Question 63: Crude and vacuum tower off gas production from bitumen crudes can be quite variable depending on feedstock quality. Please comment on observed off gas production when processing bitumen crudes.

LEE (BP North America)

Our response to this particular question is based on the presumption that bitumen crudes include the conventional Canadian heavy supply of crudes such as Lloydminster and Cold Lake. There has not been much Canadian tar sands bitumen actually processed within BP, either as a synbit (bitumen diluted with synthetic crude) or a dilbit (bitumen diluted with condensate) as of yet. Some of this new bitumen supply includes supplies such as Christina Lake, Sunrise, and Firebag bitumen. The vacuum resid cut has a very high asphaltenes content, and we expect to see a significant cracked gas production rate. The cracked gas production will vary largely with the vacuum furnace thermal severity, mainly film temperature, residence time, and feed quality. We do not see any particular notable cracked gas production from many of our crude furnace operations.

There are other factors, besides those cited, that can also contribute to gas production. If the bottom surge volume in the vacuum tower has a long residence time, say above three minutes, and it is also unquenched, then gas can be generated by cracking in this zone. We typically like to quench this zone to less than 680°F or so. Another mitigating parameter for gas cracking is the use of coil steam to increase furnace tube velocity and minimize residence time and film temperature. Most of our high severity vacuum furnaces utilize coil steam.

We generally correlate the furnace feed quality to API gravity, but the feedstock factors need to be applied based on experience with the supply source. Generally, heavier, more asphaltenic crudes will produce more off gas at a given furnace temperature. Feedstock factors are important as we know that there are more reactive and less reactive asphaltenes content present. There are also not a lot of correlated or quantified experiences with gas production rates. We have found that our conventional Canadian heavy oil supply, for example, produces roughly one and a half times the gas make predicted by a base cracked gas correlation we use. We expect the synbit or dilbit supply to produce even higher cracked gas production rates. We also recognize that once a feedstock produces a significantly higher off gas production rate than this, it will likely become uneconomical to run higher severity furnace operation – that is, higher cutpoint operation – due to the costs associated with attendant coking, fouling, and other cycle life maintenance expenses.

Tags

Crudes

Fouling

Operations

Vacuum Tower

Year

2012