Question 6: What is your experience with having a vent depropanizer off-gas unit in order to manage tower pressure, and what might be the cause of and solution to the problem?

PHILOON (Honeywell UOP)

The typical and probably most obvious driver for the need to vent from a depropanizer column is the presence of Non condensable gases. Most commonly, this is ethane and ethylene that come in with the feed. The need to vent is more common in C3/C4 alkylation units as opposed to C4units. Even though the feed GC (gas chromatography) may show zero level of C2s in the feed, the limits of the analysis method may mask the presence of a significant, or at least notable, quantity of ethane and ethylene. Another possible Non condensable that may be present is nitrogen gas. This can be from the gas used to blanket fresh asset storage drums from some types of pump seals or other sources. The nitrogen is soluble in the acid, or it could break through when loading acid into unit. C4 alkys that get too many C3s in the feed may also have pressure control issues that can be ameliorated by venting. The C3 and C4 alkys have pressure problems if too much C3 material is allowed to accumulate in the unit. Another consideration is the overhead condensers. Exceeding the duty of these exchangers will raise the receiver temperature and, therefore, the column pressure. The elevated temperature can be a result of exchanger fouling or cooling water issues or from factors such as over stripping on the HF propane stripper.

KLEISS (Valero Energy Corporation)

The causes of frequent venting, as Steve mentioned, are typically insufficient condensing of propane or just too many non-condensables in the feed. Venting of the depropanizer can get expensive, as the vented gas is typically about 50% HF. If the propane is not condensing, cooling water flow and temperature could be the problem. Operating at higher isostripper pressure may also limit the venting. Most often, frequent venting is the result of noncondensables in the feed. This condition has happened at some or our refineries. The transfer of feed streams, both olefin and isobutane, with nitrogen or fuel gas should not be done. A Best Practice is to transfer isobutane and olefin by pump. Moving isobutane with fuel gas was an issue at one of our refineries. Routine GC analysis on the purchased isobutane to ensure light components, like ethane, are not too high is also a Best Practice. Typical units can generally tolerate a maximum of about 0.5% of C2 relative to the amount of propane in the feed. For example, if there is 10% propane in the feed, only 0.05% C2 can be tolerated. Adjusting the vapor flow in the HF stripper to maintain 30to 33% of the column feed will allow around 1% C2sto go out the bottom of the HF stripper. Over stripping will cause C2sto accumulate in the overhead. However, if the light material is methane, CO2, or nitrogen, it will need to be vented.

RON GATAN (Honeywell UOP)

Just a small comment about noncondensables. Moving up to the cat, even something as simple as tweaking the vapor-to-liquid ratio on the feed of the stripper in the gas condenser so that it is increased, as well as increasing the feed temperature, can result in dramatic improvement without getting rid of noncondensable to the alky, which I have seen.

RON GATAN (Honeywell UOP)

The typical and probably most obvious driver for the need to vent from the depropanizer column is the presence of a noncondensable. Most commonly, this noncondensable is ethane and ethylene that come in with the feed. This contamination is more a concern with C3/C4 alkylation units as opposed to C4units.Even though the feed GC may showa “0” ppm level of C2s in the feed, the limits of the analysis method may mask the presence of a significant quantity of ethane and ethylene.

Another possible noncondensable that may be present is nitrogen gas(N2). This can be from gas used to blanket fresh acid storage drums, from some types of pump seals, or from other sources. N2is soluble in the acid, or it can “breakthrough” from the storage tank when loading acid into the unit.C4 alkys that get too many C3s in the feed may also have pressure control issues which may be ameliorated by venting. Even C3/C4 alkys may have pressure problems if too much C3material is allowed to accumulate in the unit. Another consideration is the overhead condensers. If we exceed the cooling duty of these exchangers, the receiver temperature and the column pressure will increase. This problem can be as a result of exchanger fouling or cooling water issues or from factors such as over stripping on the HF/propane stripper.

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