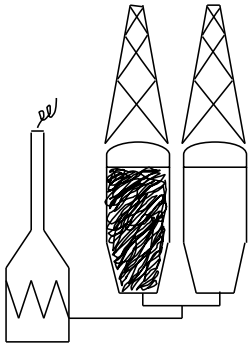
Delayed Coker

Safe Sampling – Tar or Spalled Coke



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Presented by Mitch Moloney of **ExxonMobil**

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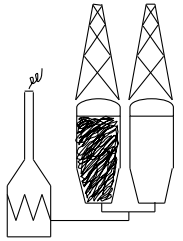
@ Galveston TX coking.com May-2013

Safe Sampling – Tar or Spalled Coke



Topics:

(1) Reasons for Sampling Resid

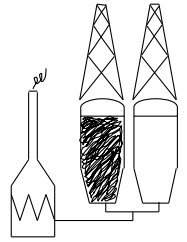
(2) Background Review
- => Systems on various coker sites
- => Types employed

(3) Sampling Resid - Our Practice

(4) On-Line Analyzer Experience

(5) Sampling Furnace Effluent during On-Line Spalling
- => Used at one site

Hot Tar – Safe Sampling



Reasons for Sampling Resid:

Validate CCR or Vis levels are in line with blend plan projections

Material Balance Validation

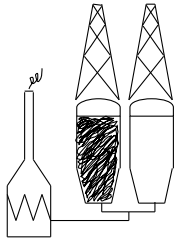
Performance testing

New feed trials

Unit Monitoring & Optimization

Pilot plant feed gathering

Hot Tar – Safe Sampling



Background:

Most cokers originally cooled the hot tar by passing the tar through a ¾" coil immersed in a bucket of flowing water.

=> The tar line in & out was steam traced & insulated (maybe)

=> Disposable tubing may have been used as well

=> The flowing tar was

-> either diluted with oil and sent to the oily water sewer (back in the day)

-> or directed to a barrel, diluted with light oil and then loaded into a vacuum slop truck

-> or returned to a lower pressure location in the process

-> or piped to a slop oil system

Hot Tar – Safe Sampling

Resid Tar Does Not Flow When Cool:

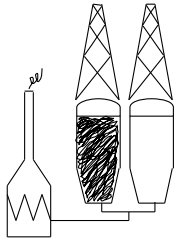
Hot Tar – Safe Sampling

Background:

Many of the old resid sample systems used a simple water cooler, which creates a low resid film temperature, high viscosity and plugging.

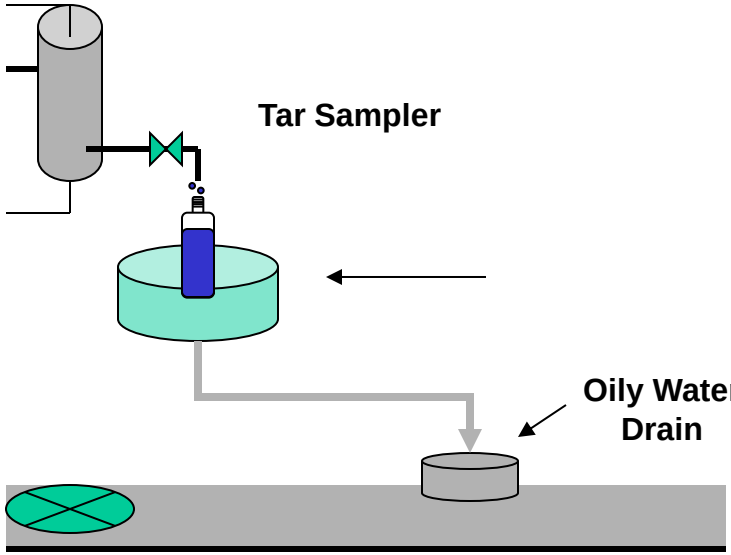
Additionally, resid foulant reduces heat transfer and the ability of the cooler to properly cool the sample.

Hot Tar - Safe Sampling

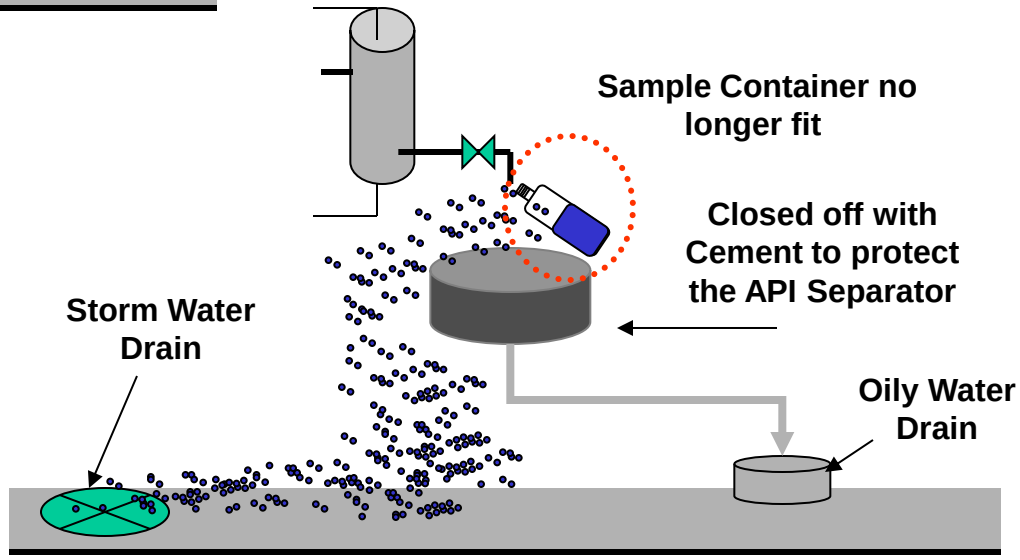


Site-1:

