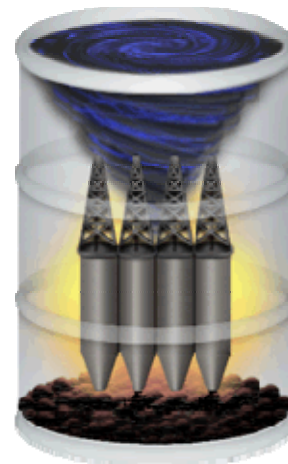
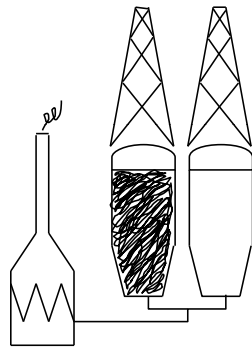


# Delayed Coker

## Safe Coke Drum Draining



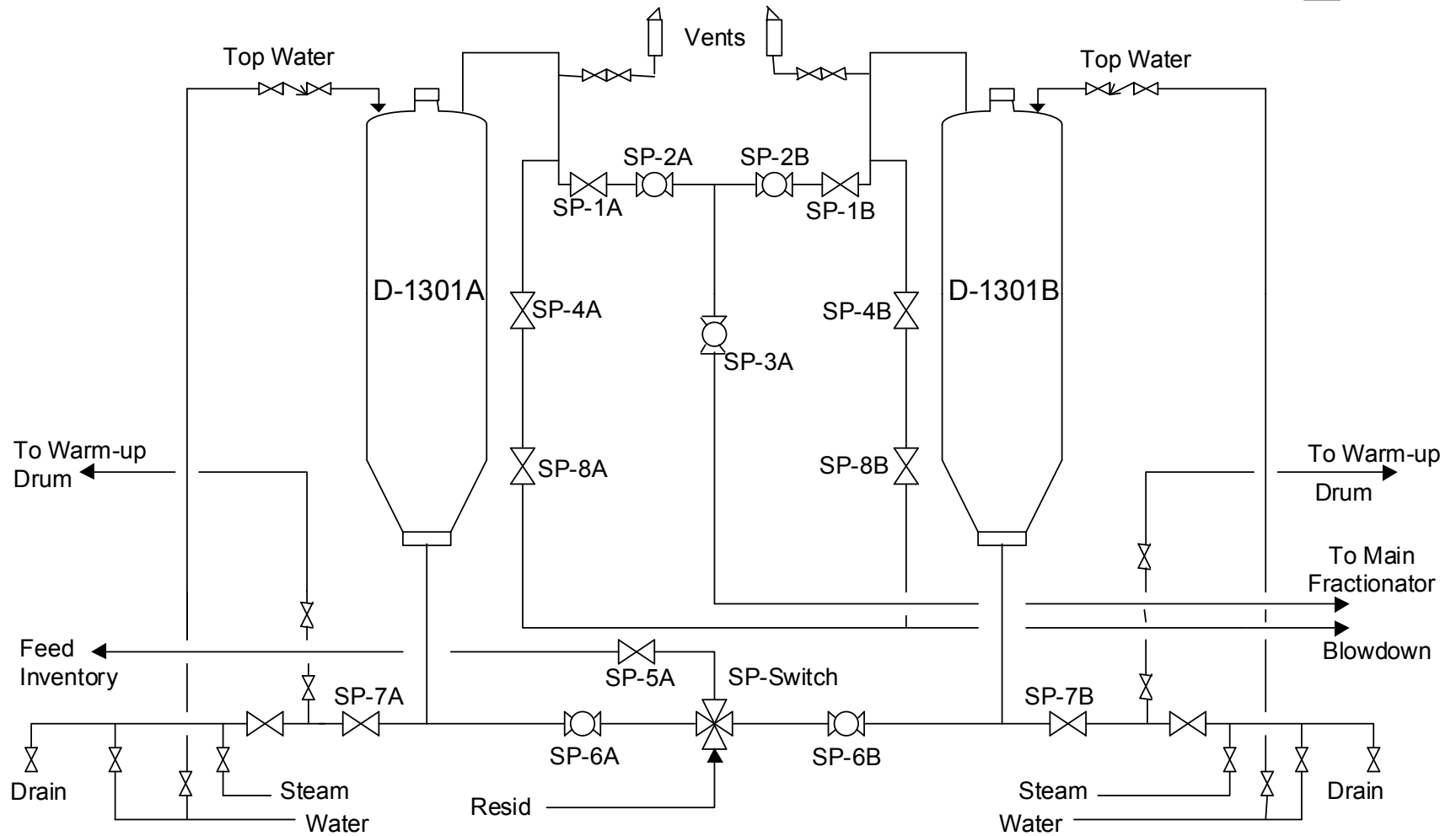
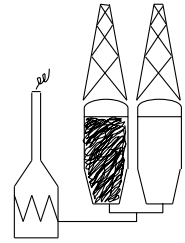
Presented by Mitch Moloney of **ExxonMobil**

