Combustion Enhancement And Emission Reduction From Flare Stacks

Nancy Papanikolaou, University of Calgary

Flare systems commonly used in the oil and gas industry are designed to operate as diffusion type flames that involve the combustion of non-premixed fuel in atmospheric air. Unless measures are taken to ensure adequate entrainment of air into the fuel, diffusion flames can frequently bring about high soot emissions and incomplete combustion. Modifications to the initial jet geometry and flow conditions of the jet flame offer a convenient means of improving combustion characteristics since near-field mixing can play a significant role in the stability and efficiency of diffusion flames. In the proposed research, passive flow control methods will be used for such a purpose. Therefore, the main objectives of the proposed research are to

1. Quantify the effluent and flame stability of a sub-scale flaring system (for comparison);
2. Design effective flow control methods that will promote better mixing between the fuel and air, and ultimately reduce harmful emissions without reducing flame stability;
3. Implement the various designs and assess their

effectiveness on the mixing processes and emission characteristics of flares; and
4. Achieve optimum performance with a system that can be retro-fit on existing flaring systems, require no power to operate, and is simple and robust.