Original

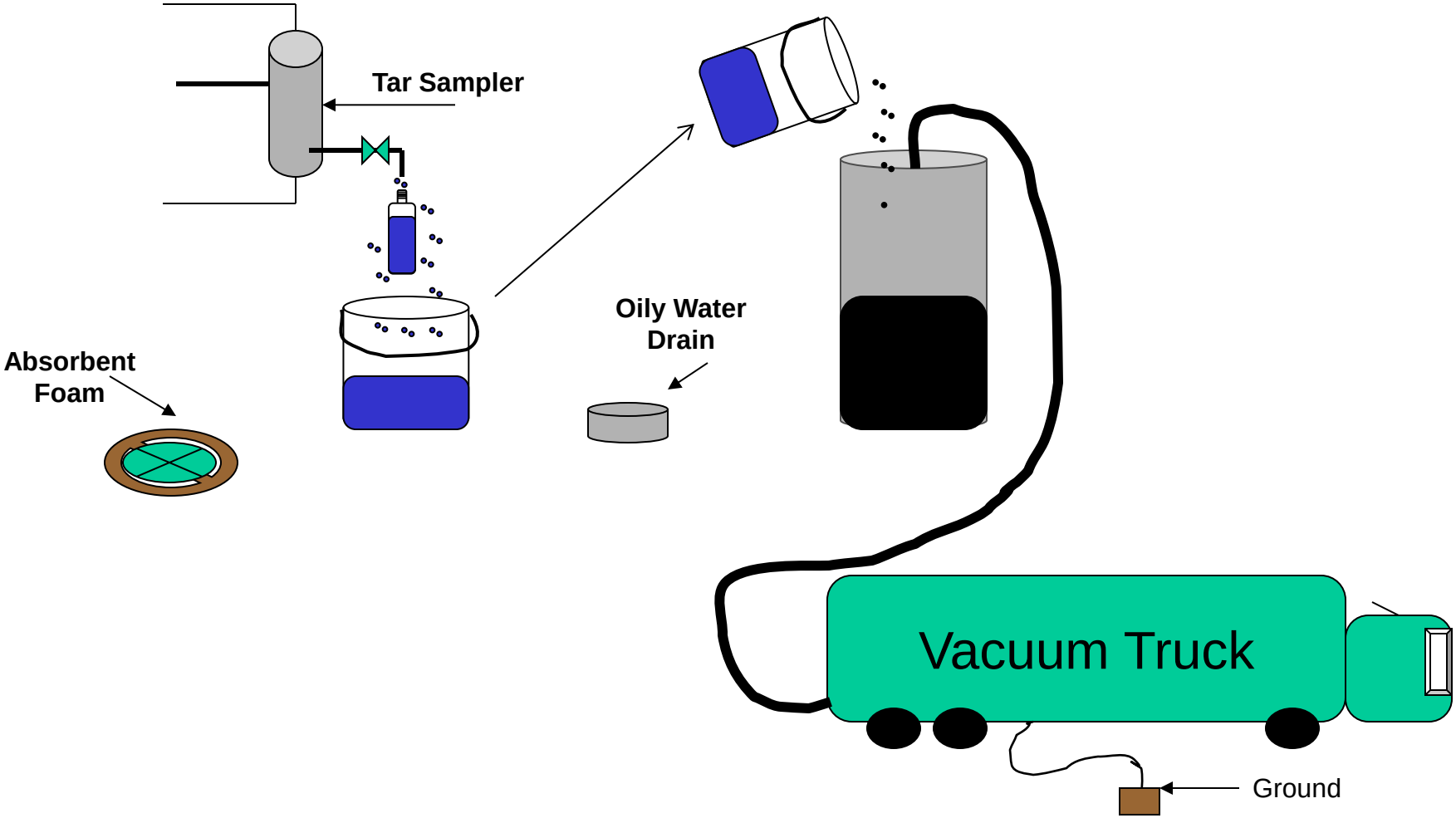


Later

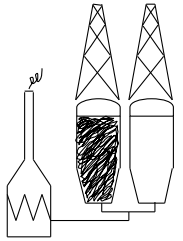


Hot Tar – Safe Sampling

Site-1:

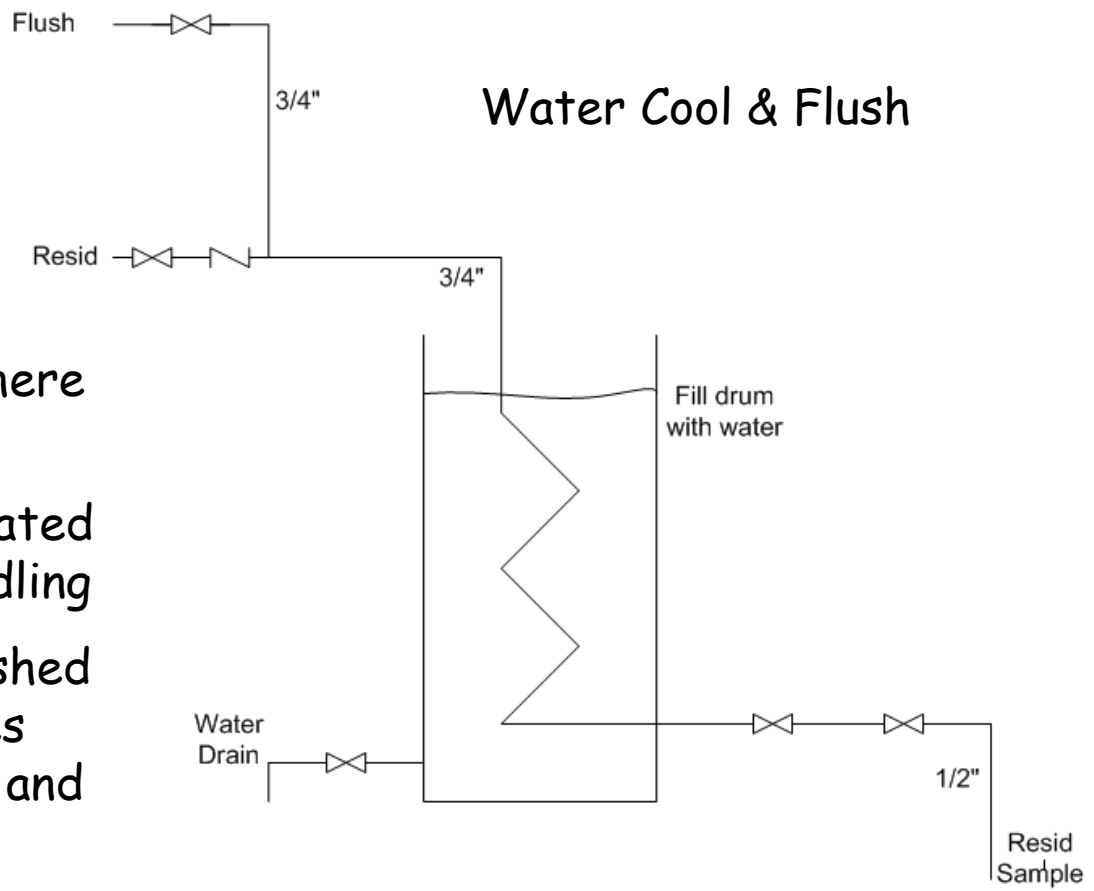


Hot Tar – Safe Sampling



Background:

Site-2
The Simplest Design



Water Cool & Flush

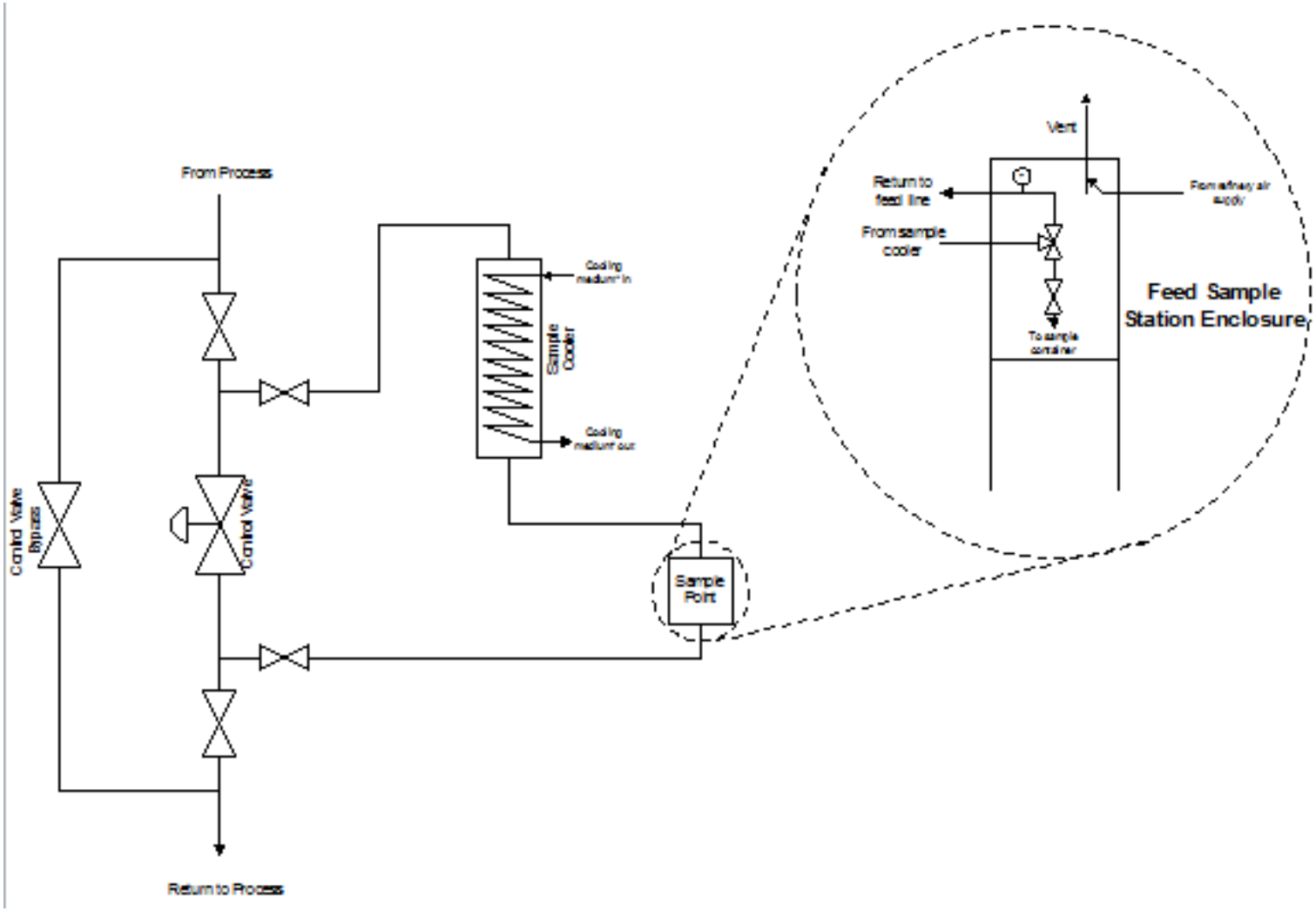
It worked for many years where they obtained a daily sample

=> Main Disadvantage – Created slop oil for disposal/handling

=> Eventually it was not flushed and plugged several times creating additional work and more safety risk

