ. 4A1-62731-AT-41 84/04/00 48 PAGES
UNCLASSIFIED DOCUMENT

UTTL: Development of concepts for corrosion assessment and evaluation of underground pipelines TLSP: Final Report
AUTH: A/KUMAR, A.; B/MERONYK, E.; C/SEGAN, E. G.
CORP: Army Construction Engineering Research Lab., Champaign, IL. AVAIL.NTIS
SAP: HC A03/MF A01
CIO: UNITED STATES
MAJS: /*COMPUTER TECHNIQUES/*CORROSION/*MANAGEMENT METHODS/*PIPELINES/* PREDICTION ANALYSIS TECHNIQUES/*PROTECTIVE COATINGS/*UNDERGROUND STRUCTURES
MINS: / DECAY/ DETECTION/ FAILURE ANALYSIS/ INDEXES (RATIOS)/ LEAKAGE/ MAINTENANCE
ABA: GRA
ABS: Underground corrosion of pipelines is best controlled by taking advantage of the synergistic effects that are developed when protective coatings are used in conjunction with cathodic protection. When these techniques are not used during pipe installation, or the corrosion control system deteriorates with age, leaks and failures result. These failures require maintenance, which involves economic analysis of repair or replace options. This report discusses the development of several new techniques for assessing and predicting the status of underground pipe corrosion. The polarization decay principle is a nondestructive technique which can determine corrosion status without having to dig up the pipe. The Corrosion Status Index Prediction Reports show quantification and prediction of corrosion damage. Concepts for computerized and manual corrosion management systems have been developed which will enable the Facilities Engineer to determine the most cost-effective options for repairing or replacing damaged pipe.

TYPE 44/2/24

84N10557# ISSUE 1 PAGE 86 CATEGORY 35 RPT#: PB83-228361
GRI-81/0165 83/05/00 67 PAGES UNCLASSIFIED DOCUMENT

UTTL: Medium- and high-pressure sonic leak pinpointing TLSP: Annual Report, Nov. 1981 - Oct. 1982
AUTH: A/HUEBLER, J. E.; B/ZIOLKOWSKI, C. J.; C/CRAIG, J. M.; D/SAHA, N. C.
CORP: Institute of Gas Technology, Chicago, IL. AVAIL.NTIS
SAP: HC A04/MF A01
CIO: UNITED STATES Sponsored by Gas Research Inst.
MAJS: /*ACOUSTIC EMISSION/*GAS DETECTORS/*NATURAL GAS/*PIPELINES/*PIPES (TUBES)
MINS: / BANDPASS FILTERS/ COMPUTER PROGRAMS/ MICROELECTRONICS/ SIGNAL PROCESSING
ABA: GRA
ABS: A detector to pinpoint natural gas leaks in medium and high pressure distribution systems (15psi) has been developed through the prototype stage. The device can detect acoustic emissions from leaking gas in the 2-5 KHz range. The actual leak pinpointing sensor, which is moved from one position to another above the pipe until the leak site is pinpointed, and

a background noise ** monitor, ** offset from the pipe area, that is used to substract background noise from the signal developed by the leak pinpointing sensor. The prototype device is handportable, rugged, and low in cost, yet sensitive and easy to use in the field, as demonstrated with preliminary field tests.

TYPE 44/2/25

83N36214# ISSUE 24 PAGE 3937 CATEGORY 26 RPT#: PB83-159806
NIPPON-STEEL-TR-19 ISSN-0300-306X 82/00/00 178 PAGES UNCLASSIFIED DOCUMENT

UTTL: Preventive equipment maintenance and inspection: Nondestructive testing
CORP: Nippon Steel Corp., Tokyo (Japan). AVAIL.NTIS
SAP: HC A09/MF A01
CIO: JAPAN
MAJS: /*INDUSTRIAL PLANTS/*INSPECTION/*MAINTENANCE/*NONDESTRUCTIVE TESTS/* SERVICE LIFE
MINS: / ELECTRIC MOTORS/ JOINTS (JUNCTIONS)/ MACHINERY/ OFFSHORE PLATFORMS/ PIPELINES/ PIPES (TUBES)/ STRESS ANALYSIS/ WELDING
ABA: GRA
ABS: Contents: development of a predictive maintenance system at Sakai Works; development and application of machine diagnostics; prolonging the life of steel-making machinery; fatigue fracture and stress analysis for stand housings of rolling mills; maintenance of large electric motors; flame gunning repair of coke ovens; methods of analysis for towing, launching and upending of jackets; development of fatigue-resistant sockets; high-speed automatic welding system for submarine pipelines; and ultrasonic examination of T-,K- and Y-shaped tubular joints of offshore structures.

TYPE 44/2/26

83N16521# ISSUE 7 PAGE 985 CATEGORY 26 RPT#: PB82-258625
EPA-600/D-82-329 82/08/00 21 PAGES UNCLASSIFIED DOCUMENT

UTTL: Principles of corrosion and corrosion monitoring
AUTH: A/KIRMEYER, G. J.; B/LOGSDON, G. S. PAA: B/(EPA, Cincinnati, Ohio)
CORP: Economic and Engineering Services, Inc., Olympia, WA. AVAIL.NTIS
SAP: HC A02/MF A01
CIO: UNITED STATES Submitted for publication Presented at conference
MAJS: /*CORROSION/*INSPECTION/*NONDESTRUCTIVE TESTS/*PIPELINES/*POTABLE WATER/* QUALITY CONTROL
MINS: / DISSOLVED GASES/ FLOW VELOCITY/ PH/ REGULATIONS/ UTILITIES/ WATER QUALITY/ WEIGHT MEASUREMENT
ABA: GRA
ABS: Problems caused by corrosion of utility water distribution and home plumbing systems can be grouped into 3 categories: health, aesthetics and economics. For electro-chemical corrosion reaction to proceed, all components of an electrochemical cell are required - an anode, a cathode, a connection between the anode and cathode and a conducting solution. Corrosivity is affected by many factors, including pH, alkalinity, dissolved oxygen, flowrate, temperature and others. Methods for documenting corrosion range from simple visual inspections to complex scale analysis including weight loss and pitting depth measurements and corrosion probes. Laboratory and pilot tests can be used to define the extent and magnitude of corrosion.

TYPE 44/2/27

83N14252# ISSUE 5 PAGE 640 CATEGORY 26 RPT#: AD-A119019 CNT#: N62742-81-C-0006 82/08/06 2 VOLS 420 PAGES UNCLASSIFIED DOCUMENT

UTTL: A-E services to perform a cathodic protection survey of the bulk fuel terminals at N.S.C. Pearl harbor, Hawaii, volume 1 TLSP: Report, Aug. 1981 - May 1982

CORP: Pacific Corrosion Research, Inc., Huntington Beach, CA. AVAIL.NTIS

SAP: HC A18/MF A01

CIO: UNITED STATES

MAJS: /*CORROSION RESISTANCE/*FUEL TANKS/*STORAGE TANKS

MINS: / ANODIC COATINGS/ EVALUATION/ FUELS/ PIPELINES/ RECTIFIERS/ SAMPLING/ SOILS/ SURVEYS/ UNDERGROUND STORAGE

ABA: GRA

ABS: The purpose of this corrosion survey was to inspect and checkout the existing cathodic protection systems of the underground metallic fuel lines and tanks at the Bulk Fuel Terminal, Naval Supply Center, Pearl Harbor, Hawaii. The corrosion survey was conducted from August 1981 to May of 1982. The corrosion survey was conducted on the following fuel tanks and fuel lines under Contract N62742-81-C-0006. The corrosion evaluation survey was conducted on the following fuel lines under Contract N62742-81-C-0006/P00002.

