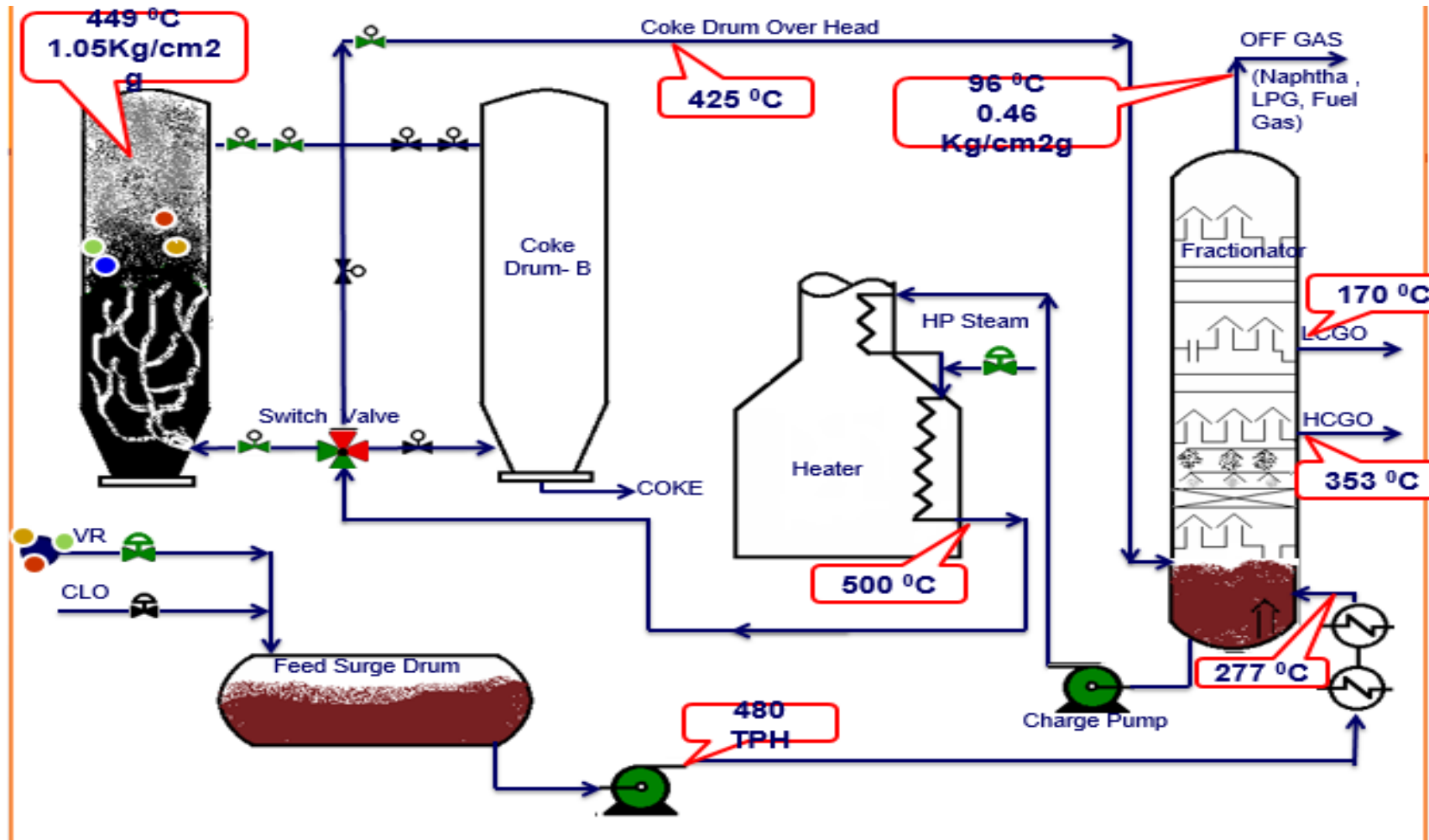




Failures in Coke Drum Overhead Piping

Delayed Coker Unit

Coke Drum Piping Loop



Damage mechanisms in Coke drum Overhead pipeline



Vibration during coke cutting cycle.

Erosion corrosion due to coke formation inside piping.