Hot Tar – Safe Sampling

Site-3 Sample Cooler on Fast Loop



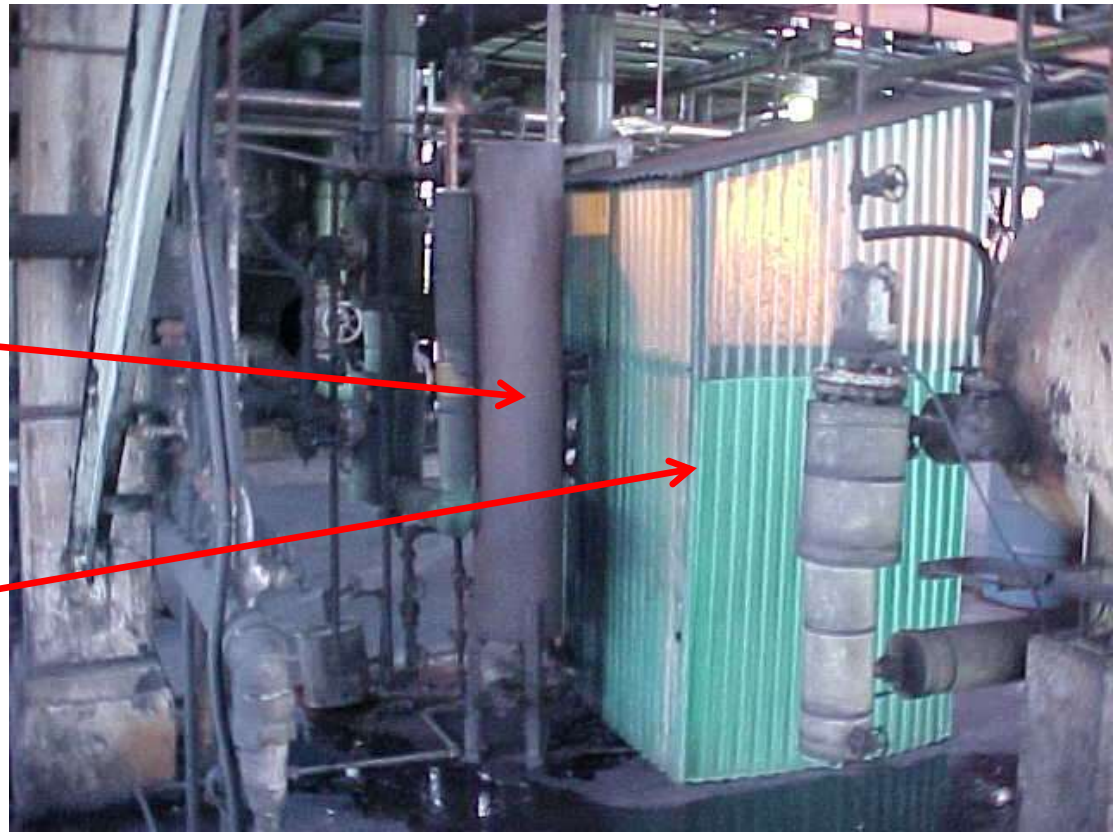
Hot Tar – Safe Sampling

Background:

Site-3
Water Cooled Design

Sample Cooler

Sample Station Enclosure



Hot Tar – Safe Sampling

Background:

Site-3 Water Cooled Design

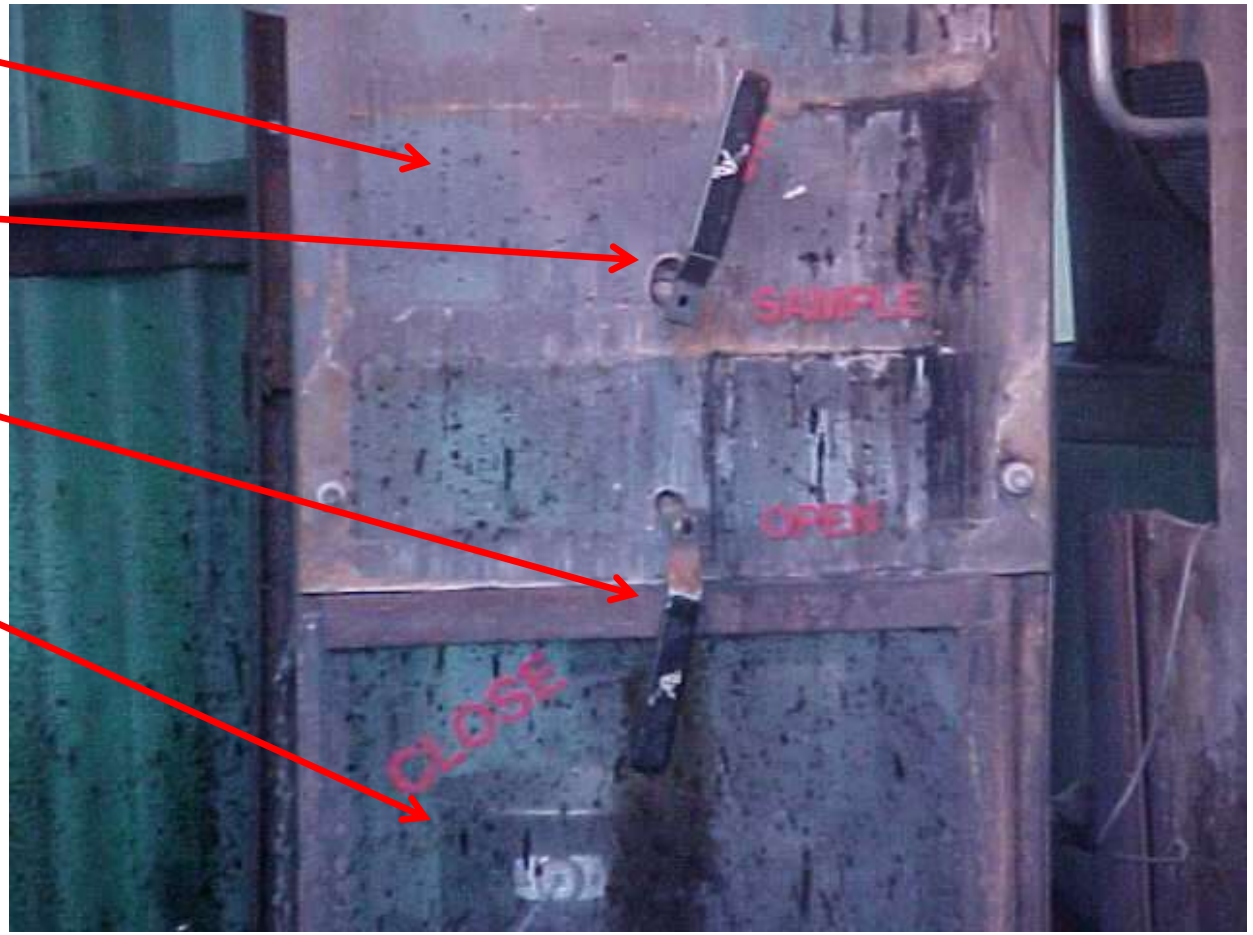
Facing the Sample Enclosure

- Warning Sign on Valve Operations
- Pressure gauge to detect plugging
- Air to Aspirated Vent to remove fumes

Hot Tar – Safe Sampling

Background: Site-3 Water Cooled Design

- Disposable Plexiglas
- ¼-Turn Block Valve
- ¼-Turn Sample Valve
- Sample Can



Hot Tar – Safe Sampling

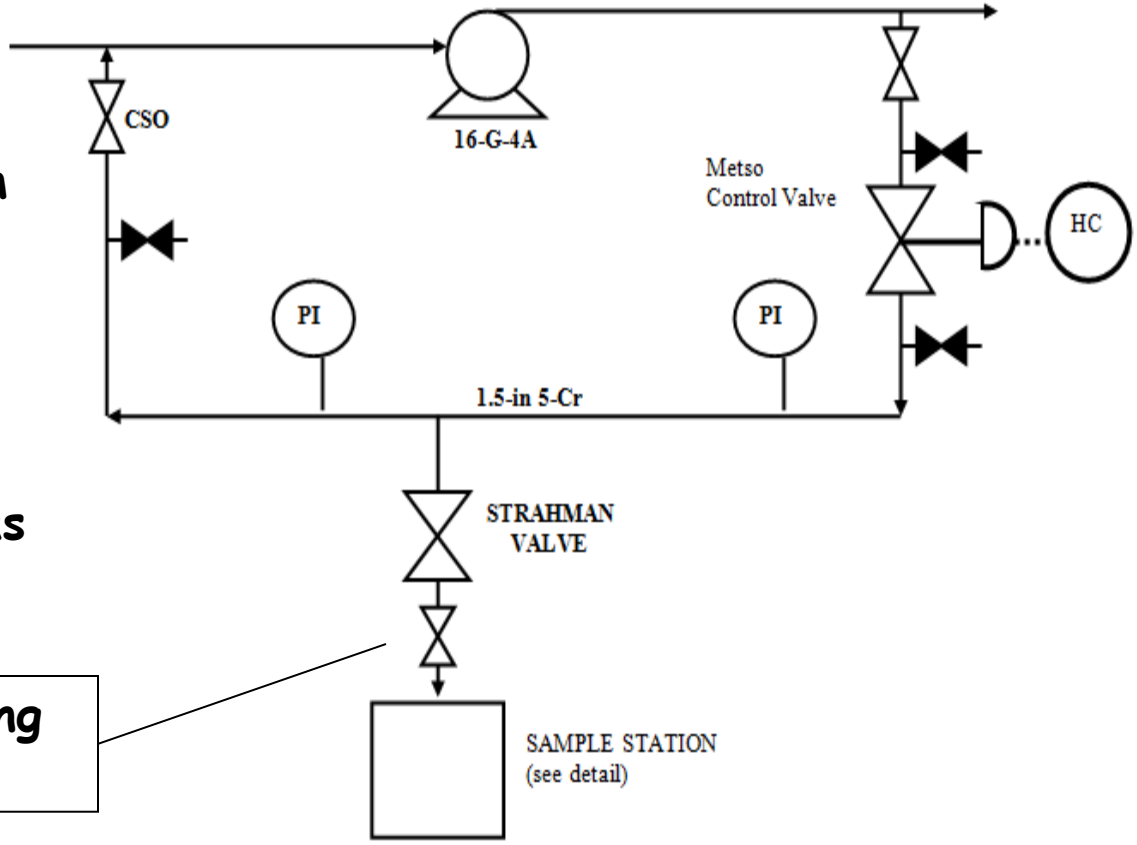
Background:

Site-4 – Good on Paper, NOT in Practice

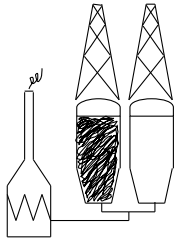
Pump out of service and system gets plugged without proper flushing and steaming

Flow control was problematic

Required purging dead leg



Hot Tar – Safe Sampling



Site-5 Hot Resid Sampler (650°F)

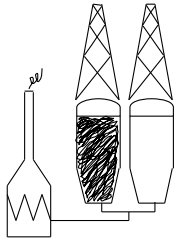
We do not recommend taking a sample at this temperature due to flashing & spitting

Hot Tar – Safe Sampling

Site-5 Hot Resid Sampler

Removing the disposable plastic shield

Hot Tar – Safe Sampling



Our Practice:

Use of a Strahman valve, close-coupled to the sample line.