TYPE 44/2/28

82N20915# ISSUE 11 PAGE 1569 CATEGORY 61 80/07/00 13 PAGES In GERMAN UNCLASSIFIED DOCUMENT DCAF E002631

UTTL: Detection of leaks in gas pipelines

AUTH: A/BILLMANN, L.

CORP: Technische Hochschule, Darmstadt (Germany, F.R.). CSS: (Inst. fuer Regelungstechnik.) AVAIL.NTIS

SAP: HC A17/MF A01

In Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 p 85-97 (SEE N82-20906 11-61)

CIO: GERMANY,FEDERAL REPUBLIC OF

MAJS: /*CORRELATION DETECTION/*DATA CORRELATION/*LEAKAGE/*PIPELINES/*POSITION (LOCATION)/*SIGNAL PROCESSING

MINS: / DATA PROCESSING/ FLUID FLOW/ MATHEMATICAL MODELS/ SIGNAL ANALYSIS

ABA: Transl. by E.A.K.

ABS: The correlation analysis method to detect and locate small leaks in pipelines was proposed. The ** leak detection ** method measures pressure and pressure flow at the beginning and at the end of the pipeline and detects and locates even the smallest leak. The correlation of pressure or flow signals is calculated to decrease the chance of breakdown effects. The procedure is applicable to pipelines with gaseous and liquid materials.

TYPE 44/2/29

80N24132# ISSUE 14 PAGE 1912 CATEGORY 71 RPT#: AD-A081791 HDL-TR-1907 79/12/00 26 PAGES UNCLASSIFIED DOCUMENT

UTTL: Analysis of ultrasonic flowmeters for leak detection in liquid hydrocarbon pipelines

AUTH: A/GEHMAN, S. E.; B/HOLMES, A. B.

CORP: Harry Diamond Labs., Adelphi, MD. AVAIL.NTIS

SAP: HC A03/MF

CIO: UNITED STATES

MAJS: /*FLOWMETERS/*FUEL FLOW/*PIPELINES/*ULTRASONIC FLAW DETECTION

MINS: / HYDROCARBONS/ LEAKAGE/ UNDERWATER STRUCTURES

ABA: GRA

ABS: A program was conducted to determine repeatability and linearity of the ultrasonic time-delay types of flowmeters, so that their applicability to leak detection on underwater pipelines could be assessed. Field tests using merchantable crude oil were conducted on two off-the-shelf, commercially available flowmeters at a refinery meter proving station. These tests showed a short-term repeatability of 0.2 percent for both meters. Long-term (7 hours) repeatability was 0.6 percent for one meter and 2.5 percent for the other. For a leak detection system in which line balance is continually computed and line packing is compensated for, slow drifts in line balance due to drifts of meter factors can be compensated for by periodically adjusting meter factors. For a meter with drift characteristics similar to those measured, a computerized simulation indicates that the probability of detecting a leak greater than 0.6 of the total flow in 10 minutes is greater than 99 percent. The probability of a false alarm for the same conditions is about once per week.

TYPE 44/2/30

76N10339# ISSUE 1 PAGE 46 CATEGORY 31 RPT#: PB-241845/7

DOT/OPS-75/04 CNT#: DOT-OS-40182 75/01/00 199 PAGES UNCLASSIFIED DOCUMENT

UTTL: Study to evaluate the tools and procedures for assessing the safety of existing gas distribution systems

AUTH: A/BARTOL, J. A.; B/NICHOLS, R. O.

CORP: AMF, Inc., Goleta, CA. CSS: (Advanced Systems Lab.) AVAIL.NTIS

SAP: HC $7.00

CIO: UNITED STATES

MAJS: /*NATURAL GAS/*PIPELINES

MINS: / COST EFFECTIVENESS/ LEAKAGE/ NONDESTRUCTIVE TESTS/ SAFETY FACTORS

ABA: GRA

ABS: The physical methods and equipment presently being used by gas distribution system companies were reviewed and evaluated, as well as statistical data on leaks and failures. A review was made of (1) nondestructive testing techniques that appear applicable to the problem, and (2) current research and development directed to distribution system evaluation. An assessment was made of relative cost effectiveness of the various techniques.

NASA Recon Citations, 2

Nondestructive Tests of Pipes or Pipelines
(Citations from the NASA Recon Database)

TYPE 99/2/1

87B10024* CATEGORY 6 MFS-29081 87/01/00 Vol. 11, No. 1, P. 48
UNCLASSIFIED DOCUMENT DOMESTIC

UTTL: Eddy-Current Detection of Cracks in Tubes

UNOC: (Nondestructive device tests narrow, sharply-bent metal tubes. Eddycurrent probe detects incipient cracks inside small metal tubes. Tube-centering device consisting of pair of opposed bars ensures tube centered on eddy-current coil. Probe moves along length of bent tube to inspect repeatably for cracks. Compatible with tubes of different cross sections, oval, flattened, square, rectangular,or irregular. Adapts for inspecting formed tubes in petrochemical, automotive, nuclear, and medical equipment.)

AUTH: A/PARENT, R.; B/KETTERING, D. PAA: A/(Rockwell International Corp.); B/(Rockwell International Corp.)

MAJS: /*CRACKS/*NONDESTRUCTIVE TESTS/*PIPES (TUBES)

TYPE 99/2/2

89A42852 ISSUE 18 PAGE 2833 CATEGORY 38 89/06/00 344 PAGES
UNCLASSIFIED DOCUMENT COPYRIGHT

UTTL: World Meeting on Acoustic Emission, Charlotte, NC, Mar. 20-23, 1989, Extended Summaries of Papers

CIO: UNITED STATES

Meeting sponsored by the Acoustic Emission Working Group. Journal of Acoustic Emission (ISSN 0730-0050), vol. 8, Jan.-June 1989, 344 p. For individual items see A89-42853 to A89-42874.

MAJS: /*ACOUSTIC EMISSION/*CONFERENCES/*NONDESTRUCTIVE TESTS

MINS: / COMPOSITE MATERIALS/ CRACK PROPAGATION/ DAMAGE ASSESSMENT/ DEFORMATION/ IMPACT TESTS/ KEVLAR (TRADEMARK)/ MONITORS/ NEURAL NETS/ PIPELINES/ PRESSURE VESSELS/ ROCK MECHANICS/ ROLLER BEARINGS/ STEEL STRUCTURES/ TRIBOLOGY/ WEAR TESTS

ABA: K.K.

ABS: The conference presents papers on intelligent systems, monitoring structures, monitoring pressure vessels, deformation studies, and developments in AE source/materials characterization. Consideration is also given to tribology, impact, and wear; machinery diagnostics; MONPAC technology; geotechnical applications; composite materials; and natural/synthetic composites. Other topics include acoustic emission detection of crack presence and crack advance during flight, time-frequency domain analysis of AE signals using simple instrumentation techniques, the linear location of AE simulated sources on steel pipelines with waveguides, and the detectability of defects in reactor pressure components by location and interpretation of AE-sources.

