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**Study of oscillating regimes in air-staged diffusion flames**

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The occurrence of fluctuating behaviours in air-staged diffusion flames was studied experimentally in a gas-fired furnace. Burner settings (swirl levels, air distribution) were systematically varied, leading to a broad range of flame characteristics and pollutant emissions. Pressure fluctuations reached significant amplitudes and displayed characteristic frequencies for certain operating conditions. However, heat release fluctuations (as estimated from OH\* chemiluminescence) were correlated with pressure only in a part of those cases. Therefore, thermo-acoustic coupling is thought to exist only under certain conditions, whereas other oscillating regimes are not ascribed to acoustic feedback but to changes in the location of the flame stabilization region. This conclusion was supported by the values of the Rayleigh index calculated for the different regimes. An enhanced tendency to the onset of thermo-acoustic instabilities was observed for highly staged flames.