Sulphidation due to high temperature and sour feed

High temperature H₂/H₂S corrosion.

Failure Case-1



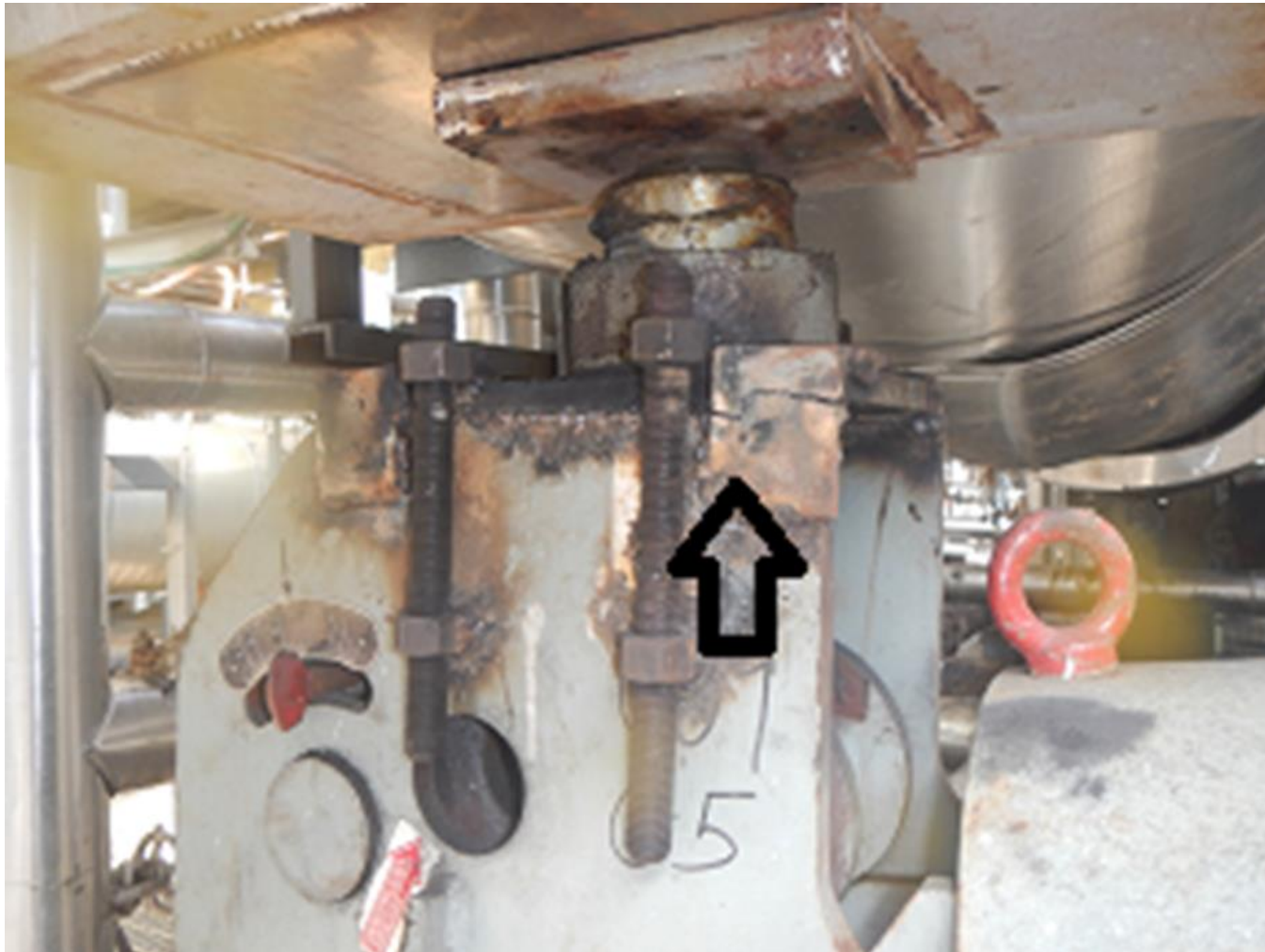
Crack was observed in spring support of 36 inch coke drum vapor outlet line at Bottom Unloading Device platform

Spring is CAN type Constant Spring support.
36 inch pipe MOC is Alloy P9, insulated.

