TOTAL PETROCHEMICALS

May 8, 2009 Certified Mail: 7004 2510 0000 6152 9558

Lindley Anderson
Texas Commission on Environnemental Quality (TCEQ)
Air Quality Division
Chief Engineers Office
PO Box, MC-206
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Re: Comments to the Flare Task Force Stakeholders Group
TOTAL PETROCHEMICALS USA, INC.
La Porte, Texas Polypropylene Plant
TCEQ Air Account No: HG-0036-S
Customer Reference No: CN-600582399
Regulated Entity No: RN-100212109

Dear Ms. Anderson:

The TOTAL PETROCHEMICALS USA, Inc, La Porte Polypropylene Plant (TOTAL) wishes to submit the following comments to the Flare Task Force Stakeholders Group to aid in the development of the Texas State Implementation Plan (SIP).

The TOTAL La Porte Polypropylene Plant is located in the Houston Galveston Area (HGA) and emits more than 10 tpy of Highly Reactive Volatile Organic Compounds (HRVOC). As a result, TOTAL is subject to 30 TAC §115 Subchapter H, and must participate in the HRVOC Cap and Trade Program outlined in 30 TAC §101 Subchapter H, Division 9. In addition, TOTAL owns and operates two (2) Steam Assisted Flares that control various normal operations, MSS, and emergency process vents that contain more than 100 ppmv HRVOC. As a result, pursuant to §115.725(d), TOTAL installed a continuous flare monitoring system on each flare header that continuously measures the flow rates and composition of all gasses routed to each of the two flares. As required by §115.729(a), these monitoring systems became active on January 30, 2006.

Prior to the installation of the above continuous flare monitoring system, TOTAL operated these flares in a responsible manner, meeting all applicable state and federal rules. This belief was based upon the periodic testing requirements of NSR Permits and 40 CFR §60.18, which indicated that using the approved EPA Test Methods, the flares were being operated in compliance with all applicable permits and regulations. In particular, during each of the tests, TOTAL demonstrated that the heat content of the combined flared gasses to each flare was above 300 Btu/scf (as determined by EPA Method 18), the flare tip exit velocities were below 60 ft/sec (as determined by EPA Methods 1-4), and the flares operated with no visible emissions (as determined by EPA Method 9 and 22). These tests were conducted during normal operating periods when the flare rate in each flare header was typically very low and often below the detection limits of EPA Methods 1-4. However, even though the results of the Methods 1-4 tests

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were below the detection limits of the test, the results were adequate to demonstrate that the flare tip exit velocities were well below the 60 ft/sec limit in §60.18, as well as the short term limits established in TCEQ Air Quality Permit's Maximum Allowable Emission Rate Table (MAERT).

Installation of the continuous flare monitoring systems allowed TOTAL to have access to continuous data during all conditions, including normal operations, MSS activity, and emission events. In addition, the Ultra-sonic flow meter installed to satisfy the requirements of §115.725(d)(1) was significantly more sensitive than the flow measuring techniques prescribed in 40 CFR §60.18. As a result, prior to the installation of the flare monitoring system, the only data TOTAL had available to track flare performance data was periodic flare tests, unverifiable engineering calculations, and daily visible emission observations. The additional data provided by the flare monitoring system presented a clearer picture of how the flares operated at various operating conditions. During the first several months after the monitoring systems were installed, TOTAL determined the following:

- The hourly flow of VOCs sent to the flares was often higher than expected.
- Steam to Flared Gas Ratios were conservatively set high to ensure smokeless operation under high flow conditions, resulting in high steam to gas ratios during low flow and normal operations.
- The amount of nitrogen sent to the flare header during certain operations was significantly higher than expected, affecting the heat content of the combined flared gasses and often leading to periods in which the heat content was less than 300 Btu/scf.
- Sweep Natural Gas was set based upon periodic performance tests and often resulted in unnecessarily high heat content of combined flared gasses. Because CO and NOx emissions are based upon total heat load, this was contributing to higher than expected CO and NO_x emissions.