TYPE 99/2/3

88A53908 ISSUE 24 PAGE 3952 CATEGORY 35 88/00/00 5 PAGES In RUSSIAN UNCLASSIFIED DOCUMENT COPYRIGHT

UTTL: New instruments for automated nondestructive ultrasonic testing equipment

AUTH: A/GAVREV, V. S.; B/KOZLOV, L. V.; C/TSVEI, G. V.; D/RALDUGIN, A. N.; E/MIKHAILENKO, IU. M. PAA: E/(Vsesoiuznyi Nauchno-Issledovatel'skii Institut Nerazrushaiushchego Kontrolia, Kishinev, Moldavian SSR)

CIO: U.S.S.R.

Defektoskopiia (ISSN 0130-3082), no. 8, 1988, p. 9-13. In Russian.
MAJS: /*AUTOMATION/*NONDESTRUCTIVE TESTS/*SYSTEMS ENGINEERING/*TEST EQUIPMENT/* ULTRASONIC FLAW DETECTION
MINS: / BLOCK DIAGRAMS/ DESIGN ANALYSIS/ DIGITAL TECHNIQUES/ NUMERICAL CONTROL/ PIPES (TUBES)
ABA: V.L.
ABS: The general design, principle of operation, and performance characteristics of some newly developed instruments and apparatus for nondestructive ultrasonic testing are reviewed. In particular, attention is given to new computer-controlled multichannel fault detectors, UDZ-12 and UDZ-16. The ultrasonic fault detector UDZ-12 is an eight-channel parallel system designed primarily for the high-capacity ultrasonic inspection of pipes, rods, and other products. The UDZ-16 is a sequential-parallel system with 4x4 channels, with fully digital data processing and representation. The main components of both systems and their functions are described.

TYPE 99/2/4
87A22887 ISSUE 8 PAGE 1115 CATEGORY 38 86/09/00 10 PAGES
UNCLASSIFIED DOCUMENT COPYRIGHT
UTTL: A new approach to the detection of longitudinal cracks in metallic tubes using electromagnetic acoustic transducers (EMATS)
AUTH: A/LIU, JOHN M. PAA: A/(U.S. Navy, Naval Surface Weapons Center, Silver Spring, MD)
CIO: UNITED STATES
Nondestructive Testing Communications (ISSN 0278-0895), vol. 2, Sept. 1986, p. 131-140. Navy-supported research.
MAJS: /*ALUMINUM/*CRACK GEOMETRY/*ELECTROMAGNETIC MEASUREMENT/*METAL SHELLS/* PIPES (TUBES)/*ULTRASONIC WAVE TRANSDUCERS
MINS: / ELECTROACOUSTICS/ NONDESTRUCTIVE TESTS/ PROPAGATION MODES/ SIGNAL PROCESSING/ TRANSMITTER RECEIVERS/ WAVE PROPAGATION
ABA: Author
ABS: A brief review is given on the use of ultrasonic techniques for the detection of cracks in metallic tubes. A new approach utilizing the interference between waves scattered from a crack and the one directly transmitted is described, and some results obtained for the detection of slots machined on the tube surface are presented.

TYPE 99/2/5
83A12161 ISSUE 2 PAGE 188 CATEGORY 38 82/11/00 3 PAGES
UNCLASSIFIED DOCUMENT COPYRIGHT
UTTL: Optical flaw detector
AUTH: A/KLOPOV, V. D.; B/RAPOPORT, D. A.; C/SHCHIPTSOV, V. S.; D/POTAPOV, A. I.; E/PASTOR, L. A.
CIO: UNKNOWN
(Defektoskopiia, Mar. 1982, p. 67-70.) Soviet Journal of Nondestructive Testing, vol. 18, no. 3, Nov. 1982, p. 221-223. Translation.
MAJS: /*GLASS FIBER REINFORCED PLASTICS/*NONDESTRUCTIVE TESTS/*OPTICAL EQUIPMENT /*SIGNAL PROCESSING
MINS: / INSPECTION/ PIPES (TUBES)
ABA: C.D.
ABS: A new optical flaw detector containing new specific components and a signal processing and amplifying unit is described. The apparatus can detect flaws of area greater than one square centimeter, delaminations with gaps of more than 0.1 mm, and foreign inclusions of diameter more

than 2.0 mm. The maximum thickness of the inspected material is less than 20 mm, and the recording is on photographic material or ECP. The amplifier bandwidth is 30 (300) Hz and the scanning speed for 1.0 square centimeter minimum flaw is 60 (600) mm/sec. A manual scanning method is used; the operating regime of the display unit is analog or discrete. The functional diagram of the apparatus is shown, and each step of the flow is discussed. The results of testing the developed apparatus are shown, including a defectogram of a glass fiber-reinforced plastic tube with several types of flaws. The sensitivity of the radiating-receiving channel of the detector was satisfactory

TYPE 99/2/6

84N71700# CATEGORY 71 RPT#: DE83-002796 NUREG/CR-2880 CNT#: DE-AC06-76RL-01830 82/10/00 46 PAGES UNCLASSIFIED DOCUMENT DOMESTIC

UTTL: Acoustic emission monitoring of ASME Section 3 hydrostatic test. Watts Bar Unit 1 nuclear reactor

AUTH: A/HUTTON, P. H.; B/TAYLOR, T. T.; C/DAWSON, J. F.; D/PAPPAS, R. A.; E/KURZ, R. J.

CORP: Pacific Northwest Lab., Richland, WA. AVAIL.NTIS

SAP: (US Sales Only) HC A03/MF A01; DOE Depository Libraries

CIO: UNITED STATES

MAJS: /*ACOUSTIC EMISSION/*DEFECTS/*NONDESTRUCTIVE TESTS/*PIPES (TUBES)/* PRESSURE VESSELS

MINS: / INTERFERENCE/ NOZZLES/ NUCLEAR POWER REACTORS

TYPE 99/2/7

82N72564# CATEGORY 38 RPT#: EPRI-NP-1153-SR CNT#: EPRI PROJ. 892 79/08/00 143 PAGES UNCLASSIFIED DOCUMENT

UTTL: Improved ultrasonic inspection method for stainless steel piping

CORP: Electric Power Research Inst., Palo Alto, CA.; Coe Associates, Mountain View, CA. AVAIL.NTIS

CIO: UNITED STATES Prepared in cooperation with Coe Associates, Mountain View, Calif.

MAJS: /*PIPES (TUBES)/*STAINLESS STEELS/*ULTRASONIC FLAW DETECTION

MINS: / INSPECTION/ NONDESTRUCTIVE TESTS/ REACTOR SAFETY/ ULTRASONIC WAVE TRANSDUCERS

TYPE 99/2/8

82N71947# CATEGORY 38 RPT#: PB82-800947 NTIS/PS-79/0637 81/10/00 3 VOLS 322 PAGES UNCLASSIFIED DOCUMENT

Supersedes NTIS/PS-79/0637

UTTL: Nondestructive ultrasonic testing and inspection. Citations from the Engineering Index data base TLSP: Progress Report, Jun. 1979 - Sep. 1981

CORP: National Technical Information Service, Springfield, VA. AVAIL.NTIS

SAP: HC $30.00/MF $30.00

CIO: UNITED STATES

MAJS: /*BIBLIOGRAPHIES/*INSPECTION/*NONDESTRUCTIVE TESTS/*ULTRASONIC FLAW DETECTION/*ULTRASONIC TESTS

MINS: / COMPOSITE MATERIALS/ FRACTURES (MATERIALS)/ IMAGING TECHNIQUES/ PIPES (TUBES)/ STEEL STRUCTURES/ ULTRASONIC SPECTROSCOPY/ WELDED JOINTS