[mitchell.j.moloney@exxonmobil.com](mailto:mitchell.j.moloney@exxonmobil.com)

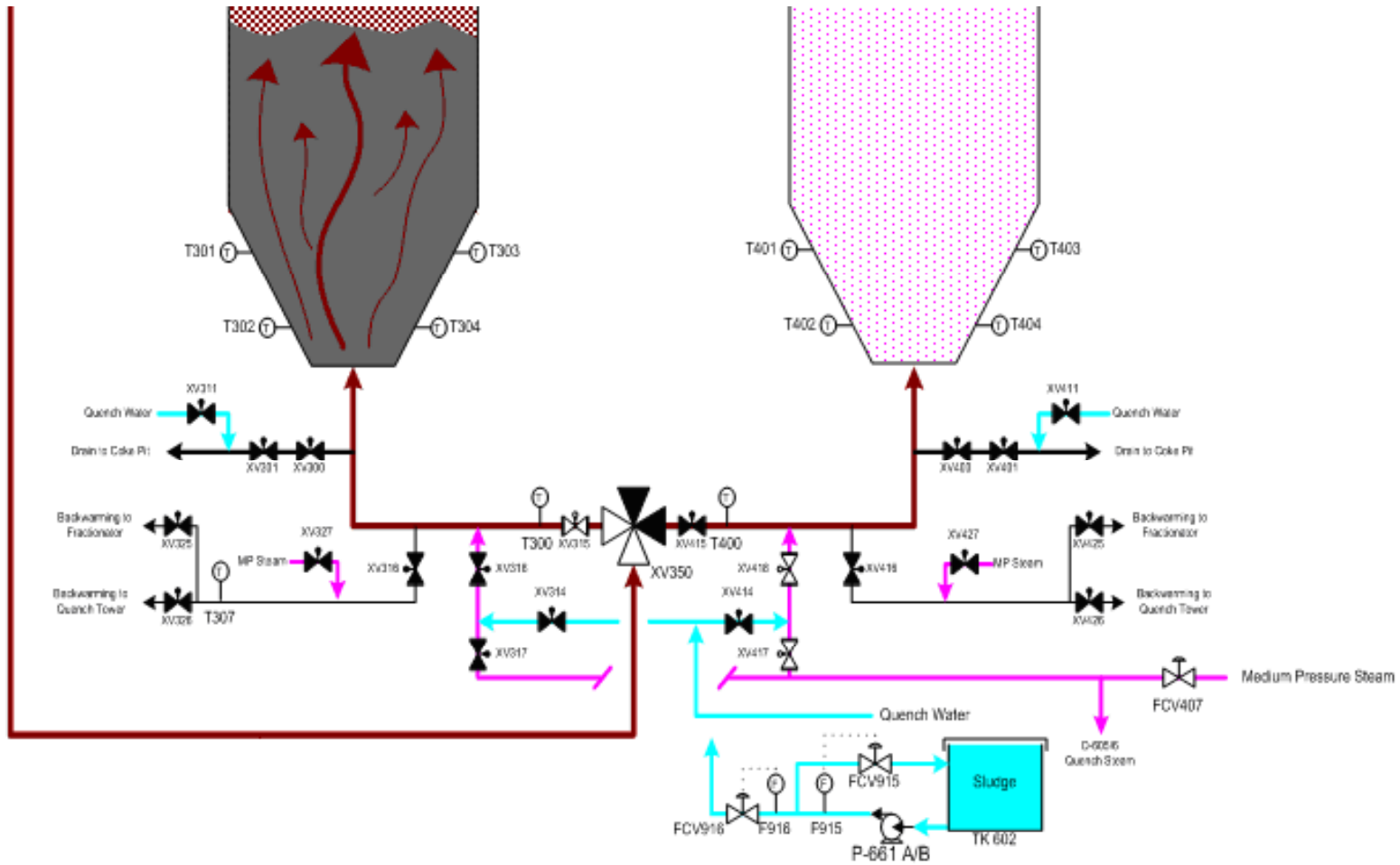
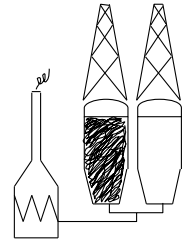
@ coking.com April-2010