The above revelations resulted in TOTAL to begin working on the design and implantation of several projects to ensure compliance. Several of these projects are discussed in the following sections.

Response to higher than expected hourly VOC sent to Flare Systems

Prior to the installation of the continuous flare monitoring systems, hourly MAERT limits for these flares were based upon the estimated annual flow rates of hydrocarbons sent to each flare divided by 8,760 hours per year. This simplified assumption assumed that the flow to the flare remained unchanged throughout a given year. However, as demonstrated by the new monitoring systems, the normal operations flow rates are very intermittent. In addition, the annual flow of VOC sent to each flare during normal

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operations was underestimated. Rather than requesting the MAERT Limits to be adjusted upward to reflect the levels measured by the newly installed monitoring systems, TOTAL initiated a project to install two new 39 MMBtu/hr Thermal Oxidizers (TOs) that have 99.99% destruction efficiencies (DE) that would be installed and be operated in conjunction with the two existing process flares. The North Thermal Oxidizer (EPN: ES-215) was brought on line in February 2007 and the South Thermal Oxidizer (EPN: ES-815) was brought on in November 2007.

Each of the two new TOs was installed along the existing enclosed vapor collection systems used to vent gasses to the two existing flares. Existing knock out drums in the existing collection headers were converted to seal pots and are now being used to divert the first 34 MMBtu/hr of gasses away from the flare and to the new higher DE TOs. To ensure the thermal oxidizers are not damaged during high flow conditions, each TO is equipped with an emergency control system, which consists of two automated control valves. When a sudden change in heat load is observed, the emergency control system of each TO isolates the unit to ensure it is protected. However, if the heat load increases steadily to 34 MMBtu/hr, each TO continues accepting up to 34 MMBtu/hr of the flared gasses, and the gasses above 34 MMBtu/hr are diverted to the flares. The current control system is based upon maintaining a firebox temperature in the TOs between 1,600 °F and 1,700 °F. As the temperature in the firebox approaches 1,700 °F, a control valve in each TO's feed line begins to close, forcing the pressure in the flare header to increase and forcing some of the gasses to overcome the water level in the seal pot. As stated above, this system works well for gradual increases. However, during large releases in which a sudden increase in the flare header pressure is observed, a second control valve in each of the TO's feed line isolates the thermal oxidizer from all of the flared gasses. The purpose of the second control valve is to protect the thermal oxidizer from receiving too much gas at one time, which could lead to damaging the unit. TOTAL is committed to send as much of the flow to the TOs as possible. However, attention must be placed on safety. As a result, the control system conservatively isolates the TOs from process gasses whenever conditions become unsafe.

Issues Encountered during Installation of High DE Thermal Oxidizers

Once it was discovered that more hydrocarbons were being sent to the two flare systems than previously believed, actions were taken to procure and install the two new High DE Thermal Oxidizers. Focus was placed on a technology that was robust enough to handle the dirty flare gasses and would respond well to sudden changes in flow and composition. It was soon determined that TOs could be safely used for the day-to-day vents sent to the flare. However, it was TOTAL's conclusion that TOs could not be used to completely replace a flare. In other words, the range of the composition and quantity of gasses sent to a flare system is very wide. To replace a flare with a TO would require sizing the unit to operate under very high flow emergency conditions. This would result in installing a very large TO that would typically operate at a fraction of its full firing rate. As a result, the TOs were sized to take a majority of the day-to-day vents

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sent to each flare system and each of the TO's control systems were designed to divert large flows to the flares. It is important to note that there are a few day-to-day operations that are greater than 34 MMBtu/hr and will be partially controlled by the TOs and partially controlled in the flares. Likewise, during periods when the TOs are undergoing routine MSS, all of the gasses routed to the flare headers will be directed to the flares.