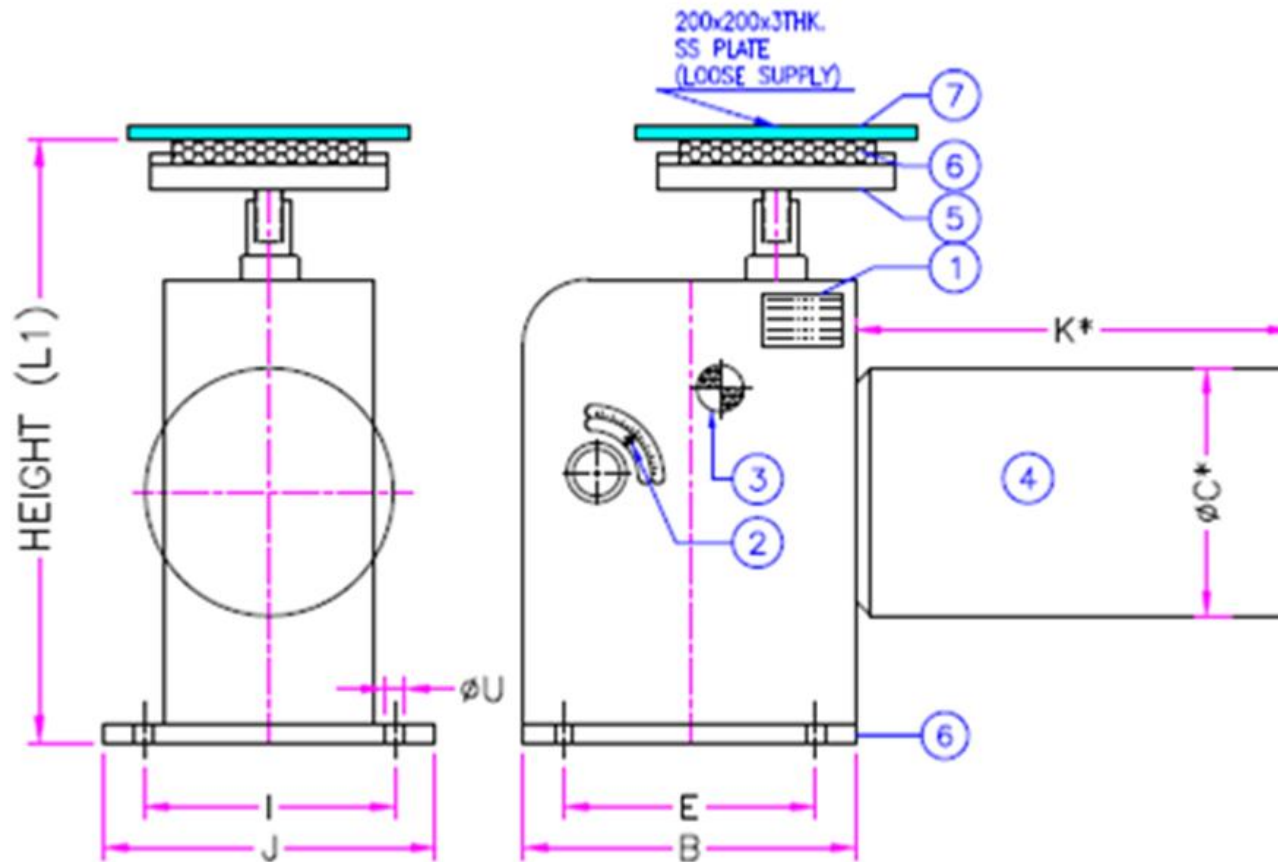
Failure Case-1



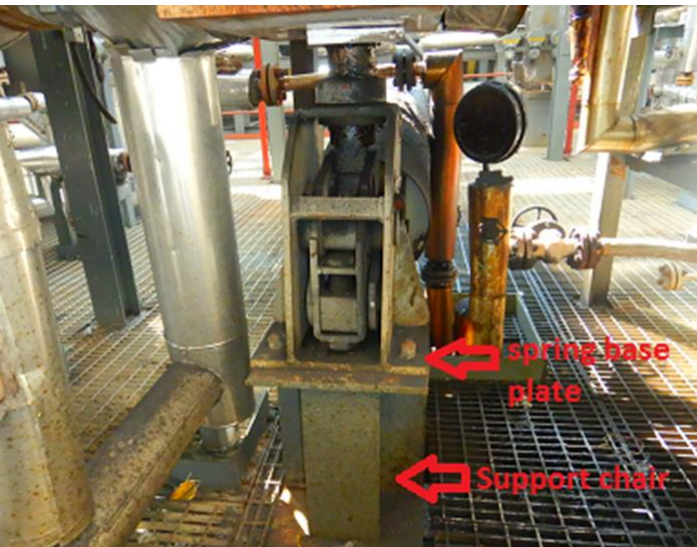
Failure Case-1



Failure Case-1



Failure Case-1



Case-1 Findings...



Graphite pad provided between flange load and pipe support was found damaged.

Vibration was found transferred to the spring support during coke cutting cycle.

Primary damage mechanism is fatigue crack due to transmission of vibration from 36 inch coke drum vapor outlet line to spring support.

Failure Case-1 Recommendations



Replace the damaged CAN type spring support.

Mirror finished SS plate/ roller type flange load shall be provided between support and load flange.

Failure Case-1 Recomm Implemented



