

Hydrogen-assisted combustion in a lean premixed natural gas swirl burner

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Hydrogen is an excellent energy carrier to stabilize combustion and lower pollutant emissions. Since it will not be abundant in the medium term, it is crucial to find the applications that profit the most from hydrogen-assisted combustion to minimize the overall environmental footprint of the system. Therefore, a semi-industrial combustion system was investigated at a constant 13.3 kW thermal power, representing gas turbines, boilers, and furnaces. The effect of hydrogen addition on the combustion process was evaluated in terms of pollutant emission (CO and NO_x) and flame characteristics. The natural gas was injected through 12 small orifices and premixed with the combustion air, while hydrogen was introduced as a piloted, non-premixed fuel inlet. The combustion characteristics were evaluated at various equivalence ratios. The hydrogen share was increased up to 60 V/V%. Due to the non-premixed piloted inlet, no flashback was observed. The goal was to identify the conditions with low pollutant emission. The flame structure was investigated by Schlieren photography with Z setup to evaluate the effect of hydrogen inlet on the flame plume.