To: Flare Task Force Stakeholder Group
From: Don Weaver
Sub: Comments on Stakeholder Group Meeting, March 30, 2009

I was pleased to attend the Flare Task Force Stakeholder Group Meeting on March 10 of this year. I feel strongly that both the EPA and TCEQ have been guilty of little progress in the area of controlling pollution from flares in the past and it was encouraging to learn that work in this general area is being planned. My fear is that if the work proceeds at the slow pace represented by past efforts, it will be too little, too late. Industry has long claimed that all the necessary experimental work has been done, that all the industrial flares in Texas operate at high efficiency, regardless of operating conditions which are, for the most part, neither measured nor reported to TCEQ. This sad state of insufficient reporting was made public in a TCEQ report of some years ago. As an example, this report stated that in about 80% of cases the steam flow rate to flares was unknown and uncontrolled. Instillation of an orifice in the steam line, sending the signal to a flow recorder-controller would solve this problem. Many such setups for handling steam flows exist in any refinery. Why has not the TCEQ insisted on this solution? Why have operating plants resisted this solution? I suspect operating plants like the freedom of no steam flow control. Why? The EPA study of 1983, reported in 1984, showed steam addition to be an effective method of controlling smoking of flares. The study also found that flare smoke contained small amounts of adsorbed carcinogens. The present solution for flare smoking is probably- see smoke, add steam until it disappears. The new problem then introduced is "over steaming" which can result in lowered combustion efficiency. As far as industry is concerned, lowered efficiency is not a problem, since they will routinely report 98+% conversion to TCEQ. Something is wrong with this picture. TCEQ must demand that steam rates be controlled and reported. Also, mass fuel flow rates and stream compositions must be known to complete the picture. It seems to me that TCEQ has made some tentative steps in addressing these big problems but not much progress appears to have been made. After all, the existence of these problems was reported by TCEQ many years ago.

The EPA study if 1983-4 left some big unanswered questions which both TCEQ and industry have consistently refused to admit as being problems or have refused to address. Two such questions come to mind: (1) The effect of crosswinds and (2) the effect of feed composition. Regarding crosswinds, EPA reported in the study that it was impossible to obtain meaningful samples of flare effluent at crosswind speeds of greater than 5 miles per hour. When confronted with a lot of data from Canadian researchers which showed that crosswinds had a significant deleterious effect on the efficiency of simple pipe flares, industry responded that these data did not apply to industrial flares with engineered burning tips. TCEQ responded by saying they would disregard the Canadian data because unsound assumptions were made in development of correlating equations. What? Does that make sense? Assisting the TCEQ representatives in reaching this questionable decision was a well known spokesman and lobbyist employed by a major refining company. Should he have been invited to these discussions? I don't think so.

I think the possible effect of crosswinds was mentioned in your presentation, but only in passing. This question must be answered with definitive experimental programs. My conviction is that crosswinds will affect any open flame- from candle to industrial flares- and it is just a matter of establishing the degree of loss in conversion efficiency. Industrial flares will probably be influenced less than pipe flares, but this question must be answered experimentally. The assertion by industry that this is an impossible task is, in my opinion, absurd.

How would I approach the problem experimentally? I would suggest using the existing experimental flare installation that TCEQ has employed before (John Zink Co.). Install a suitable variable speed blower at the burner level. Install a sampling system opposite he blower, to be held in place on the crane used to install the blower. This allows simple positioning and moving of the sampling device as required to map the plume.

Flyover data using qualitative imaging devices have already shown industrial flare plumes to be pretty ugly (rich in unburned organics). Plume compositions must be quantified. Industry will never undertake to do this, so it remains for EPA and TCEQ to do so. I suggest this can be done rather simply and inexpensively. First, select flares where the prevailing breezes carry the plumes over the fence line. Second, sample the plume from private or government property. How? Use tethered weather balloons. Attach the other end of the tether to a deep-sea fishing rig, so that the balloon can be positioned anywhere in the plume by the ground operator. The plume can then be mapped using a simple hydrocarbon concentration indicator-recorder, with readout at ground level. Problem plumes can be analyzed more completely by taking samples for subsequent analysis, again using the tethered balloon.

Regarding flare research, what has happened with the ambitious program which the International Flare Consortium embarked upon fully two years ago? Their mission, as I interpreted their proposed research plan, was to prove that flares were the best available control technology (BACT) on the planet for disposal of hydrocarbon waste. In my opinion, this is an absurd position, but it is shared by industry, EPA, and TCEQ. What rates as BACT, in my opinion? High temperature furnace incinerators, where residence time and flame temperatures can be controlled as necessary to ensure complete combustion, even in a fierce thunderstorm or hurricane. As you know, EPA studied furnace incineration intently during the 1990's. Your presentation admitted that furnace incineration could be considered as an alternative, as California seems to be doing now. However, you also indicated that it would not be considered in Texas, because of the increase in the formation of nitrogen oxides at higher incineration temperatures. I am sure that both TCEQ and EPA are aware that proven technology is available to remove these nitrogen oxides and that this technology is slowly being implemented at electrical power generation plants, for example. The real problem is that industry does not want to spend the money, and will go to great lengths to avoid the incineration alternative.

Back to the International Flare Consortium, have they made any progress on their ambitious experimental program since they took over the flare test facility in Canada? I noted from their website that they met with TCEQ last year, but the only published memo of that meeting contained no technical results. My search of their website and the open literature also revealed no publications. As I understood their earlier published program, one of their important objectives was to investigate the Canadian researchers finding that crosswinds resulted in leakage of fuel into a low pressure zone created by the crosswind, thereby bypassing the flare flame. If this fuel bypassing is also observed in industrial flares, I would say that the position that flares are BACT must be abandoned.

As mentioned earlier, the EPA flare study of 1983 defined operating envelopes for flare feeds of propane and methane only. These fuels burn readily, and have good fuel value. However, propane and methane are probably not major components of industrial flare feeds. The Canadian researchers, in their last published report, state that unsaturated compounds (lower hydrogen to carbon ratio) are more difficult to burn and have a greater tendency to produce smoke. Their work also confirmed the EPA finding that flare smoke particles contained small amounts of various carcinogenic compounds. The new information they added is that these particulates have a diameter much less than the minimum size that can be excluded from the lungs (about 2.5 microns). I think the possibility of allowing flare operation closer to the smoking limit (less steam addition) was mentioned in the meeting discussion as a possible means of improving flare burning efficiency. The Canadian findings would suggest caution in investigating this approach.

My discussion points regarding the meeting presentation have just about been exhausted. Again, I thank you for the opportunity to attend the meeting, and to express my critical comments. I apologize for not including critical bibliography references where they might be helpful, but I can furnish such references on request.

Respectfully submitted,

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