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# ExxonMobil Baton Rouge Refinery Coke Bed Combustion Incident

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APRIL 29 - MAY 3 2019

# Agenda

Introduction

Event Summary

Coke Drum Repair Strategy

Investigation Conclusions

Investigation Recommendations

# Baton Rouge Coker Complex

- Baton Rouge – three Cokers, 10 drums
- Far East Coker – four drum coker, 1979 start-up
  - Bottom deheading – force actuated closure
  - Top deheading – manual unbolting with hydraulic swing back
  - Coke cut into pit, transferred to railcars, transported to barge loading

# Event Summary

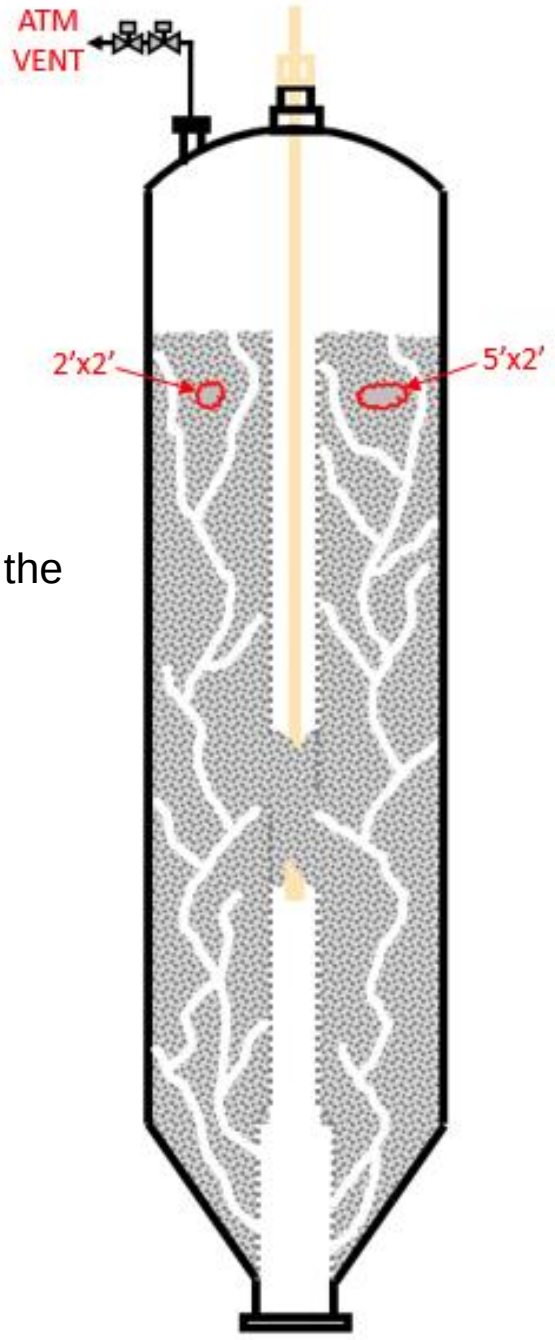
*Stuck drillstem → Temperature increase → Drum failure*

**Timeline**

- Circulated out of coke drum
- Quench, vent, and dehead drum without issue
- Pilot hole complete, drill stem becomes stuck while raising
- Coke drum temperature increases
- Drum integrity compromised, sparks observed falling from the drum – Emergency Response includes:
  - Top water
  - Rehead bottom and add quench water
  - Steam purge into top head space
- Drum decoke complete

**Outcome**

- No personnel injured or exposed
- Two through-wall holes formed near outage level
- Damage localized to drum
- Extended downtime to repair

