## Question 39: What operating conditions increase the generation of coke fines? What reliability issues do you associate with increased fines production?

**BILL CATES** (Hunt Refining)

Coke fine generation is really a function of the coke cutting process. Feed stock and coke drum operations during the actual drum fill cycle have very little to nothing to do with the generation of coke fines.

Coke fines are formed during the drilling of the pilot hole and during the cutting cycle due to the grinding nature of these two tasks. In each case, the longer it takes to cut the pilot hole and then to cut the coke will lead to additional production of coke fines.

The main issue with the coke fines is the particle size. The smaller the fine, the longer it will take for the fine to settle. This leads to increased fines in the clean water tank which will settle and over time form a substantial layer of solids in the bottom of the tank. Using a snorkel style of pump to try to remove these fines is the normal means of solid removal. The issue is that the snorkel needs to me moved periodically which can stir up the small particles. When this happens, the cutting water now will contain particles which over time will erode the internals of the jet pump or the cutting head nozzles.

In our experience, we have had to bring in outside equipment to help to remove the solids out of the bottom of the clear water tank. This is done at a large expense as equipment like a filter press is used to get the small particles out of the tank. Once removed from the tank, the filter cake is analyzed for “purity” meaning that if the filter cake does not contain rocks or trash then the cake is put back on the coke pad to be sold along with the coke. If the filter cake contains too much foreign material, it will be disposed of in an approved landfill facility.

**MICHAEL KIMBRELL** (Becht Engineering)

Soft coke produces coke fines. One method of making soft coke is by operating at low drum temperatures. Another method is to add FCC slurry oil to the feed and not increase the heater outlet temperatures. Some paraffinic feeds require more energy per bbl of feed to convert completely to coke and they will make sandy coke or a soft coke that will cause the quantity of fines to increase. Not filling the coke drums to the minimum outage will result in a higher percentage of coke fines. This is due to the top portion of the coke pile being softer than the rest of the coke pile. At high outages, that soft portion is a higher percentage of the total coke produced.

The technique used to cut coke out of the coke drum and the condition of the cutting equipment is another way to impact the generation of coke fines. If the cutting equipment is worn and the cutting nozzles do not generate a sharp stream of water to the coke bed, the momentum is spread out over more of the coke surface which removes small pieces of coke rather than cutting out larger chunks. The drill stem speed of rotation and the rate of vertical travel are other variables that can impact the total

quantity of fines generated.

**EZEQUIEL VINCENT** (KBC)

Generally, coke fines tend to be generated in a low temperature, high pressure operation, and from crude mixtures where one crude has high asphaltenes while the other crude has very low asphaltenes content (e.g., WTI and WCS).

Coke fines pose concerns with environmental pollution due to high dust generation; they also affect the cutting water equipment reliability.

Coker fines are produced during the process of cutting the coke out of the Coker drum and are recirculated through the jet nozzles via the cutting water (which is recycled). The fines can also be created when the high-pressure water “smashes” the coke, rather than cutting it, liberating fines large enough to cause issues, but small enough to pass through the fines filtration system in the cutting water. The smashing of coke is a result of eroded drill bit nozzles due to coke fines in the cutting water.

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