# Delayed Coker **Safe Coke Drum Draining**

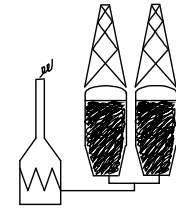
## Valve Layout Schematic 1



# Delayed Coker **Safe Coke Drum Draining** Valve Layout Schematic 2



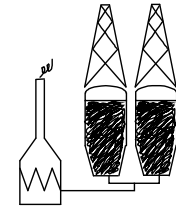
# Delayed Coker **Safe Coke Drum Draining**



## Proper Drain Procedure Why?

- (1) Avoid the risk of "boil over" at open top head during the initial stages of draining (coke beds can shift as the water drains past, exposing 800°F coke to the water, resulting in an explosion of 180 - 200°F water out the drum top).
  - => We do not allow opening manual top heads until coke bed is drained, at least, into middle of coke bed
  - => Automatic, remote top deheading can allow this operation during the early stage of draining.
  
- (2) Ensure that sufficient water has drained so that it is safe to remove the bottom head from the coke drum prior to removing the bottom head.
  - => Leaving residual water in the coke drum (a short or inadequate drain) is the primary cause of coke fallouts during deheading.

# Delayed Coker **Safe Coke Drum Draining**



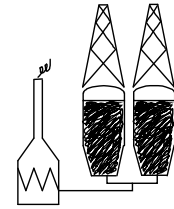
## Safe Draining Procedures:

Verify & Triple Check for Proper Drain

- + Maintain good steam purge during switch to avoid leaving resid in feed line
- + Visually verify drain rate several times during drain
  - => Verify that pit sump is being pumped at normal rate
- + Utilize pressure gauge on drain line to trend water head during drain
- + Verify level probes are dropping
  - => Utilize a Calculation Sheet to Measure Drain Rate
- + Measure drain water recovery via upgauge in tank
- + Verify drain time is normal when "completed"
- + Check TI on feed line if between coke drum and drain take-off
- + Add top water at end to visually verify water drain path
- + Drain under pressure (optional)

# Delayed Coker Safe Coke Drum Draining

## Special Technique Details:



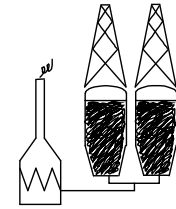
### Site 1

- => Blows the bottom utility header after warm-up to insure clear lines
- => If the drain is slow, they close the drain line blocks and use a pressure gauge on the drain manifold to see how much water head there is. This pressure also reads out in the TDC for the console. The gauge is used to help verify that steam blowing worked to free the drain.

### Site 2

- => Has a TDC alarm that sounds if the time from start of drain until the water level drops below the highest level detector takes too long and also a TDC alarm that sounds if the time for the water level to drop between the highest and next highest level detectors (both above the normal coke outage level) is too long.
- => Uses a vacuum gauge on their Coker to indicate if there is vent pluggage or closure, preventing excessive vacuum from damaging the coke drum.