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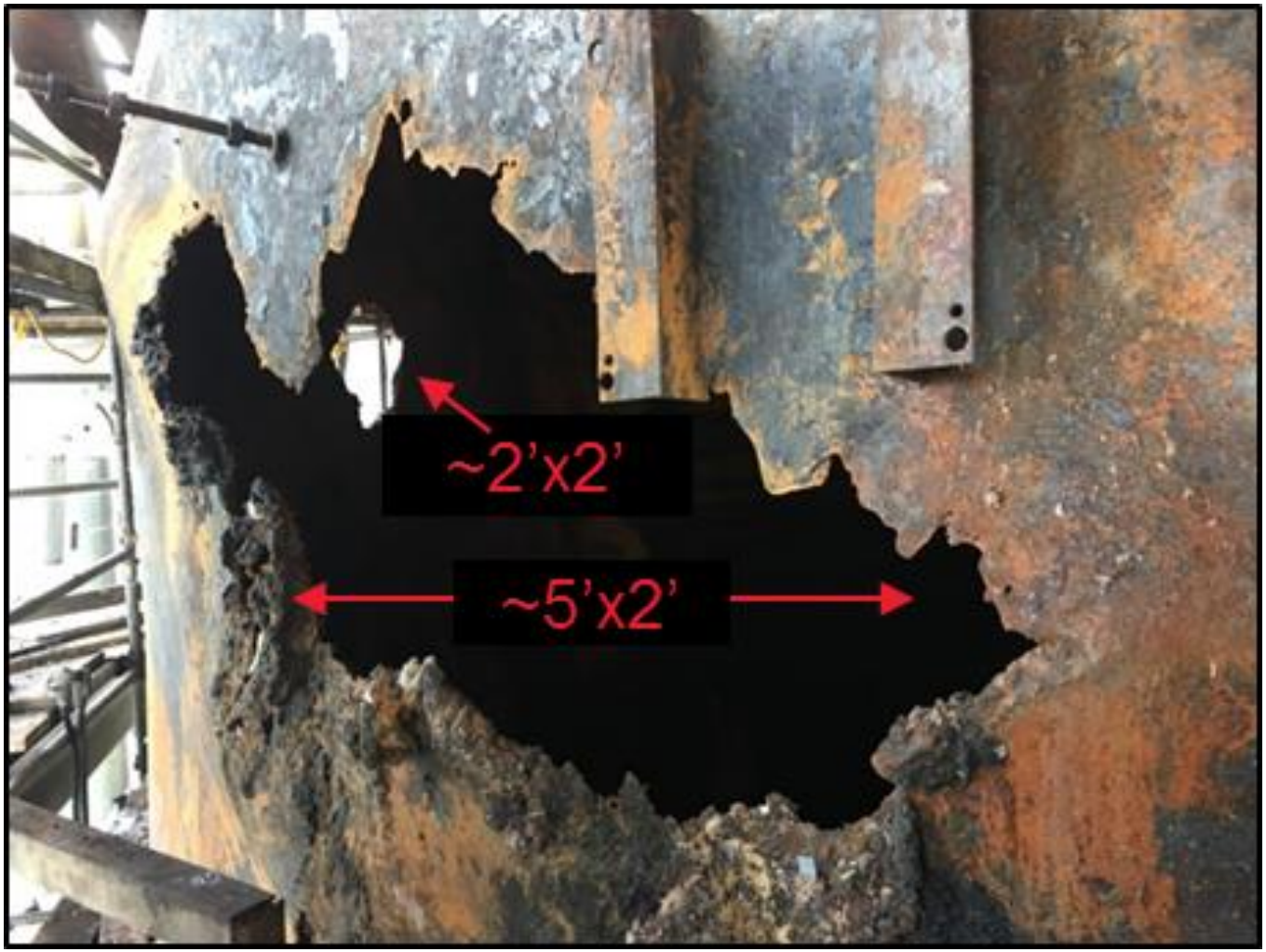
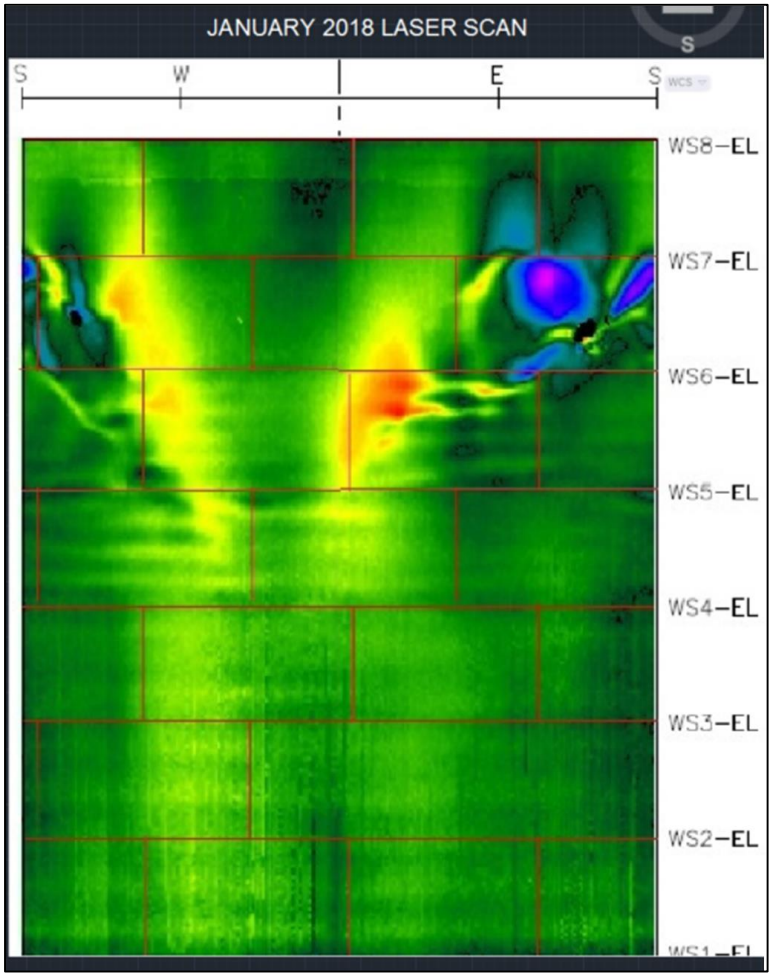
# Factors Contributing to Combustion

