Chevron El Segundo’s Power Outage Recovery & Tarry Drum Mitigation

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Overview

Discussion Topics
- Power Dip Overview
- Coker Impact
- Tarry Drum Mitigation

Key Messages
- Chevron El Segundo Refinery’s experienced a lightning strike that resulted in a power dip and subsequent SRU power outage.
- In response to the lightning strike, Coker Operations was able to effectively mitigate three potentially tarry drums without a safety or environmental event.

Desired Outcomes
Share Chevron’s effective response to the loss of several key pieces of equipment and three potentially tarry drums following our Best Practices.
Lightning Strike

• On January 31\textsuperscript{st}, a lightning strike fell on a power pole within the Chevron El Segundo Refinery’s Sulfur Acid Division.
  – The strike resulted in a power dip at several substations throughout the refinery with a complete power outage at the sulfur units.
  – In addition to the temporary loss of power to several units within the refinery, all units were required to begin cutting back feed immediately to address the SRU power outage, including the Coker.
Lightning Strike
Coker Posture Prior to Lightning

Feeding 11.5 hrs  Preheating

Feeding 7.5 hrs  Cutting

Feeding 3.5 hrs  Cooling
## Coker Impacts

### Power Dip
- Loss of all electric pumps
  - Feed
  - Overhead accumulator HC/H2O
  - HCGO pumparound
  - Jet/Diesel draws
- Loss of furnace induced draft fan
  - Furnace trip to natural draft → elevated CO and reduced transfer temperatures

### Power Outage
- A + B modules circulating oil
- C module superheated steam stripping (oil removed)
- Low steam header pressure
  - 150# → 30#
  - 850# → 340#
Recovery Priorities

- **Furnace charge pumps**: Avoid loss of flow case
- **Fractionator overhead system**: Keep overhead compressor online to avoid flaring
- **Furnace CO’s**: Minimize fuel gas to reduce risk of explosive environment
- **HGO P/A system**: Avoid loss of flow and plugging
- **Distillation product pumps**: Manage column levels
Table 1A: Decision Flow Chart for Tarry Drum Prevention
Furnace outlets dropped below 850°F

< 5 hours in cycle
Pull feed from the furnace, open pass velocity steam and start superheated steam procedure for at least 8 hours. See Section 1.3 for Superheated Steam procedure.

5-9 hours in the cycle
Furnace outlet can be corrected in 30 minutes
Yes
Decrease feed rate to minimum. When furnace outlet is back to normal, Restore feed rate.
No
Pull feed from the furnace, open pass velocity steam and start superheated steam procedure for at least 8 hours. See Section 1.3 for Superheated Steam procedure.

> 9 hours in the cycle
The adjacent drum preheat is started (Expect ~300°F drum skin temperature) and the furnace outlet temperature can be corrected within 45 minutes.
Yes
 Decrease the feed rate to minimum, Switch the feed to adjacent drum, Watch for foaming when temperature is restored. Increase steam strip time to 1.5 hours. Quench per normal procedure.
No
Bypass the module (maintain furnace flow at min. feed), start steam preheat the adjacent drum.

Notes:
1. If tarry drum situation is suspected for multiple drums, the superheated steam procedure should be started with the drum feeding the least amount of time.
2. Never reintroduce feed to a drum that has been bypassed. This will result in a foaming drum.
3. Do not allow more than 30 minutes of below coking temperature resid in the coke drum.
4. Monitor coke drum inlet temperature, it should only be 10-15°F below furnace outlet temperature, slightly greater delta T can be seen if inlet TI has coke build up.

Expect ~300°F drum skin temperature and the furnace outlet temperature can be corrected within 45 minutes.
Handling Tarry Drums

Feeding Time → 11.5 hours
Time Below 850F → 10 minutes

Recommended Path Forward → If feed available, switch feed to adjacent drum and increase steam strip to 1.5 hours

Actual Path Forward → Steam strip for 4 hours
Handling Tarry Drums

Feeding Time → 7.5 hours
Time Below 850F → 21 minutes

Recommended Path Forward → If feed available, return to normal transfer temperature and continue feeding

Actual Path Forward → Steam strip for 9 hours
Handling Tarry Drums

Feeding Time → **3.5 hours**  
Time Below 850°F → **42 minutes**

Recommended Path Forward → **Superheated steam strip for minimum 8 hours**

Actual Path Forward → **Superheated steam strip for 10 hours**
Superheated Steam Strip

- Steam is superheated to a tube metallurgical limit across all 4 passes while the switch valve is open to E drum for a total of 10 hours
  - Comparable to our online spalling method

- Once feed was reintroduced to F-501C several days later, start of run furnace skin temperatures matched those of a spall or de coke.
Outcomes

Successes

• All pumps and fans safely returned to service

• No hot spots or blowbacks during drum cuts

• No step changes in furnace skin temperatures or fouling rates following incident

• No foamovers resulting in vapor line dP

Challenges

• HGO pumparound and rundown coke fines
  o Reboiler plugging
  o HGO stripper level controller plugging

• Furnace pass flow plugging

• Debutanizer loss of heat input resulting in LPG odors in off-test tankage
Outcomes

Significant coke found in HCGO stripper level control valve

Reboiler believed to be fouled with swinging discharge pressure at HX outlet - partially bypassed
Outcomes

HGO Stripper Level Controller
Outcomes

With no flow to E-515, no separation occurred between LPG and naphtha in the debutanizer.

Debutanizer Reboiler
2/1/19 12:30A
One Module
- No jet, diesel or LCGO make
- Pulling off-spec naphtha and HCGO
- Waiting on crude units for more resid
- Waiting on refinery for more steam and hydrogen

2/2/19 7:00P
Two Modules
- Pulling on-spec naphtha and jet to downstream units
- Downstream delays at diesel and gas oil hydrotreaters
- Holding on two modules until crude unit fully on-spec

2/9/19 7:00P
Three Modules
- Both crude units online and on-spec
- Pulling all sidecuts on-spec with exception of diesel (hydrotreater unavailable)