# Delayed Coker **Safe Coke Drum Draining**

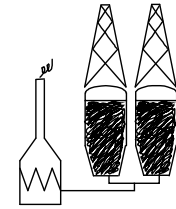


## Slow Drains:

### Causes

- + Formation of loose coke in cone area above feed entrance that collapses on to feed distributor or into lines
  - => Related to feed properties and feed entrance flow characteristics
- + Bonded and loose shot coke beds that collapse into channels
  - => Feed properties, coke drum superficial velocity and coke drum diameter are factors
- + Obstruction in feed line
  - => Resid not properly swept from feed line
  - => Coke in drain line
- + Vent severely obstructed or closed (very rare)

# Delayed Coker **Safe Coke Drum Draining**



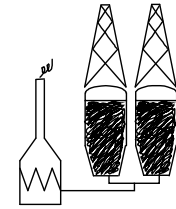
## Safe Draining Facilities:

- + Drain outlet discharge to a safe disposition
  - => an area that does not expose workers to the splashing hot water or rising steam.
  - => corner of the coke pit or the entrance to the fines lane or labyrinth
- + Drain outlet should not be submerged, allowing visual verification of drain rate
- + Each drum pair should have its own dedicated drain line to avoid overlap of drains with other drums
- + The drain line should be as short and as straight as possible.
- + A clean out connection should be provided in the event of a pluggage.
- + An air/water connection to pull a vacuum on the drain line while breaking the oil inlet/bottom flange.



# Delayed Coker **Safe Coke Drum Draining**

## Safe Draining Benchmarking:

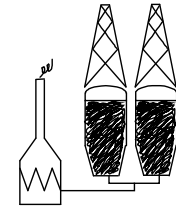


**Coke Drum Drain Verification (as of mar-2010)**

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Coke Drum Level Indicators Dropping at Normal Speed => DCS Smart Alarm if slow drain	x	x	x	x	x	x	partial
	x	in progress					
Visual Check of Discharge Flow vs Time	x	x	x	x	x		x
Water Tank Uppauge		not possible		x	x	partial (1)	NA
Feed Line Temperature Check => DCS Smart Alarm if no indication		x		x			x
		in progress					
Drain Line Pressure Indication	NA	NA	NA	x	NA	NA	NA
Calculational Tool a la JOL						x	
Introduce Top Water to "Proof" Drain		x					x
Special Procedures (as needed):							
Steam or Water Blowback to speed a slow drain	x	x	x	x	x	x	
"Pressure Drain"	x	x	x				

# Delayed Coker Safety Benchmarking

## Safe Draining Neutron Back-Scatter Tracking:



**POSSIBLE FALL OUT - Lower Coker Rate??**  
Calculate when to Break Grayloc

**SLOW - Extend Drain Time?** Enter times from PROMIS or DCS 0.035

>6 minutes: time since drain valve opened

Be sure to drain the whole drum

SEE TAB 'PROJECTION CHART'

19:44	Drain Valve Open	
19:56	10'	10' Probe
20:13	15'	15' Probe
20:46	25'	25' Probe
21:27	45'	45' Probe

1:31 45'-10'

0:41 45'-25'

Time to break Grayloc **BASED TIME FROM 10' PROBE** 22:11 2:15

Time to break Grayloc **BASED ON 20' DRAIN FROM 25' PROBE TO 45'** 22:45 2:49

SEE CURVES ON TABS "PROJ CONE 050 AND 150"

If a Fallout occurs, whether small or large, please fill out a report and send to Enlow.

**Fall Out Investigation Report**

If a slow drum occurs and you have an idea why, send Enlow an email to discuss.

**USE THE GREATER OF TIMES TO ESTABLISH THE "Break-the-Grayloc" TIME.**

Made by Richard L. Enlow, Extension 5722 02/25/2005

Recommends that the longest predicted drain time be used prior to breaking the feed line flange and deheading, to reduce the chance of a coke fallout.