- Ignition source
  - Average layer AIT of petcoke dust <700F
  - Potential region of hot material in drum after quench
- Stack effect
  - Pilot hole provides ~4’ diameter air ingress point, bottom head open
  - Multiple air egress points: open vent, drillstem guide plate
  - Bed cave in could resist flow, but is not airtight
  - Air density differential: ambient temperature near freezing, vapor space in head >150F
- Event drum operating conditions
  - Circulated furnace at end of cycle, material fed to drum at lower operating temperature
  - Ignition sensitivity increases with VCM
  - End of cycle material likely to deposit near top of drum

# Drum Damage



# Drum Damage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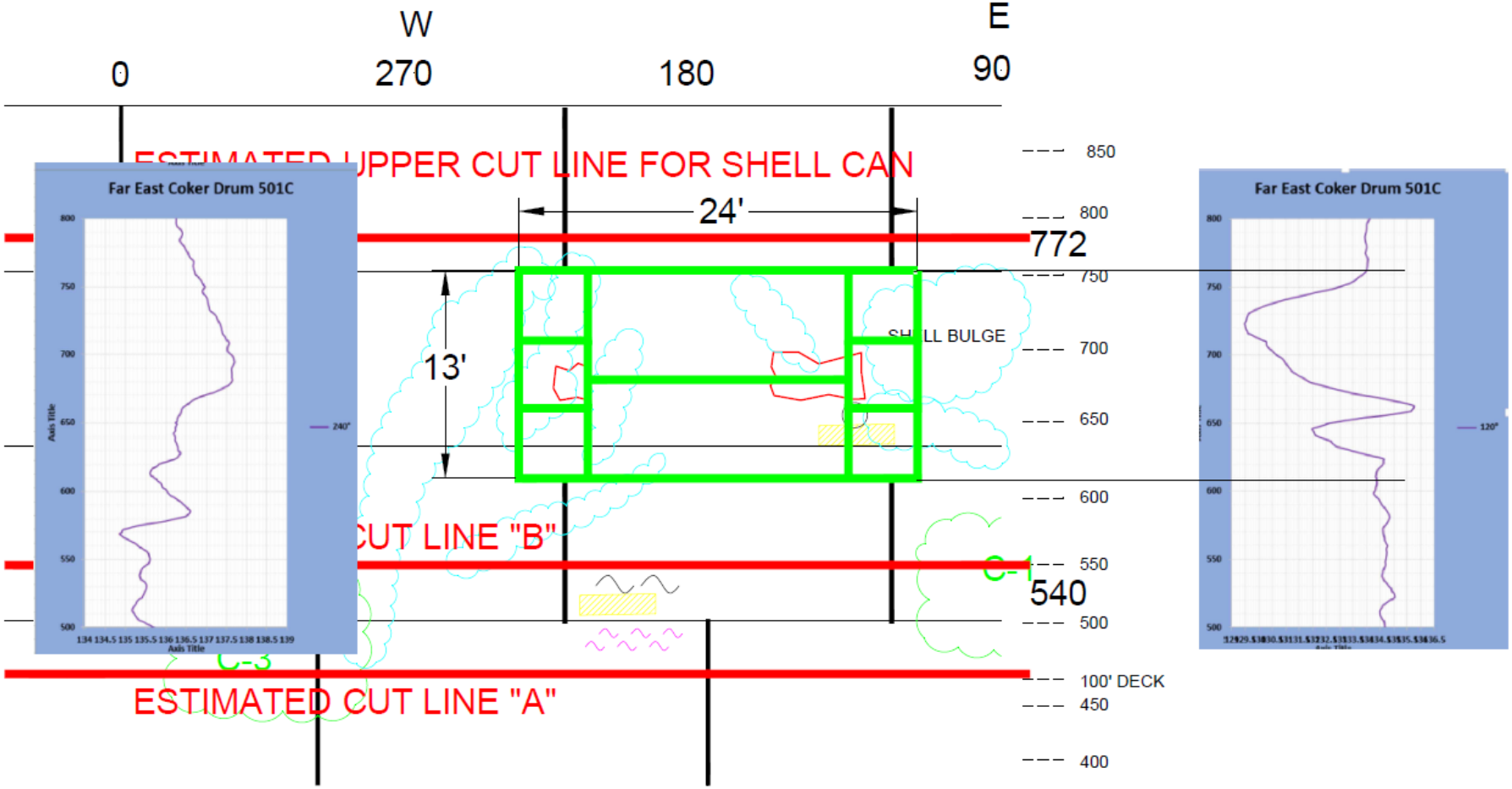
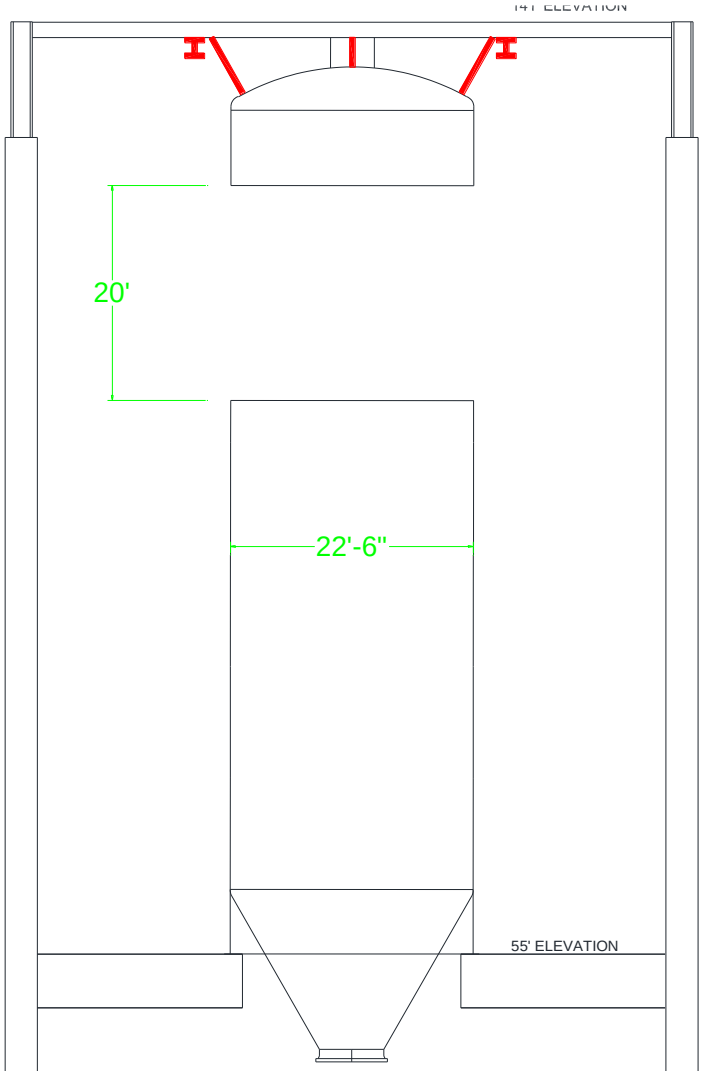
# Coke Drum Repair Options