=> A "regular" normal-body Strahman design should be used in the fast-loop piping.

=> Extended body Strahman valves used in heavy-wall-piping can distort and leak through the packing.

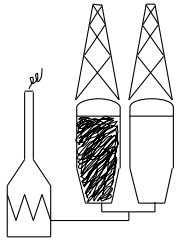
=> It is also important to have the valve piping well supported to avoid any torque on the Strahman body.

Installation of sample valve as a take-off on a fast loop line installed in parallel with a flow control valve or other pressure drop device.

If the sample point temperature is > 475°F (246°C), consider a steam or tempered-water cooler to lower the temperature to <475°F

=> The cooler should be installed in the fast loop line rather than in a separate take-off line that requires flushing after each sample.

Hot Tar – Safe Sampling



Our Practice (cont'd):

Use of steam tracing or jacketing and insulation to prevent line pluggage.

Flushing connections and isolation valves around the sample valve to allow the sample valve to be taken out of service for maintenance (these would normally be provided on the fast loop sample line).

The capability to fill one gallon (or 1 quart if desired), 5 gallon and 55 gallon sample containers.

=> The sample container should be rated for the sample temperature and allow safe handling in the field and the laboratory.

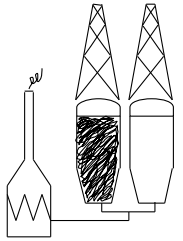
=> Proper shielding to protect the sample taker

=> Adequate lighting and proper sample station ingress/egress

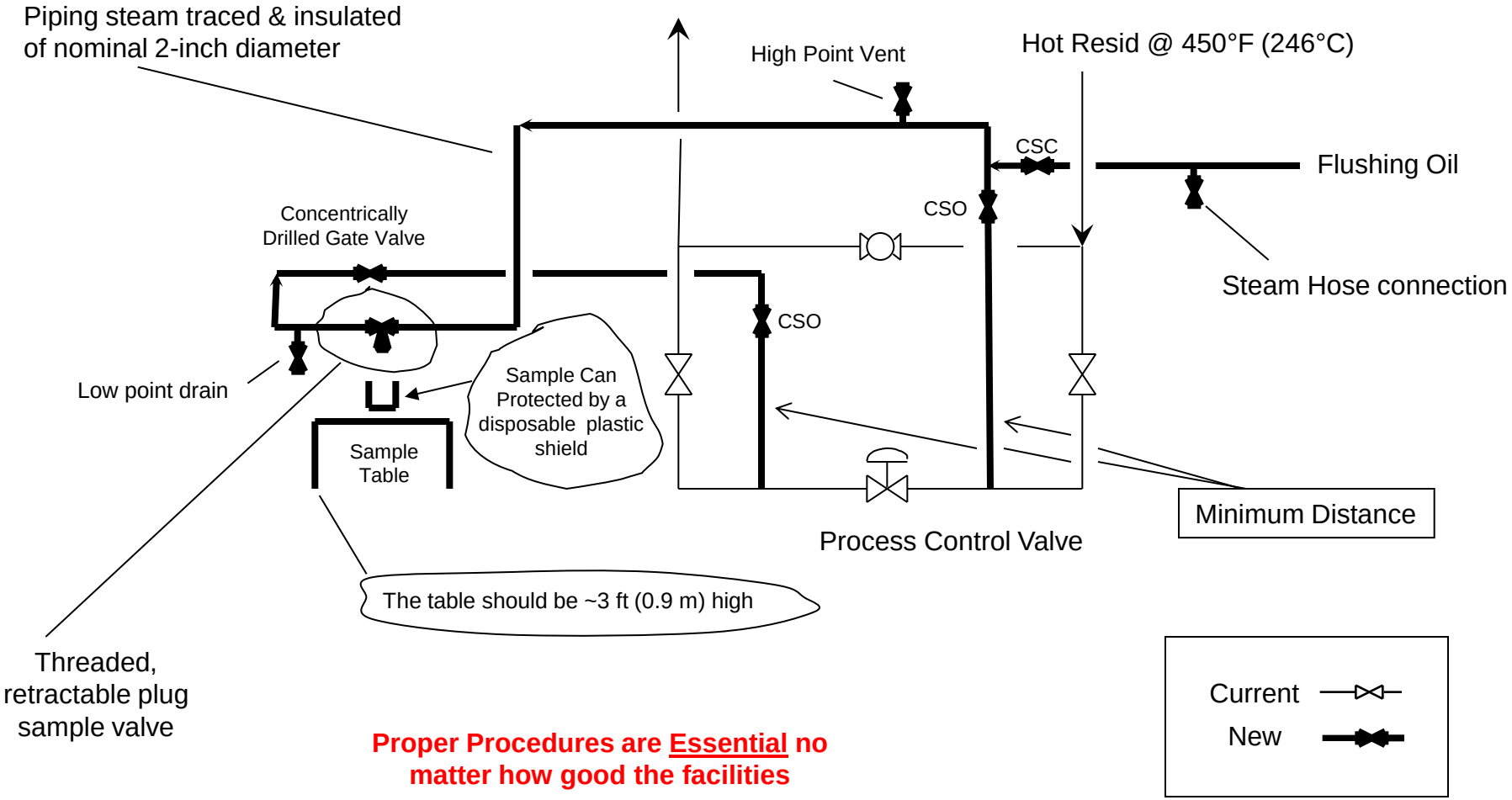
Use of a drilled gate valve downstream of the sample to allow control of the sample line flow.