TYPE 99/2/9

89N26428# ISSUE 20 PAGE 2892 CATEGORY 61 RPT#: AD-A206628 SA/TR-2/89-VOL-2 CNT#: N00019-86-C-0219 89/01/20 151 PAGES UNCLASSIFIED DOCUMENT

UTTL: Computer algorithms and architectures for three-dimensional eddy-current nondestructive evaluation, volume 2, chapters 1-5 TLSP: Final Report, 2 Dec. 1986 - 20 Jan. 1989
CORP: Sabbagh Associates, Inc., Bloomington, IN.
SAP: Avail: NTIS HC A08/MF A01
CIO: UNITED STATES
MAJS: /*ALGORITHMS/*ARCHITECTURE (COMPUTERS)/*COMPUTER PROGRAMS/*COMPUTER SYSTEMS PERFORMANCE/*EDDY CURRENTS/*NONDESTRUCTIVE TESTS/*PIPELINES/*RUN TIME (COMPUTERS)
MINS: / CHIPS (ELECTRONICS)/ CONJUGATE GRADIENT METHOD/ DATA BASES/ ELECTROMAGNETIC RADIATION/ ELECTROMAGNETIC SCATTERING/ FREQUENCIES/ INTEGRAL EQUATIONS/ INVERSIONS/ MATHEMATICAL MODELS/ SEQUENCING
ABA: GRA
ABS: An electromagnetic model for three-dimensional inversion of eddy-current data, an inversion algorithm based on the conjugate gradient technique, and a special purpose computer that we estimate can execute this algorithm in times comparable to high speed main-frames was developed. This computer has a pipe architecture and is designed around our parallel implementation of the inversion algorithm and makes use of high-speed DSP chips. The inversion process achieves a higher performance measure when more than one data set is inverted. The sequential order of the inversion scheme restricts the number of active elements in the pipeline for a single problem. When more than one inversion problem enters the pipe, then more than one element could be active to improve the overall performance of the system. The basic electromagnetic model starts with the integral equations for electromagnetic scattering, which are then discretized by means of the method of moments. This gives us the fundamental inversion model, which is then solved using the conjugate gradient algorithm. In order to accomplish the three-dimensional inversion, we acquire data at a number of frequencies; therefore, our inversion process is called a multifrequency method. The choice of frequencies, and the number of frequencies to be used, depend upon the conductivity of the host material, and the depth resolution sought. This volume contitutes chapters 1 through 5.

TYPE 99/2/10
89N26427# ISSUE 20 PAGE 2891 CATEGORY 61 RPT#: AD-A206627
SA/TR-2/89-VOL-1 CNT#: N00019-86-C-0219 89/01/20 13 PAGES
UNCLASSIFIED DOCUMENT
UTTL: Computer algorithms and architectures for three-dimensional eddy-current nondestructive evaluation. Volume 1: Executive summary TLSP: Final Report, 2 Dec. 1986 - 20 Jan. 1989
CORP: Sabbagh Associates, Inc., Bloomington, IN.
SAP: Avail: NTIS HC A03/MF A01
CIO: UNITED STATES
MAJS: /*ALGORITHMS/*ARCHITECTURE (COMPUTERS)/*COMPUTER SYSTEMS PERFORMANCE/*EDDY CURRENTS/*NONDESTRUCTIVE TESTS/*PIPELINES/*RUN TIME (COMPUTERS)
MINS: / COMPUTER PROGRAMS/ CONJUGATE GRADIENT METHOD/ DATA BASES/ ELECTROMAGNETIC RADIATION/ ELECTROMAGNETIC SCATTERING/ FREQUENCIES/ INTEGRAL EQUATIONS/ INVERSIONS/ MATHEMATICAL MODELS/ SEQUENCING
ABA: GRA
ABS: This report develops an electromagnetic model for three-dimensional inversion of eddy-current data, an inversion algorithm based on the conjugate gradient technique, and a special purpose computer that we estimate can execute this algorithm in times comparable to high speed main-frames. This computer has a pipeline architecture and is designed

around our parallel implementation of the inversion algorithm and makes use of high-speed DSP chips. The inversion process achieves a higher performance measure when more than one data set is inverted. The sequential order of the inversion scheme restricts the number of active elements in the pipe for a single problem. When more than one inversion problem enters the pipe, then more than one element could be active to improve the overall performance of the system. The basic electromagnetic model starts with integral equations for electromagnetic scattering, which are then discretized by means of the method of moments. This gives us the fundamental inversion model, which is then solved using the conjugate gradient algorithm. In order to accomplish the three-dimensional inversion, we acquire data at a number of frequencies; therefore, our inversion process is called a multifrequency method. The choice of frequencies, and the number of frequencies to be used, depend upon the conductivity of the host material, and the depth resolution sought.

TYPE 99/2/11

88N26683# ISSUE 20 PAGE 2812 CATEGORY 38 RPT#: MPA-86-02
ISSN-0721-4529 ETN-88-92092 86/10/00 160 PAGES In GERMAN
UNCLASSIFIED DOCUMENT DCAF E002631

UTTL: Principles of a nondestructive evaluation process for damage location, damage profile, and damage extension in welded joints by radiometric measurements
AUTH: A/WUENSCH, WOLFGANG
CORP: Materialpruefungsanstalt, Stuttgart (Germany, F.R.).
SAP: Avail: NTIS HC A08/MF A01
CIO: GERMANY,FEDERAL REPUBLIC OF Sponsored by Bundesministeriums des Innern, Bonn, Fed. Republic of Germany
MAJS: /*DAMAGE ASSESSMENT/*FRACTURES (MATERIALS)/*NONDESTRUCTIVE TESTS/*NUCLEAR REACTORS/*WELD TESTS/*WELDED JOINTS
MINS: / GAMMA RAYS/ PIPES (TUBES)/ RADIOMETRIC RESOLUTION/ REACTOR SAFETY/ WELDED STRUCTURES
ABA: ESA
ABS: A procedure for damage evaluation of welded joints of pipes and nuclear reactors with wall width up to 60 to 120 mm is described. The method is based on gamma radiation attenuation by metals and application of monoenergetic gamma rays. Experimental assembly includes an Ir-gamma radiation source, test sample inserted between two collimators, and NaI-detector. This nondestructive testing method improves visual flaw detection by direct measurement on the test sample allowing the quantitative evaluation of welded joint quality independently from the image assessment.