As discussed above, each of the two TOs have a designed firing rate of 39 MMBtu/hr. During discussions with vendors, it was determined that the cost of installing a TO with a design firing rate greater than 40 MMBtu/hr was not significantly greater than the TO chosen (design firing rate = 39 MMBtu/hr). Likewise as noted above, the TO control systems were designed to maintain a heat load of 34 MMBtu/hr to each TO. The reason TOTAL chose a smaller unit was to avoid having to include the new TOs in the NOx Cap and Trade Program. As written, 30 TAC §117.303(a)(4)(A) specifies that incinerators (thermal oxidizers) with a maximum rated capacity less than 40 MMBtu/hr are exempt from the NOx Cap and Trade Program. As a result, purchasing a larger unit would have resulted in adding these new units to the NOx Cap and Trade Program, and would have required TOTAL to reduce NOx emissions at other existing sources on site or purchase NOx allowance to offset the new NOx emissions. Likewise, the TO control systems were designed to limit the heat load to each unit to 34 MMBtu/hr. The reason this lower rate was chosen was to ensure that at no time would the firing rate of either TO exceed 40 MMBtu/hr and jeopardize the §117.303(a)(4)(A) exemption. The purpose of installing the TOs was to reduce HRVOC emissions. When controlled in the flare, VOCs with 3 carbons or less are destroyed by 99%. On the other hand, all hydrocarbons controlled by the TOs are destroyed by 99.99%. In effect, the TOs are 100x more efficient in removing HRVOC (with less than 3 carbon atoms) than a flare. The NOx emission factor for flares is between 0.0485 - 0.0680 lb NOx/MMBtu. The vendor guaranteed NOx rate for the TOs is 0.15 lb NOx/MMBtu (confirmed by testing Oct 2008). The higher NOx rates observed in TOs is typical of all combustion technologies explored by TOTAL. In other words, controlling HRVOC in a TO will result in a reduction of DE of up to 100x when compared to a flare, but each Btu/hr fired in the TO will increase NOx emissions 2 - 3 times over the same Btu/hr controlled in a flare. TOTAL recommends that the TCEQ consider determining what the trade off between lower HRVOC emissions is in comparison to increased NOx emissions. In other words, is the ozone forming properties of NOx and HRVOC equal, or is one more highly reactive than the other? Would it be beneficial to increase NOx emissions if the trade off is considerable lower HRVOC emissions? Is it possible that this can somehow be addressed with the current cap and trade programs for NOx and HRVOC?

Another issue TOTAL has experienced by installing the TOs is demonstrating the 99.99% DE. The detection limits of the current EPA Reference Methods make this task very difficult. Measuring the flow rate of the inlet using Method 1-4 has not presented a problem, nor has measuring the composition of the inlet stream using Method 18 been difficult. However, because the TOs have such high destruction efficiencies, Method 18 cannot be used to accurately measure the composition of the outlet. When Method 18

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is used, many of the components in the outlet stream are well below the detection limits of the respective component. Using the detection limit or even one half the detection limit to calculate the DE often results in not being able to mathematically prove 99.99%. Instead, Method 18 is limited to verify that the probability of the unit's DE is approaching 99.99% (example DE > 99.78%), but cannot confirm 99.99%. TOTAL has also attempted to confirm 99.99% DE by using Method 25A on the outlet. Stork SWL has developed a variation to Method 25A that brings the detection limit of total VOC down to 100 ppbvd (0.1 ppmvd). However, even with this low detection limit, TOTAL has seen non-detectable quantities of total VOC. In short, trying to demonstrate compliance using the NSR boilerplate special condition is next to impossible. TOTAL has been working with Robert Mann and Robert Havalda (TCEQ Air Permit Division) to develop a new boilerplate condition for high DE units that control moderate flows. Options discussed are to develop a special condition that allows compliance by demonstrating either 99.99% DE or achieving a minimum stack total VOC concentration. Another option offered by TCEQ Staff was to adjust the TO MAERT to show the units gets a lower destruction efficiency (use 99% DE in calculation to establish limits) that may be verifiable. TOTAL appreciated this offer, but declined it. TOTAL has invested significant resources to install these TOs and believes it should get full credit for their increased efficiency. TOTAL believes that industry will be more willing to install costly thermal oxidizers and control systems if they can obtain credit for the higher efficiency units. TOTAL believes that resolving this issue is important in persuading other industry partners to install similar units and recommends the SIP Development Group monitor the progress between TCEQ Staff and TOTAL in resolving the issues faced with proving high DE under moderate flow conditions.

