

THE MEAN FLOW IN ROUND BUBBLE PLUMES

ABSTRACT

Previous experimental studies are reviewed and those whose data are deemed reliable are identified. New experiments at larger scale are described and the results are reported. These are combined with the reliable previous studies to form a data set covering heights from 3.66 to 50 meters and gas flow rates from 0.0002 to 0.59 normal cubic meters per second. This wide ranging data is combined with an integral theory for bubble plumes to determine functional relationships between local plume properties and the entrainment coefficient and the fraction of the momentum flux that is carried in the turbulent velocity fluctuations. These relationships together with the integral theory provide a set of equations that are suitable for numerical solution for the mean flow properties of any round bubble plume. Examples of the numerical solutions are presented and a comparison of one of these with existing experimental data is given.