TYPE 99/2/12

88N12107# ISSUE 3 PAGE 334 CATEGORY 38 RPT#: DE87-752511
VTT-TUTK-434 86/09/00 35 PAGES In FINNISH In FINNISH UNCLASSIFIED DOCUMENT

UTTL: Real time analysis of the results from mechanized ultrasonic testing
AUTH: A/LAHDENPERAE, KARI; B/LIPPONEN, AARNE; C/SANDLIN, STEFAN
CORP: Technical Research Centre of Finland, Espoo.
SAP: Avail: NTIS (US Sales Only) HC A03/MF A01
CIO: FINLAND
MAJS: /*AUTOMATIC CONTROL/*NONDESTRUCTIVE TESTS/*REAL TIME OPERATION/*ULTRASONIC TESTS
MINS: / COMPUTER GRAPHICS/ INTERFACES/ MICROPROCESSORS/ PIPES (TUBES)/ PLATES/

TRANSDUCERS

ABA: DOE

ABS: Mechanized ultrasonic testing equipment has been built in Finland's Technical Research Center. The equipment can be used for ultrasonic testing of plates and pipes having a diameter in excess of 200 mm. A large computer program has been written for analyzing results and reporting. A micro/PDP-11 with 512 kbyte central memory, a 10 Mbyte Winchester disk and dual 700 kbyte diskettes have been selected for the computation; the operating system is RT11. Measurements were made with a four channel - computer controlled - ultrasonic device KB 6000. The communication between the computer and the KB 6000 occurs via an interface unit DRV11J. The reporting is made with microprocessor based matrix printer Genicom 3404 working in graphic mode. As a result A-, B- and C-figures are produced from the inspected volume. From these figures two projections of the reflectors as well as the amplitude can be seen. The inspection parameters are also included. Afterwards the results can be reanalyzed from data stored on disc and for example, another reporting level can be used. In the case of four transducers, two figures are printed out. The results from the opposite transducers are printed in the same figure. The measurements are coordinated using interrupt signals produced by the independent controller of the manipulator. With the VT240 graphic monitor one can get an image of the weld to be tested including the position of the transducers, their scanning movement and of the volume to be inspected. There are also programs to be used for inspecting the base material.

TYPE 99/2/13

84N13576*# ISSUE 4 PAGE 543 CATEGORY 37 RPT#: NASA-TM-85733 NAS 1.15:85733 83/12/00 16 PAGES UNCLASSIFIED DOCUMENT

UTTL: Pressure system recertification at NASA-Langley Research Center

AUTH: A/HUDSON, C. M.; B/RAMSEY, J. W., JR.

CORP: National Aeronautics and Space Administration. Langley Research Center, Hampton, VA. AVAIL.NTIS

SAP: HC A02/MF A01

CIO: UNITED STATES

MAJS: /*CERTIFICATION/*PRESSURE VESSELS/*RESEARCH FACILITIES

MINS: / INSPECTION/ NONDESTRUCTIVE TESTS/ PIPES (TUBES)

ABA: S.C.L.

ABS: Langley Research Center pressure systems are being recertified to ensure safe operation of these systems. The procedures for recertifying these pressure systems are reviewed. Generally, the analysis and inspection requirements outlined in the appropriate national consensus codes are followed. In some instances where the requirements of these codes are not met. The systems are analyzed further, repaired, modified and/or tested to demonstrate their structural integrity.

TYPE 99/2/14

83N36214# ISSUE 24 PAGE 3937 CATEGORY 26 RPT#: PB83-159806 NIPPON-STEEL-TR-19 ISSN-0300-306X 82/00/00 178 PAGES UNCLASSIFIED DOCUMENT

UTTL: Preventive equipment maintenance and inspection: Nondestructive testing

CORP: Nippon Steel Corp., Tokyo (Japan). AVAIL.NTIS

SAP: HC A09/MF A01

CIO: JAPAN

MAJS: /*INDUSTRIAL PLANTS/*INSPECTION/*MAINTENANCE/*NONDESTRUCTIVE TESTS/*

SERVICE LIFE
MINS: / ELECTRIC MOTORS/ JOINTS (JUNCTIONS)/ MACHINERY/ OFFSHORE PLATFORMS/ PIPELINES/ PIPES (TUBES)/ STRESS ANALYSIS/ WELDING
ABA: GRA
ABS: Contents: development of a predictive maintenance system at Sakai Works; development and application of machine diagnostics; prolonging the life of steel-making machinery; fatigue fracture and stress analysis for stand housings of rolling mills; maintenance of large electric motors; flame gunning repair of coke ovens; methods of analysis for towing, launching and upending of jackets; development of fatigue-resistant sockets; high-speed automatic welding system for submarine pipelines; and ultrasonic examination of T-,K- and Y-shaped tubular joints of offshore structures.

TYPE 99/2/15
83N28475# ISSUE 17 PAGE 2764 CATEGORY 38 RPT#: DE82-903577
EPRI-NP-2332 CNT#: EPRI PROJ.1570-2 82/04/00 79 PAGES UNCLASSIFIED DOCUMENT
UTTL: Operation of EPRI nondestructive evaluation center TLSP: Annual Report, 1981
AUTH: A/NEMZEK, T. A.; B/STONE, R. M.; C/AMMIRATO, F. V.; D/BEHRAVESH, M.; E/BROWN, S. D.; F/MACDONALD, D. E.; G/PHERIGO, G. L.; H/WILSON, G. H., III
CORP: Jones (J. A.) Applied Research Co., Charlotte, NC. AVAIL.NTIS
SAP: HC A05/MF A01
CIO: UNITED STATES Sponsored by EPRI
MAJS: /*BOILERS/*BOILING WATER REACTORS/*NONDESTRUCTIVE TESTS/*PIPES (TUBES)/* STEAM TURBINES
MINS: / EDDY CURRENTS/ EDUCATION/ SIGNAL PROCESSING/ ULTRASONIC FLAW DETECTION
ABA: DOE
ABS: A dedicated facility for providing field qualified nondestructive evaluation equipment, procedures, and personnel to the utility industry is discussed. Three main elements are involved: transfer of technology to field use by qualification and refinement of equipment and techniques, training of personnel using realistic samples and mockups under simulated field condition, and encouraging greater involvement of the academic community to provide educational opportunities for NDE careers at all levels.

TYPE 99/2/16
83N16521# ISSUE 7 PAGE 985 CATEGORY 26 RPT#: PB82-258625
EPA-600/D-82-329 82/08/00 21 PAGES UNCLASSIFIED DOCUMENT
UTTL: Principles of corrosion and corrosion monitoring
AUTH: A/KIRMEYER, G. J.; B/LOGSDON, G. S. PAA: B/(EPA, Cincinnati, Ohio)
CORP: Economic and Engineering Services, Inc., Olympia, WA. AVAIL.NTIS
SAP: HC A02/MF A01
CIO: UNITED STATES Submitted for publication Presented at conference
MAJS: /*CORROSION/*INSPECTION/*NONDESTRUCTIVE TESTS/*PIPELINES/*POTABLE WATER/* QUALITY CONTROL
MINS: / DISSOLVED GASES/ FLOW VELOCITY/ PH/ REGULATIONS/ UTILITIES/ WATER QUALITY/ WEIGHT MEASUREMENT
ABA: GRA
ABS: Problems caused by corrosion of utility water distribution and home plumbing systems can be grouped into 3 categories: health, aesthetics and economics. For electro-chemical corrosion reaction to proceed, all

components of an electrochemical cell are required - an anode, a cathode, a connection between the anode and cathode and a conducting solution. Corrosivity is affected by many factors, including pH, alkalinity, dissolved oxygen, flowrate, temperature and others. Methods for documenting corrosion range from simple visual inspections to complex scale analysis including weight loss and pitting depth measurements and corrosion probes. Laboratory and pilot tests can be used to define the extent and magnitude of corrosion.

TYPE 99/2/17

82N33726# ISSUE 24 PAGE 3443 CATEGORY 38 RPT#: DE82-700448
KAERI/RR-262/80 80/00/00 216 PAGES In KOREAN; ENGLISH summary
UNCLASSIFIED DOCUMENT DOMESTIC

UTTL: Development of nondestructive testing technique. Ultrasonic testing and radiographic testing

AUTH: A/LEE, Y. P.; B/RYOO, K. K.; C/AHN, H. S.; D/CHUNG, Y. M.; E/KANG, S. C.