Failure Case-2



Failure of spring support in 36 inch coke drum overhead PSV outlet line .

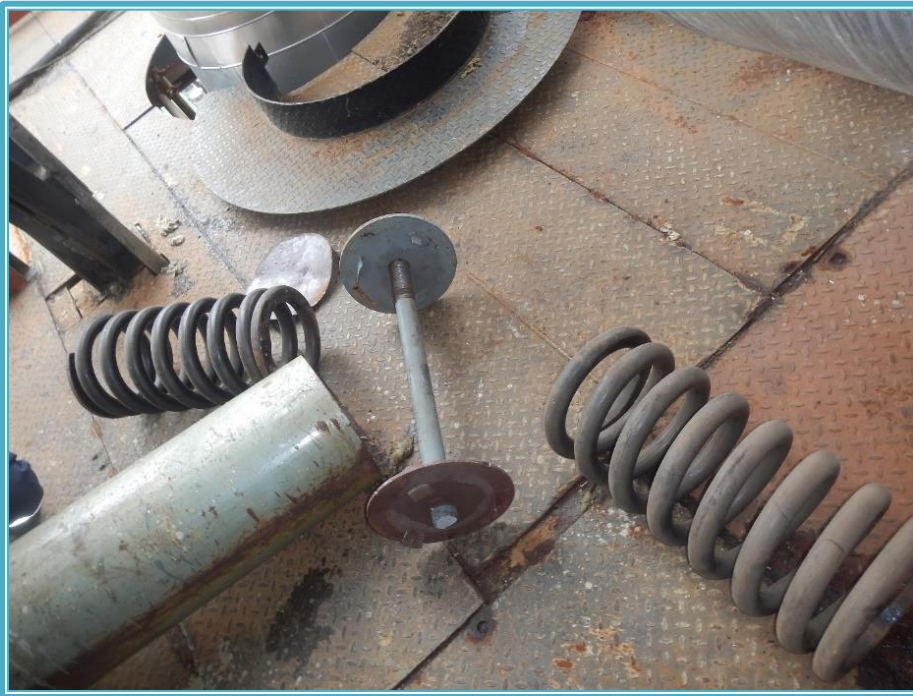
Spring: CAN type and Constant spring support.

Pipe : Alloy P9 with insulation.

Failure Case-2



Failure Case-2



Case-2 Findings



Failure was happened due to inadequate functioning of CAN type spring support

Due to dust environment, the load flange spindle got stuck and hence spring was not able to function properly.

At some point of time, spindle may get released due to any jerk and got hit on overhead line leads to spindle failure.

Case-2 Recommendation



CAN type spring support shall be replaced with Hanger type spring supports.



