COMMENTS FROM DON WEAVER, RECEIVED MAY 26, 2011

Reference: Flare Task Force Stakeholders Group

I have just finished my first reading of the published draft of the results of the recent TCEQ study of flare operating variables. The study was obviously carefully planned and executed using advanced analytical techniques. The study reinforced and extended the EPA study of 1983. However, in my opinion, much research remains to be done before these data can be applied with confidence to presently operating flare systems in Texas refineries and chemical plants.

High on the list of variables which have not been addressed in EPA and TCEQ studies is flare feed composition. Experimental work work to date has utilized propylene and methane as flare fuel. These fuels burn very cleanly and have good fuel value. Published data from Canadian scientists at the University of Alberta have shown that the smoking tendency of flare feeds is critically dependent on the hydrocarbon feed composition. Basically, they find that the smoking tendency increases as the carbon to hydrogen ratio of the feedstock increases. For example, propylene will burn cleanly, while styrene will burn with lots of smoke.

A simple backyard experiment will demonstrate this fact. A small piece of polypropylene will burn cleanly with little smoke. A small piece of polystyrene (foamed insulation or foamed packing material) will smoke badly. The only difference in these two linear polymers is that 25% of the hydrogen atoms in the polymer chain of polypropylene have been changed to benzene groups to give polystyrene.

The Canadian work has also confirmed the EPA finding of 1983 that carbon particles from flare combustion contain carcinogenic particles. They added the information that these particles are much less than the minimum size that can be excluded from the lungs (about 2.5 microns). This finding shows the importance of keeping smoke generation low in flares (eliminating it completely is impossible). We can assume that actual flare feeds will burn less cleanly than propylene or methane. I think we can also assume that steam requirements to eliminate visible smoking will be greater and that conversion levels at the required greater steam requirement will tend to be lower. Putting it another way, with the additional information provided by the University of Alberta work, we cannot assume that actual flare feeds will burn according to the experimental data developed for the "base case" using propylene and methane feed stocks. A short experimental program focused on feed composition variables should be undertaken on a priority basis, in my opinion.

A second variable which needs better definition is the effect of crosswind on burning efficiency. The International Flare Consortium promised to investigate this variable in detail some years ago. About two years ago, they announced it a TCEQ meeting that their study of flares had been completed, four reports had been issued for internal review and publication would then follow. Until these reports issue,the effect of crosswinds remains an unanswered question, in my opinion.

The above comments reflect my present concerns relative to the continuing work on the flare project. Thank you for giving me the opportunity to express them.

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