Steam to Flare Gas Ratio

Historically, continuous operation of the existing flares has focused on ensuring compliance with existing State and Federal regulations. In particular, focus has been placed on ensuring the flare flame is lit at all times and that visible emissions are minimized. Little or no attention has been placed on ensuring a minimum or maximum steam rate to either of our steam-assisted flares. Interviews with Operations indicate that steam rate has been adjusted based upon need. In other words, a judgment call is made to have enough steam to avoid smoking, but not so high that it jeopardizes the flame integrity.

The steam added to the South Flare (EPN: ES-805) is measured and recorded with a flow meter. Please note that this flow meter was not installed to comply with any environmental regulations. As a result, it has not undergone regular calibration checks. The accuracy of this data is suspect, but can be used to follow trends. Unfortunately, steam added to the Monument No. 2 Flare (EPN: ES-205) is not measured. However, in late June 2008, TOTAL began recording the position (% open) of the valve that controls this steam rate. The maximum steam rate that can pass through this valve

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when it is 100% open is 36,000 lbs/hr. If it is assumed that the flow rate is a linear function of the valve position, a rough estimate of the steam rate to ES-205 can be made. Once again, the accuracy of this estimation method is crude; however, it can be used to follow trends.

In late June 2008, an energy conservation study was initiated and it was noted that more steam than necessary was being sent to the flares. This study was approached from an economic standpoint to reduce energy consumption. Preliminary findings have focused on using existing instrumentation to automatically adjust the steam rate to each flare based upon the heat load to each flare. Because existing instrumentation is being utilized, attention has been placed to adding enough steam to avoid visible emissions at all time. As a result, the steam-to-vent gas ratio has been initially set conservatively high. As feedback from the new system is obtained, it is hoped that the steam-to-vent gas ratio can be optimized. However, literature regarding the correct steam-to-vent gas ratio is limited and this rate will likely be set based upon previous judgments of 0.5 to 5.0 lbs steam/lbs vent gas.

The installation of the flare monitoring systems required by §115.725(d) does offer an opportunity to expand existing systems to reduce steam energy cost. However, §115.725(d) only applies to facilities that emit HRVOC and are located in the HGA. There are many facilities outside of HGA that are not required to monitor the flow rate and composition of their flared gas, which places them in a position of guessing what the proper steam to gas ratio is. In addition, because the emphasis of current State and Federal rules is focused on minimizing visible emissions, facilities that have the ability to measure the flow rate and composition of flared gasses will likely remain focused on setting steam to gas ratios conservatively high. TOTAL recommends that as State and Federal rules are updated to require more facilities to install flare monitoring systems similar to those required by §115.725(d), the TCEQ and EPA should also write specific rules that specify proper steam-to-gas ratios. However, without first establishing the need to install a monitoring system to measure flow rate and composition of the flared gasses, specifying a set steam to gas ratio is meaningless.

Excess Nitrogen in Flare Header effecting Heat Content of Flared Gasses

Review of data obtained from the flare monitoring systems required by §115.725(d) reveled that there are several activities that resulted in large quantities of Nitrogen to be sent to the two flare systems. Examples include purging a large vessel with nitrogen to remove residual hydrocarbon prior to opening the vessel to the atmosphere for planned maintenance. Because Nitrogen does not contribute Btus to the heat content of the flared gasses, adding too much Nitrogen to the flare header can result in the combined heat content of the gasses routed to the flare to drop below 300 Btu/scf, which directly affects the performance of the flares.