Failure Case-3



- Failure of 1.5 inch steam purge line in coke drum overhead PSV outlet line.
- MP steam purge line: Alloy P9
- Coke drum overhead line : Alloy P9

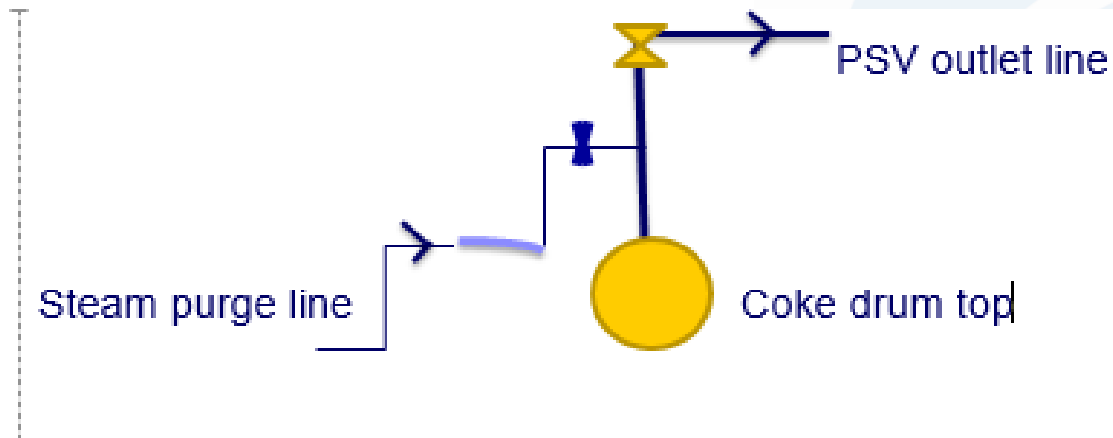
Failure Case-3 Findings..



1 ½ inch MP steam purge line to coke drum overhead relief valve line was found failed due to weld crack in half coupling .

Vibration was noticed in small bore piping.

Flexible braided steam hose connected to the 1 ½ inch MP steam line was found damaged and broken

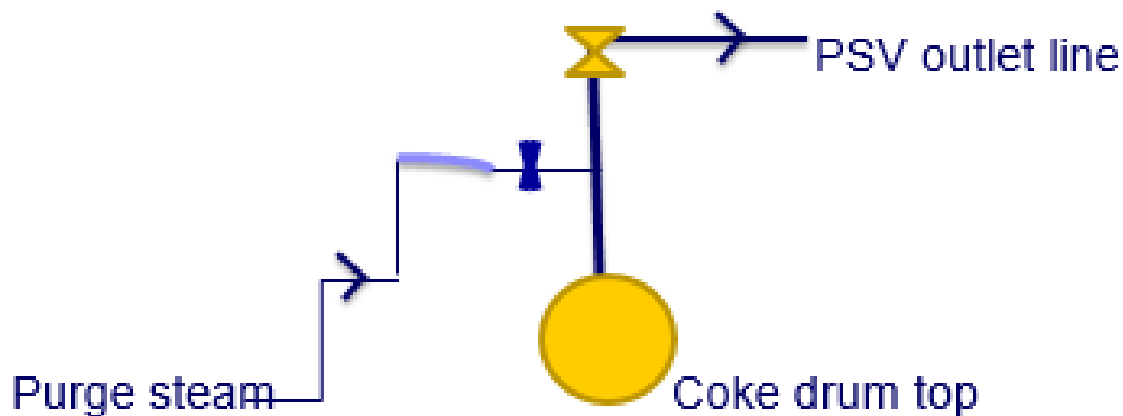


Case-3 Recommendations



Provide two numbers of stiffeners at 90 degree apart for small bore piping at TUD to impart adequate stiffness to branch connections

Relocate flexible hose on purge steam line towards upstream of isolation valve.



Failure Case-3



Take Away...



In dust environment like in Coker unit, Hanger type spring supports shall be recommended to avoid frequent malfunctioning of spring support spindle.

Mirror polished SS plate / roller shall be provided between spring flange load and pipe support plate in CAN type spring supports to avoid vibration.

All small bore pipings connected to coke drum shall be stiffened by providing plates 90 degree apart. Ensure same metallurgy of pipe to be used for stiffener plates.

Steam hose provided in purge line connected to coke drum overhead shall be designed suitably to avoid unnecessary load on purge line at stub connections especially during coking cycle.



THANK YOU