Effects of Steam-Assist on Industrial Flaring Emissions Control

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Abstract

In the oil and gas industry, flaring is a routine practice used to dispose of undesired flammable gases by burning them in a controlled manner. Depending on operating conditions, however, the flare combustion efficiency can drop, leading to the production of sooty, black smoke. According to climate scientists, this has dire environmental implications, since soot generated by gas flaring has been linked to the increased melting of Arctic sea ice. A popular method deployed in industry to improve flare combustion efficiency and curtail soot formation, called "steam-assist," is the addition of steam to the flare. Although this concept is promising, its implementation in industry is inconsistent and has led to major violations of flaring regulations.

Currently, there is a severe lack of quantitative data on the effect of steam on combustion efficiency. Too much steam, for instance, extinguishes the flame and allows waste hydrocarbon gases to escape into the atmosphere. Therefore, this research will seek to evaluate the effectiveness of steam-assist as a means of controlling flare emissions. A model steam-assisted flare will be designed and constructed based on established industry standards. A wide range of experiments will be performed using a variety of fuel gases and steam-assist configurations in order to represent the scope of industrial flaring practices. Data on combustion efficiency and soot formation will be collected, which will allow for comprehensive models to be built for predicting steam-assisted flaring emissions. This knowledge will better enable industry to develop fossil fuels while generating less pollution.