

Quantifying Flare Combustion Efficiency through MWIR Imaging

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ABSTRACT. Flaring converts the gaseous byproducts of oil and gas extraction, principally natural gas, into carbon dioxide, but crosswinds, and use of steam and air injection to reduce visible smoke, can decrease the effectiveness of this process. This work evaluates the potential of mid-wavelength infrared (MWIR) cameras to quantify flare combustion efficiency: a broadband camera equipped with 8-cryogenically cooled filters, and an imaging Fourier Transform spectrometer (IFTS). A design-of-experiment procedure is used to select the optimal filters for the broadband camera. These devices are evaluated on a CFD-LES simulation of a combusting flare. The broadband camera had a maximum error of 82%, while the IFTS had a maximum error of 20%.