Optional – Depending on the sample temperature, an aspirated vent in the sample box can be employed

Hot Tar – Safe Sampling



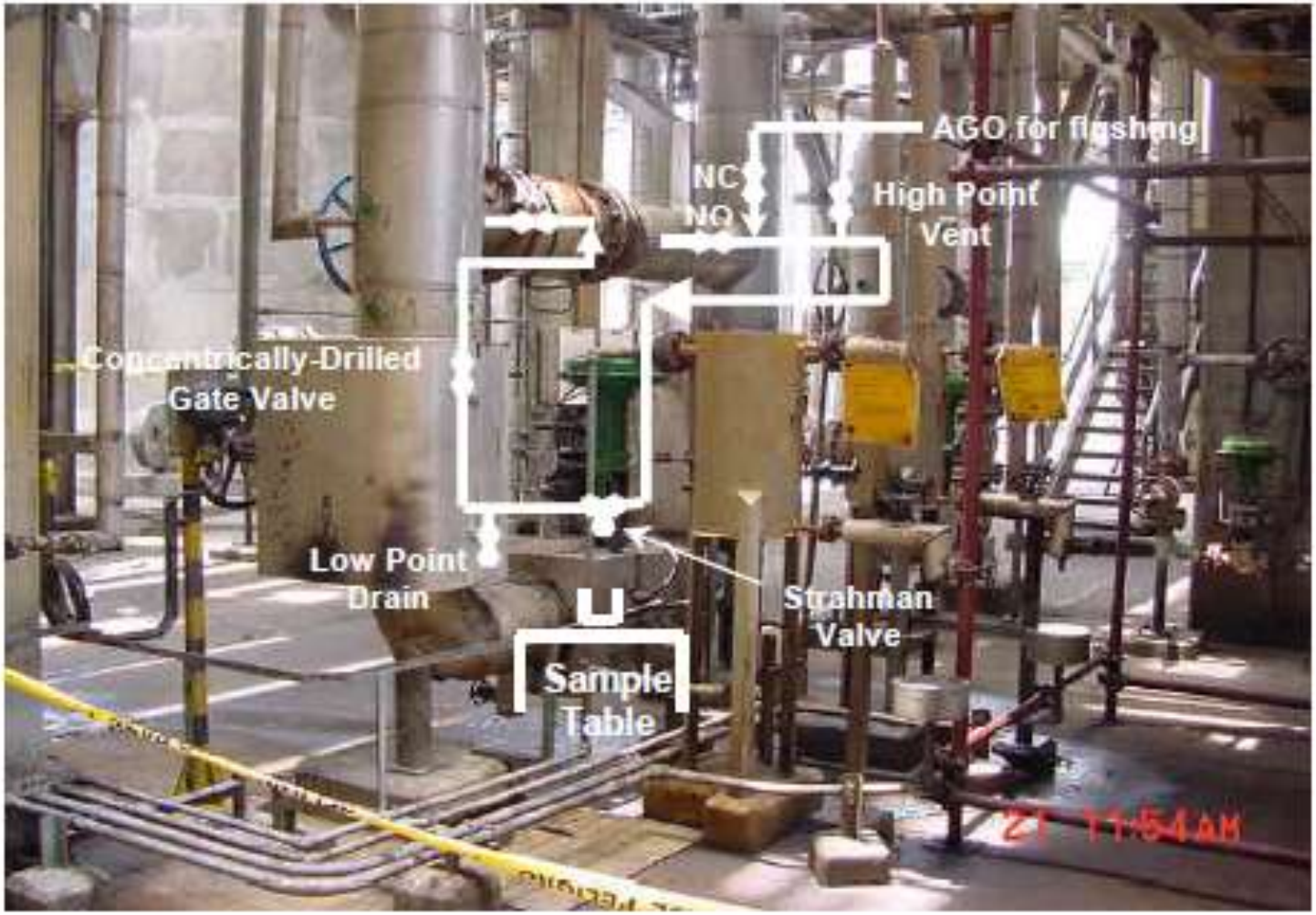
Our Arrangement



Proper Procedures are Essential no matter how good the facilities

Hot Tar – Safe Sampling

Layout in the Field

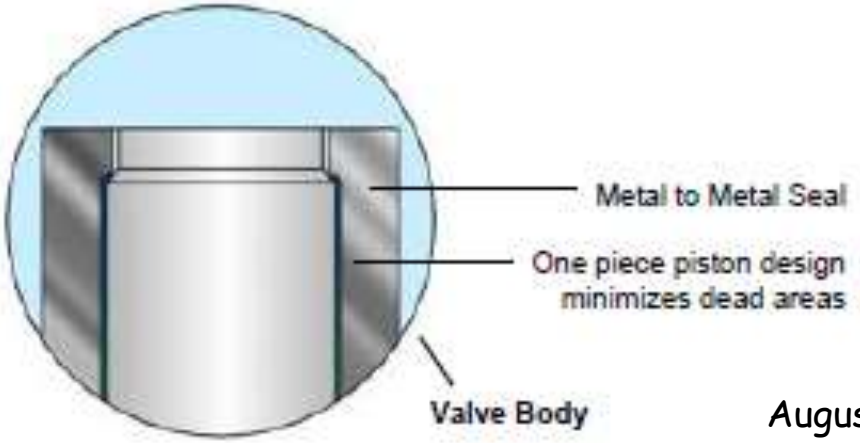


Hot Tar – Safe Sampling

Strahman Valve:

"Sealing system uses a range of material combinations to create a differential hardness between the body and plunger seat."

These valves do not allow any fluid flow until they are opened 9 turns, and the flow increases with each extra turn open.



Temperature
Min: -200° C / -330° F
Max: 540° C / 1000° F

Pressure
ANSI 600: 100 bar/1440 psi max
ANSI 1500: 250 bar/3600 psi max

August 29, 2009 Brochure

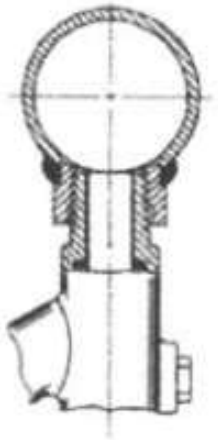
Strahman VALVES, INC.
Established 1921

Hot Tar – Safe Sampling

Strahman Valve – Half Coupling:

Use of Half-Coupling Design reduces chance of seal leakage due to torque on the plunger.

