From: Karen Olson <kolson@zephyrenv.com>
Sent: Tuesday, April 29, 2014 4:34 PM
To: LeDoux, Erica
Cc: Robinson, Jeffrey; Eric Quiat; 'Tammy Lasater'; Jose Ramos/FTOLSF
Subject: FPC TX PDH BACT limits

Erica,
On behalf of FPC TX, we are providing the following as a follow-up to our April 24th and 25th phone discussions.

1. To respond to your request for a numeric output-based BACT limit for the PDH reactors, FPC TX proposes a BACT limit of 0.395 pounds of CO2e per pound of total propylene produced for the group of PDH reactors, on a 12-month rolling average basis.
The proposed BACT output limit was calculated as follows:
lb CO2e/lb propylene = [PDH Reactor group GHG emissions (tpy CO2e)] / [tpy propylene produced]
= [236,943 (tpy CO2e)] / [600,000 total tpy propylene]
= 0.395 lb CO2e/lb total propylene produced
This limit was calculated based on the total PDH reactor GHG annual emissions provided in the FPC TX permit application calculations and the total annual propylene production expected from the PDH reactors. The total expected production rate can generally be expected to decline over the life of the plant, as equipment ages and is subject to wear and fouling. In addition, throughout the life of a catalyst, catalytic performance and corresponding product yield is expected to decline. At the same time, there would not necessarily be a corresponding reduction in the required heat input to maintain reaction temperature for that reduced production rate. Therefore although the maximum production rate expected and requested in the permit application is 725,000 short tons per year of propylene, as the plant and catalyst ages the maximum production rate actually achieved may be expected to drop as low as 600,000 tpy . Therefore, 600,000 tpy is used as the estimated maximum production rate over the life of the plant and is the basis of the output limit proposed above.

2. As you requested in our April 24th teleconference, a written discussion of FPC TX’s PDH reactors and the design aspects that support stack temperature monitoring as the ongoing compliance method to ensure thermal efficiency is provided below.
Since the PDH reaction is endothermic, the propane feed must be heated to the appropriate temperature. Please note, the required reaction temperature varies among the available PDH

process technologies. FPC TX considered the available PDH processes and chose the process license
that requires the lowest reaction temperature.
The process license for FPC TX's proposed PDH Plant also involves a reactor design in which the fuel
gas combustion section is completely integrated with the process reaction section. This PDH reactor
integrated design philosophy is similar to that used in the design of ethylene heaters/pyrolysis
furnaces. This integrated combustion and reaction design chosen by FPC TX is unique as compared
to other PDH processes. Since the purpose of the reactor is to convert propane to propylene
product, which is accomplished in a specific temperature range, control of heat input and
combustion control is critical to maintain the appropriate conversion/production and to sustain a
viable and safe process. Temperature control is also required to minimize the formation of coke and
minimize the need for related maintenance, startup and shutdown (MSS) activities and related MSS
emissions. Therefore, effective temperature and combustion control and related thermal efficiency
is inherent to the process and reactor design selected by FPC TX.
The reactor is top-fired which requires an induced draft fan near the exit of the flue gas duct to
provide negative pressure and promote the flow of flue gases through the recovery section of the
reactor. The air adjustment to the burner is controlled through the use of burner dampers as well as
an automatic damper control near the induced draft fan. Again, this combustion air control is
required to maintain temperature control required by the integrated reactor design to maintain
proper operation of the propylene production process.
This integrated design philosophy provides efficient transfer of the required heat in the
reaction/radiant section and then quickly recovers the remaining heat (in the combustion/flue
gases) for re-use in the process with minimal opportunity for heat loss to the atmosphere.
Finally, temperature control is also essential to proper operation of the selective catalytic reduction
(SCR) control device that is proposed to satisfy TCEQ NOx control requirements. The SCR is to be
installed in the reactor ductwork routing the reactor flue gas to the final exit stack.
Each of these process and design features substantiates stack temperature monitoring as a reliable,
ongoing demonstration of thermal efficiency for this PDH process.
With this response we understand, that there are no more information needed to finalize the

draft permit and SOB for headquarter review. As you previously requested, we will provide copies of the TCEQ draft permit conditions when FPC TX and TCEQ complete their discussion and the conditions are finalized for public notice.

Thanks for your help.
Karen Olson

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