CORP: Korea Advanced Energy Research Inst., Seoul (South Korea). AVAIL.NTIS

SAP: (US Sales Only) HC A10/MF A01; DOE Depository Libraries

CIO: KOREA(SOUTH)

MAJS: /*BOILERS/*INSPECTION/*NEUTRON RADIOGRAPHY/*NONDESTRUCTIVE TESTS/* ULTRASONIC FLAW DETECTION

MINS: / COBALT 60/ EXPERIMENT DESIGN/ NUCLEAR POWER PLANTS/ ODD-ODD NUCLEI/ PIPES (TUBES)/ THICKNESS

ABA: DOE

ABS: The feasibility of determining defect size by ultrasonic testing with artificial reference block and maximum echo was investigated. The design and fabrication of the various necessary calibration blocks used were carried out according to existing ASME code and standard. A container for Co-60, 10 Ci was designed to apply the radioisotope for radiographic testing. Neutron radiographic testing using thermal neutron flux (1.7 x 10 to the 6th - 7th power N sq cm/sec) produced from the reactor (250 KW) was attempted and compared with X-ray radiographic testing. The thickness of boiler tubes for a paper mill was successfully measured.

TYPE 99/2/18

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UTTL: Nondestructive testing: Reliability of ultrasonic and radiographic inspection --- weld defect detection

AUTH: A/AALTIO, M.

CORP: Technical Research Centre of Finland, Espoo. CSS: (Metallilab.) AVAIL.NTIS

SAP: HC A06/MF A01

CIO: FINLAND

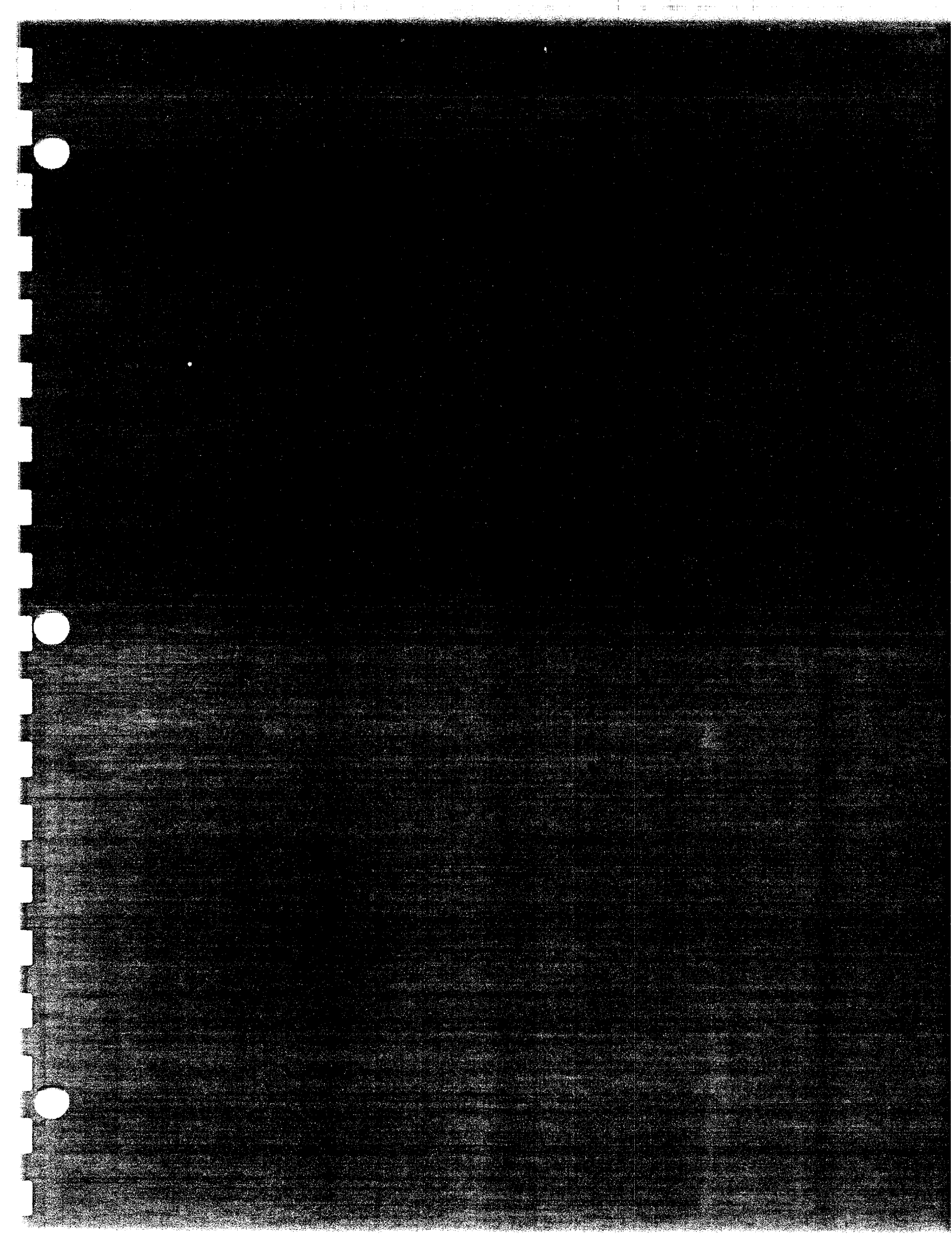
MAJS: /*INSPECTION/*NONDESTRUCTIVE TESTS/*RADIOGRAPHY/*RELIABILITY/*ULTRASONIC FLAW DETECTION/*WELD TESTS/*WELDED JOINTS

MINS: / BUTT JOINTS/ INCLUSIONS/ METAL PLATES/ PIPES (TUBES)/ SPECIMEN GEOMETRY/ X RAY ANALYSIS

ABA: Author (ESA)

ABS: Radiographic and ultrasonic nondestructive inspection methodologies for welded joints were compared. The reliability of defect detection on different test specimen geometries was evaluated. Butt joints on metal plates and pipes were examined. Conformity of internal weld defects,

classified routinely by experienced inspectors, was checked against results from visual examination of sectioned welds. Although overall effectiveness of nondestructive inspection is satisfactory, marked departure from correct fault classification by X-ray analysis is noted. This points to application factors which influence test performance.



APPENDIX B

SURVEY OF

VENDORS AND EXPERTS

B-1 VENDORS

Mr. Thomas Aude
Principal Engineer
Pipeline Systems Incorporated
460 N. Wiget Laneda
Walnut Creek, CA 94598
Phone: (415) 939-4420

Specialty areas includes SCADA systems and transient pressure analysis, pipeline simulator, and leak detection. Provides testing, math modeling, etc. Differential transpressure variables, logic, alarm lights, etc. Time factor for small leaks including subsea pipelines. Recent work in time averaging. Real time computer modeling of pipelines systems which can be used as a basis for leak detection. This methodology would be applicable to the study of rapid leak detection of subsea pipelines being done for the Minerals Management Services. Mr. Aude was very helpful. He sent a computer disk on subsea leak detection simulation which is excellent. Real time modeling will calculate steady state hydraulic gradelines, pressures, flowrates along the pipeline which in turn will show any leaks quickly.