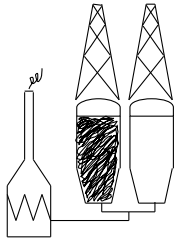
Strahman **HALF COUPLINGS**



HALF COUPLING INSTALLATION INSTRUCTIONS

The Sampling Valve inlet connection should be flush with the contour of the half coupling, AFTER WELDING INTO PIPE OR VESSEL, to assure proper satisfactory opera- tion of Sampling Valve. To ensure proper installation and sealing of threaded connection – retapping of the half coupling may be necessary to correct distortion caused by welding.

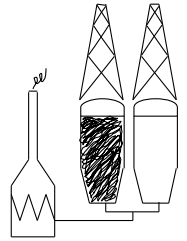
Hot Tar – Safe Sampling



Our practice requires only one Sample Can:

Eliminates need for Sample Purge Can

Hot Tar – Safe Sampling



There should be no need for this:

Hot Tar – Safe Sampling

Still Need to Wear Proper PPE:

Spalled Coke – Safe Sampling

Sample Take-Off and Return

Sample Take-Off & Return piping around Control Valve

Hot Tar – Safe Sampling

Open Sample Box

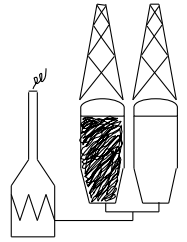
Spalled Coke – Safe Sampling

Sample Box – Sample Outlet & Fume Vent

Spalled Coke – Safe Sampling

Vent Aspirator Controls

Hot Tar – Safe Sampling



Experience with On-Line Hot Tar Analyzers

An On-Line Flow-Through Viscometer was used successfully for many years at a formerly-owned site.

=> Expensive Installation

=> High Maintenance & Frequent Calibration

Recently installed an On-Line Gravity Analyzer

=> Nuclear-based instrument

=> Non-intrusive, low maintenance

Spalled Coke – Safe Sampling

Continual Sampling of Furnace Pass During On-Line Spalling allows tracking of Coke Removal Effectiveness during the Spall

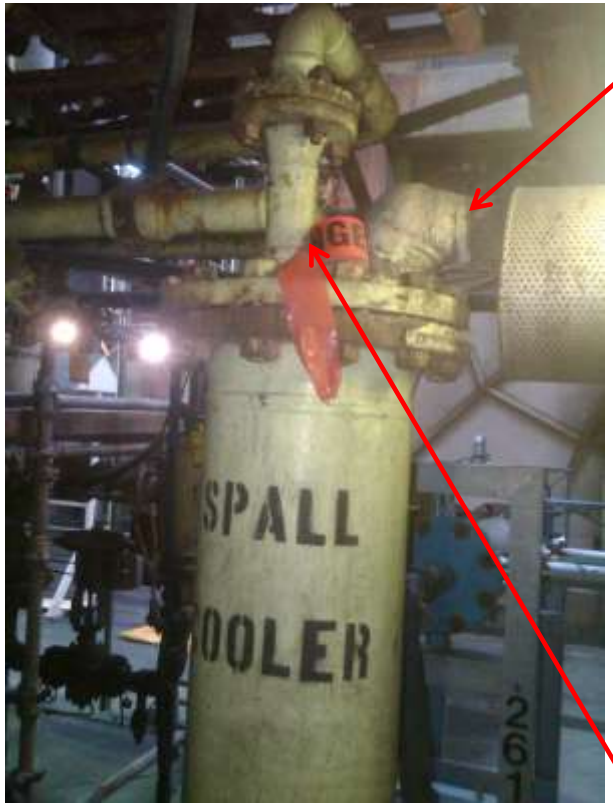
A slipstream of furnace pass outlet flow (steam and coke) was passed through a coil in a counter-flow water bath.

Samples are taken into calibrated beakers, allowed to settle and effectiveness of the spall could be gauged as time progressed

Spalled Coke – Safe Sampling

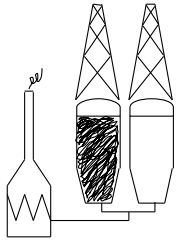
Close-Up photos of the water and sample piping

Sample inlet & outlet piping from furnace



Water outlet & inlet piping from furnace

Fluid Coker Hot Coke – Safe Sampling



Incident (Tuesday Oct 3, 2000)

A Field Technician was preparing to catch a normal Hot Coke sample. Prior to catching the sample he walked over to the sample box and opened both exterior and inner doors to obtain the sample pot which rested on the grid. He then walked over to the forklift/chunky cart, located just East of the heater chunky chute, and emptied the contents of the pot into the cart. He walked back to the sample box, replaced the sample pot and closed both doors. He then operated the forklift and positioned it under the heater chunky chute at which time he heard a popping sound coming from the direction of the Hot Coke Sample Box then a small fire coming out of the sample box, extending upward about 2-3 feet. After reporting the fire, he & another technician put out the fire using a fire hose. Upon further inspection they noticed an accumulation of coke below the "grid" of the sample box and determined that the box was partially plugged. They connected a nitrogen hose to the sample box and proceeded to clear the vacuum line.

Investigation Conclusion: The vacuum line from the sample box was partially plugged allowing hot (1000°F) coke from a previous sample to accumulate in the bottom section of the sample box. When the technician opened the box to remove the sample pot, air was introduced to the smoldering coke. The location of this sample point is at ground level under the heater structure and the lighting in this area is less than adequate. The technician did not notice that there was an accumulation of coke in the cone part of the sample box.