

WATER FLUME STUDY OF BUOYANT PLUME RISE AND DISPERSION FROM MULTIPLE STACKS

Background

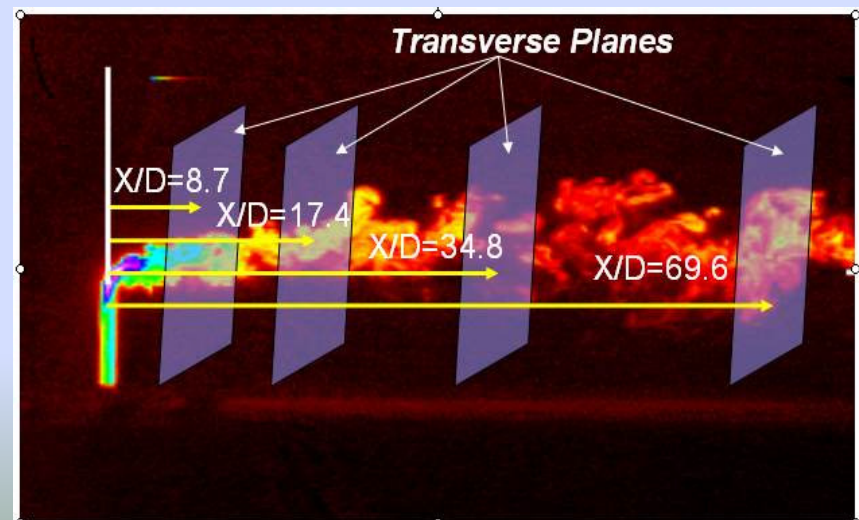
Stacks are often grouped together when it is not possible to mix the exhaust gases within the building. There are presently no sound guidelines for the optimum stack arrangements.



Ferrybridge power station, UK

Objective

Identify the relative importance of the following on the plume dilution effectiveness: stack separation distance, stack array pattern and exit velocity ratio.



Flow visualization of single stack dispersion

Research Carried Out

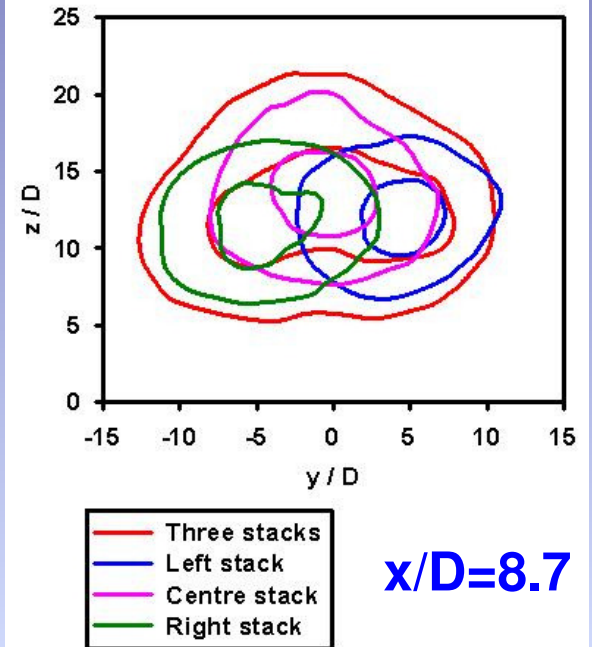
Dispersion modeling in a water flume. PLIF used for quantitative analysis of concentrations. 1, 2 and 3 stack arrangements studied, with all stacks seeded by dye and then seeded individually to assess degree of mixing.

Key Findings

In-line plumes merge more rapidly, side-by-side plumes much later. The individual plumes are still distinct far downstream, even when the overall “mixed” plume shows a Gaussian profile.

Concentration profiles across three side by side plumes for two downstream locations showing enhanced rise of the centre plume and far from complete mixing of the three sources

Concentration contours at $x / D = 8.7$ (3SBS)



Concentration contours at $x / D = 34.8$ (3SBS)