1. Local insert patch (~13’H x 24’W) deformed to match bulge profiles at ends.
2. Minimal height shell can (13’H) – leaving significant bulging.
3. 20’ height shell can – removing fire related bulging/cracking.



# Coke Drum Repair – 19’-10” shell can replacement




## Schedule Optimization:

- Supported top head/shell from coke drum structure
- Installed curved monorail – minimized bull rigging
- Demo’d 19’-10” of shell vs panel replacement approach
- Installed bare C-1/2 Mo shell rather than clad or overlayed, future replacement previously scheduled
- Limited vertical weld seam thickness to 5/8”, eliminating PWHT requirement and temper bead
- Protected vertical seam CA with Inconel WOL
- Allowed re-insulation prior to hydro coupled with NDE
- Temporary insulation vs permanent panels

# Investigation Conclusions

- Extended exposure of coke bed to air allowed combustion event
  - Smoldering coke observed in past at lower severity
  - Risk assessments had not considered drum failure due to combustion
- Circulation event led to less-reacted resid feed and escalated severity
  - Drum did not meet site unreacted/green drum criteria
  - Circulation procedure followed
- Reduced quench water injection effectiveness
  - Normalized quench water volume below 5$^{th}$ percentile of recent operations
  - Minor mid-cycle temperature upsets – potential abnormal bed channeling
  - Increased probability of abnormally quenched coke

# Investigation Recommendations

- Reduce frequency of delays while cutting
  - Improvements to cutting equipment and instrumentation

- Develop procedure for management of cycle delays
  - During quench – Do not drain, ensure water covers coke bed, open vent
  - While draining – Stop drain, do not dehead, refill with water, leave vent open
  - If drained and bottom deheaded – When delay exceeds 1 hour
    - Ensure telescoping chute is up
    - Start overhead water injection
    - Introduce water 15 minutes every 2 hours or continuously if drum draining
      - Visually check if drum is draining
      - Stop water if level detected above bed
    - Perform visual checks for smoke
    - Routinely reheading bottom not practical for Baton Rouge Cokers
      - For Cokers with bottom slide valves: option to close bottom and steam purge or refill with water

# Questions?