Mr. Chuck Davis
Senior Marketing Consultant
scientific Software-Intercomp
10333 Richard Ave., Suite 1000
Houston, TX 77042
Phone: (713) 953-9272

He sent us a Computer Aided pipeline monitoring management and planning booklet of about 40 pages describing Real Time Model and Predictive Modeling, Automatic Look-Ahead Module, Application Modules. They include leak detection and location, overpressure/underpressure protection, Dynamic line inventory, Operational Control, Pig Tracking, and Instrument Analysis. One-line pipeline modeling systems and SCADA interface.

LEAK ALERT
leak Alert Service Co., Inc.
1240 N. Van Buren, Suite 204
Anaheim, CA 92807
Phone: (800) 464-4405

Spoke with them several times and received some information. Dr. Young, President for Leak Alert said their best leak detection equipment is a cable used in dry environments only, since the sensor detects liquid. It works up to five miles. It would work in a double walled pipe used in new construction. He is also the President of Universal Sensors and Devices.

Mr. C. P. Williams
President and Chief Executive Officer
Earth Observation Satellite Co.
4300 Forbes Blvd.
Lanlham, MD 20706
Phone: (301) 552-0500

Earth Observation Satellite Company operates the U.S. land remote sensing program-Landsat and markets remote sensing data in domestic and international markets.
Sent questionnaire. Received valuable information on spills and leak detection methods from their satellite. Resolution about 28.5 meters. Data set takes about eight weeks to complete.
Landsat provides information for each quarter-acre of earth. Satellite data is extremely cost-effective. Photographic image cost less than fifteen cents per square mile.

Band 6 Thermal Infrared

Landsat TM sensors collect thermal data with Band 6 (10.4 to 12.5 um). The energy sensed with Band 6 is emitted, not reflected, from the earth's surface. Because it is not dependent upon reflected sunlight, Band 6 imagery can be collected at nite. Since water is the only object whose emissivity is constant under different conditions, its temperature can be reliably estimated from its radiance.
Analysts often spot potential safety or environmental problems with Band 6 data monitoring the water temperature. The drawback is that Band 6 does not work well in cloudy waters.

Mr. Bob Fiddes
President
Hydro vision, International, Inc.
13230 Hempstead Highway, Suite 314
Houston, TX 77040
Phone: (713) 895-8716

Underwater equipment including cameras and lighting for remote controlled vehicles. Sent questionnaire for additonal information. Previously worked for Honeywell Advance Marine System operations which made ICCD cameras and ROV's. Hydro vision sent all their technical and company information for monitoring inspection showing they are a world leader in supplying closed circuit television and lighting for hazardous environments and basic surveillance. They serve the Department of Defense, offshore petroleum industires, and others. They use cost-effective equipment to produce problem-solving and remote viewing systems. Lighting consists of many types which include the AQ 1000 Annular light which incorpates four 250 watt quartz halogen bulbs and underwater mercury lights. The Super-Q has 2000 foot operating depth at 500 watts per bulb and low light cameras with sensitivity levels as low as .0005 footcandles. This equipment is being used on ROV's to inspect and monitor offshore pipelines.

B. J. Frantom
Manager, Exploration and Producing Technical Division
Mobil Offshore Engineering Department
Box 819047
Dallas, TX 75381
Phone: (214) 851-8111 Ext. 8329

We sent our questionnaire to Mobil for information and techniques on their methods of leak detection and monitoring for a safer environment. Dick Shea is the Process Engineering Group Leader.

MrBill

Dalton
President and Chief Engineer
Datasonics, Inc.
1400 Route 28A, Box 8
Cataumet, MA 02534
Phone: (503) 563-5511

Supplier of equipment and services to the offshore industry. Specializes in underwater acoustics.
We sent him our questionnaire and he gave me a phone call in which he discussed that his company does locating of pipelines and can only detect the larger leaks with the type of equipment they use.

Mr. B. E. Daniels
Principle
Pipeline Consulting Services
5726 Old Lodge
Houston, TX 77066-1514
Phone: (713) 440-3905

Provides professional engineering and management services in design, engineering, operations, or maintenance of pipelines, etc., both on and offshore. Also pressure testing and certification of integrity of pipelines and piping systems. NPDES permitting and SPCC plans; operational safety analysis and seminar.
We sent our questionnaire to Mr. Daniels but he was unable to give us the type of information that was needed.

Mr. Lyal Singleton
General Manager
Singleton Associated Engineering LTD.
Crowchild Sq., Suite 207
5403 Crowchild Trial, N.W.
Calgary, AB T3B 4Z1, Canada
Phone: (403) 286-3221

Specializes in pipeline engineering and facilities design and environmental assessment and inspection.
We sent our questionnaire out for leak detection data and references.

Dr. Wing
Syminex Limited
21, Sussex Mansions, Old Brompton Road
South Kensington, London, SW7 3LB, United Kingdom
Phone: 01-584-4716

Engineering Co. that specializes in products that include new cost effective NDT techniques for detecting cracks etc., (offshore) using Vibrodetection, pressiodection, Flexodetection and Acoustic Emission systems developed by Syminex.
A wide range of metocean sensors and data acquisition equipment including a radar wave meter...monitoring environmental conditions offshore. Real time transmission of data is available by Argos satellite from remote sites to customer headquarters.

Doug Ametek Gage
Wilmington Instrument Inc.
332 N. Fries Avenue
Wilmington, CA 90744
Phone: (213) 834-3459

Contact person was Doug. He suggested double wall piping with sensor/gas detection equipment, etc. They sent us some of their instrumentation equipment listings.
Parent Company is:
Ametek Inc. U.S. Gauge Division
900 Clymer Ave.
Sellersville, PA 18960
Phone: (215) 6531

FCI Fluid Co.
Ponton Industries
8118 Ponton Allport Ave.
Santa Fe Springs, CA 90670
Phone: (213) 945-1621

We sent our questionnaire to the Santa Fe Springs office but was unable to get the proper information.
FCI FLuid Components, Inc. (Parent Company)
1755 La Costa Meadows Drive
San Marcos, CA 92069
Phone: (800) 854-1993

B-2 EXPERTS

Mr. Lindon Onstad
Clean Seas
1180 Eugenia Place, Suite 204
Carpinteria, CA 93013
Phone: (805) 684-3838

We spoke with Mr. Onstad on the phone and he gave us some good references dealing with offshore pipeline companies; Arco offshore facilities in California which has a subsea pipeline, for instance

Mr. Mervin Fingas
Environmental Emergencies Technology Division
River Road, Environmental Technology Center
Ottawa, Ontario, Canada KIA OH3
Phone: (613) 998-9622

Oil spill conference 1989.
Environmental Emergencies Technology Division
Environment Canada
We sent our questionnaire for further information on current and future technology. Also references of other firms that are involved in this leak detection and prevention.

Mr. John Gallagher
Hudson Maritime Services, LTD
Hudson Square, 800 Cooper Street
Camden, NJ 08102
Phone: (609) 342-7500

Oil Spill Conference 1989.
Author of "MANAGEMENT ELEMENTS OF RESPONSE TO MAJOR MARITIME OIL SPILLS".
Implementing oil spill contingency plans.
Asked for references and new techniques in rapid leak detection and prevention.

Mr. Jack Gould
America Petroleum Institute
1220 L Street NW/Health and environmental
Washington, DC 20005
Phone: (202) 682-8000

Oil Spill Conference 1989.
Health and Environmental Sciences Department.
Fate and Effects II
We sent our questionnaire to Mr. Gould and asked him if he could supply us with any additional information especially #8 which are references to other companies or services which may do leak detection.