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In many cases, it was determined that individual activities alone did not result in the flared gasses heat content to drop below 300 Btu/scf. However, when multiple activities were performed at the same time, the combined Nitrogen contribution from all of the activities was enough to drive the heat content below the §60.18 limit. As a result, work practices were studied and have been rewritten to increase communication between different sections of the plant to ensure several units are not purging Nitrogen to the flare at the same time. If it is determined that none of these activities can be delayed, Operations will adjust the natural gas sweep gas to ensure proper heat content is maintained. The increase in communication between units alone has reduced the number of low heat content periods dramatically.

In addition, the installation of the two thermal oxidizers has significantly contributed to reducing the quantity of gasses with heat contents less than 300 Btu/scf to be sent to the flares. The TOs are better suited to control low heat content gasses and are therefore not limited to gasses with excess Nitrogen. Because the first 34 MMBtu/hr of flared gasses is directed to the TOs, excess Nitrogen is typically sent to the TOs. Usually, when the heat load goes above 34 MMBtu/hr, there is adequate hydrocarbon present in the flared gasses to ensure a heating value greater than 300 Btu/scf.

Sweep Natural Gas

Prior to the installation of the flare monitoring systems required by §115.725(d), TOTAL relied upon periodic performance tests to determine the quantity of natural gas needed to be added to the flare header to maintain the heat content of the combined flare gasses above 300 Btu/scf. However, as discussed above, the composition and heat content of flared gasses is highly variable. Installation of the flare monitoring systems indicated there were periods when too much natural gas was being sent to the flare header (low Nitrogen content in flare header) and other periods when not enough natural gas was added (high Nitrogen flow to flare header).

In addition, the installation of the two new thermal oxidizers complicated the addition of natural gas to the flared gasses, because when all of the gasses were being routed to the thermal oxidizers, a minimum heat content does not need to be maintained.

In an effort to reduce the amount of natural gas sent to the flare headers, TOTAL developed a control system that utilizes the control system of the thermal oxidizers, the flare monitoring systems required by §115.725(d), and two new automated control valves installed in the natural gas feed lines. The natural gas control system monitors the operation of the thermal oxidizers and if it is determined that all of the vent gasses are being processed by the thermal oxidizers, the automated natural gas control valves will close and natural gas will not be added to the flared gasses. On the other hand, if it is determined that the heat load to the thermal oxidizers is approaching 34 MMBtu/hr, the automated natural gas control valves will begin to open allowing natural gas into the flare header. As discussed above, usually when the heat load of the flared gasses approach 34 MMBtu/hr, there is adequate amounts of hydrocarbon in the flared gasses and the heat content is typically above 300 Btu/scf. As a result, the natural gas control

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system also relies on the calculated heat content of the flared gasses measured by the flare monitoring system to determine how much the natural gas control valves need to be opened. Unfortunately, the calculated heat content of the gasses from the flare monitoring system can lag behind the actual heat content by 10 to 15 minutes. However, §115.725(d)(5) specifies that the hourly average net heat content shall be based upon one-hour blocks. As a result, even though data from the flare monitoring system lags behind the actual heat content of the flared gasses, this data has been satisfactory in adjusting the natural gas fast enough to avoid sending gasses with heat contents less than 300 Btu/scf to the flares. TOTAL has considered installing calorimeters that could supply the net heat content of the combined vent gasses at near real time and further reduce sending natural gas to the flare header unnecessarily. However, the savings recognized by using the available flare monitoring system seems adequate at this time.

If you have any questions regarding this submittal, please contact Ron Copeland at (281) 476-3762 or Don Clauson at (281) 476-3811.

Sincerely,

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cc :

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