Capt. Robert Storch
Commanding Officer
U.S. Coast Guard, Marine Safety Office
196 Tradd St.
Charleston, SC 29401
Phone: (803) 724-7683

Oil Spill Conference 1989.
Commanding Officer, Marine Safety Office
Case Histories III
We received some valuable insights which are in the main body of the report.

Mr. Richard Griffiths
U.S. EPA/R&D Office of Research and Development
Raritan Depot
Edison, NJ 08837
Phone: (201) 321-6657

Oil Spill Conference 1989.
Fate and Effects IV
U.S. EPA, Office of Research and Development
We sent our questionnaire to Mr. Griffiths and asked him if he could answer #8 for further references and if he knew of any new techniques that he might be under development

Mr. John B. Andersen
Chairman and Managing Director
Norpol Environment
Torstadbakken 4, Box 120
N-1364 Hvalstad, Norway
Phone: 47-2-845760

Worldwide specialized services in prevention and fighting marine oil spills. Oil pollution contingency plans, coastal management studies, airborne coastal services, remote sensing, and scientific experiments.
He was sent our questionnaire for and technical data and rapid leak detection methods he might know of.

Mr. Mans Jacobsson
International Oil Pollution Compensation Fund.
4 Albert Embanklment
London, SE1 7SR, United Kingdom
Phone: 071-5822606

Oil Spill Conference 1989.
International Oil Pollution Compensation Fund.
We sent Mr. Jacobsson our questionnaire for additional references and any new techniques that might be known.

B-3 USERS OF TECHNIQUES & EQUIPMENT

Mr. Quintin Clark
Director of Operations
Solus Schall
Abbotswell Road, West Tullos
Aberdeen, AB2 ODP, United Kingdom
Phone: 224-8460-60

Pipeline nondestructive testing. We sent our questionnaire for more information and Mr. Randall H. Thompson, Technical Services Manager responded with about a 120 page booklet about their company's technical information including leak detection and leak prevention. They do nondestructive testing and quality control inspection using X and Gamma Radiographic pipeline crawler services.

Mr. Thompson
OCEANEERING SOLUS SCHALL USA
1441 Park Ten Blvd.
Houston, TX 77084
Phone: (713) 579-0627

They also do research and development. Ultrasonics examination by both portable and fixed equipment, forms a very large part of their service. Other services include Magnetic Particle Inspection, Eddy current, and CAIRS (Computer Aided Inspection Reporting System). Pipeline CAIRS record pipeline inspection data, where continuous monitoring of a major pipeline exists. They survey data from an ROV computer system which includes inspection items like physical damage current or past, photo, etc.
Solus Schall is a very good NDT tester but not really noted as a rapid leak detection firm. Much of their information will be a good start and could be applied to rapid leak detection methods and finding cost-effective solutions.

Mr. J. Miles
Director of Technical and Testing Divisions
SGS Inspection Services Limited
217-221 London Road
Camberly, GU15 3EY, United Kingdom
Phone: 0276-091133

Provides full range of measurement and inspection sevices for on/offshore and petroleum installations. The company has 360 inspectors, engineers, chemist, technicians for the areas of flow measurement, laboratory analysis, NTD, metallurgy, corrosion consultancy, (pipelines).
We sent our questionnaire for further information. An example of some of the answers are: (refer to the questionnaire)
A: Andrew Penny - NDT International Coordinator
2. Uses Radioactive tracers
3. Acoustic Emmission
a. Real time/full time monitoring for leaks, cracks, and wall loss.
4. Vehicle above pipe
5. Research into acoustic emission
6. Yes, it must be cost effective
7. British Gas
Research and Development Division
P.O. Box 3
Crambingtion Northumberland,
NE23 9EQ, England

Mr. R.A. Zimmerman
Partner
Applied Offshore Technology
900 Town & Country Lane, Suite 305
Houston, TX 77024
(713) 465-4800

Offshore pipelines and pipeline repairs.
The questionnaire was sent out to him for more technical information. Our phone conversation went on about his ideas as monitoring the volume, pressure at the begining and several other places (inlet & outlet for sure). Yearly ROV inspections, sonic, satellite observation, and general fly over observation to detect gas bubbles from any leaking lines were just some of the things they use.

Mr. J.C. Thorne
Managing Director
Clyde House, Reform Road
Maidenhead,
Berkshire, SL6 8BU, United Kingdom
Phone: 0628-21371

Inspection-pipeline systems using stereo camera systems. Offshore and onshore data processing, interpretation and photogrammetic measurement with full computer support. Pollution detection using an air borne infra red scanner capable of 24 hour detection of oil spills and resolution of temperature differentials of 0.2 C thermal effluent.
Full remote sensing capabilities to interpret black & white, color, false color and infra red aerial photography and landsat imagery.
We sent our questionnaire out for more information.

American Gas and Chemical Co., Leak Testing
220 Pagasas Avenue
Northvale, NJ 07647
Phone (800) 288-3647

American Gas & Chemical Co., Leak Testing Division. Called them for their information on early warning instrument. Their line of equipment shows flow meters, pressure and pressure differential meters, Etc.

Mr. F. C. lowell
President
Ferranti ORE Inc.
Box 709
Fallmouth, MA 02541
Phone: (508) 548-5800

Uses Sidescan Sonar systems; Trackpoint II tracking, pingers and satellite tracking. Accusonic acoustic flowmeters
for pipeline and open channel flow monitoring.

Mr. James H. Sommerville
Managing Director
Geotem - U.K. Office
Regent House, Gegent Quay
Aberdeen, AB1 2AR, United Kingdom
Phone: 0224-593365

Side-scan sonar and ROV's; inspection of various offshore structures, including monitoring (pipelines) related to offshore oil and gas operations. Sent questionnaire for additional technical information.

Mr. Bourne
Executive Manager, Overseas
Incon Group of Association
Incon House, Stilebrook Road, Olney
Buckinghamshire, MK46 5LL, United Kingdom
Phone: 0-234-712000

Non-destructive testing including offshore pipelines.
Includes X-ray inspection of large diameter offshore pipelines utilizing the "INCON" crawler; underwater magnetic and ultrasonic inspection.
Sent the questionnaire for more technical information.

Mr. P. Bleeker
Manager-Foreign Co. Services and Operation
KOPP GMBH International
Fredrich Ebert Strassel31, Postrach 1510
D-4450 Lingen, EMS, Germany
Phone: 0591-7102-0

Complete hydraulic testing of pipeline and pipeline system; pigs, launching and receiving traps, electronic pig locators, etc.
We sent our questionnaire for further technical information.

Mr. C. J. H. Talbot
Director
Materiaal Metingen
Kilweg 6-12, Box 1110
3330 Zwijndrecht, Holland
Phone: 078-102722

Engaged in marine, offshore and industrial utilities: non-destructive testing, ultrasonic measurement service, inspection and pollution control.
We sent him our questionnaire for further information.

Mr. Richard Roth
President and General Manager
North American Inspection Services Co.
Box 239
Beaumont, AB TOC OHO
Phone: (403) 467-4270

Non-destructive testing in the fields of radiographic inspection of pipelines. Ultrasonic inspection of welds. Magnetic particle, dye penetrant, and visual inspection.
We sent him our questionnaire for technical data and information on leak or rapid leak detection methods.