

Boiler inspection practices

Shut down inspection aspects of
AFBC boilers



FD Fan

- Inspect the drive shaft bearings and lubricate. Check the dust seal is OK. Replace the bearing if necessary. Carry out trial run to ensure the bearings are OK.
- Realign the motor and the fan if the vibration readings were abnormal. Remove the cause for vibration.

Tubular air preheater

1. The tubes shall be checked for erosion. The gas inlet portion of the tubes, to a length of 150 mm is prone for erosion.
2. The tubes shall be checked for corrosion. The cold end of airheater is susceptible for corrosion.
3. Clear ash choking of APH tubes.
4. Check the expansion joint is not corroded due to condensation damage.







Tubular air preheater water condensation – corrosion

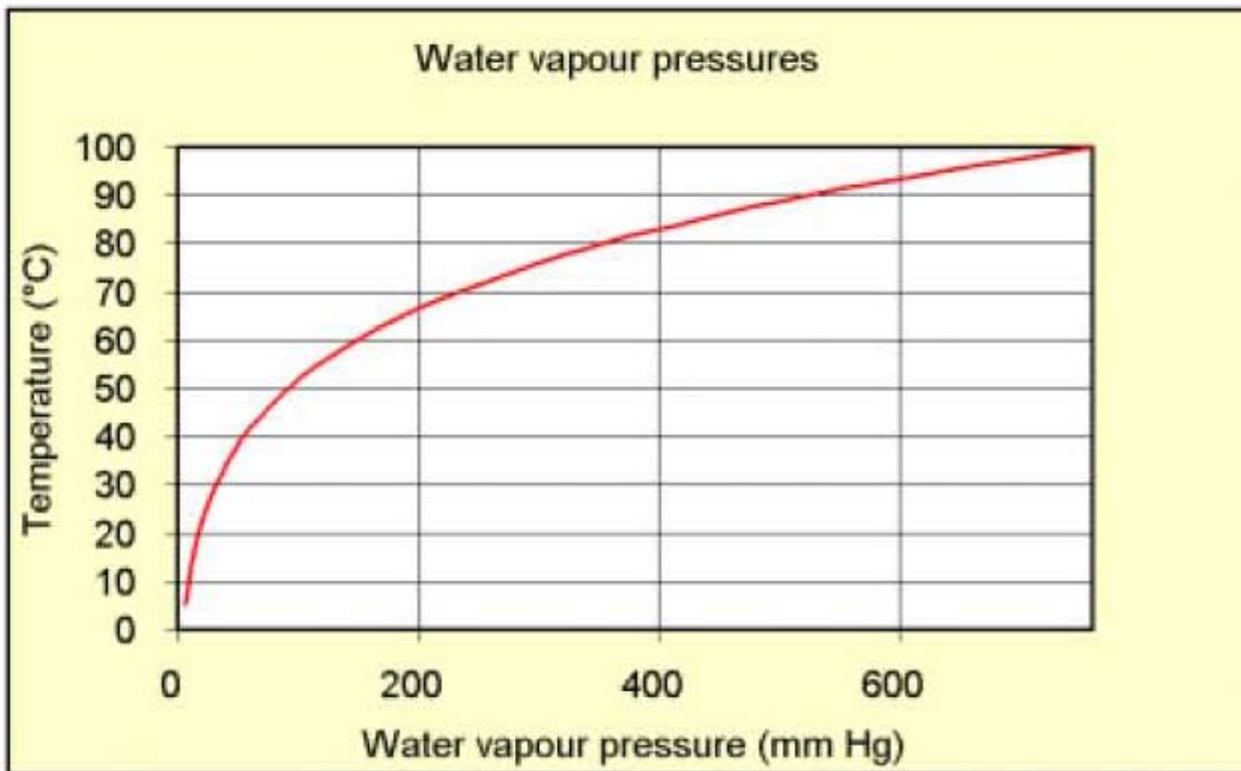


Figure 1: The water vapour pressures from the water vapour table. A gas with 6.5 v% H₂O has a vapour pressure of 49.7 mm Hg (100 v% water has a vapour pressure of 758 mm Hg) and a dewpoint of 38°C

Tubular air preheater

1. Check for ash accumulations on the air side of Airpreheater.
2. Replace the airheater tubes if necessary.
3. Check condition of insulation and replace where required.

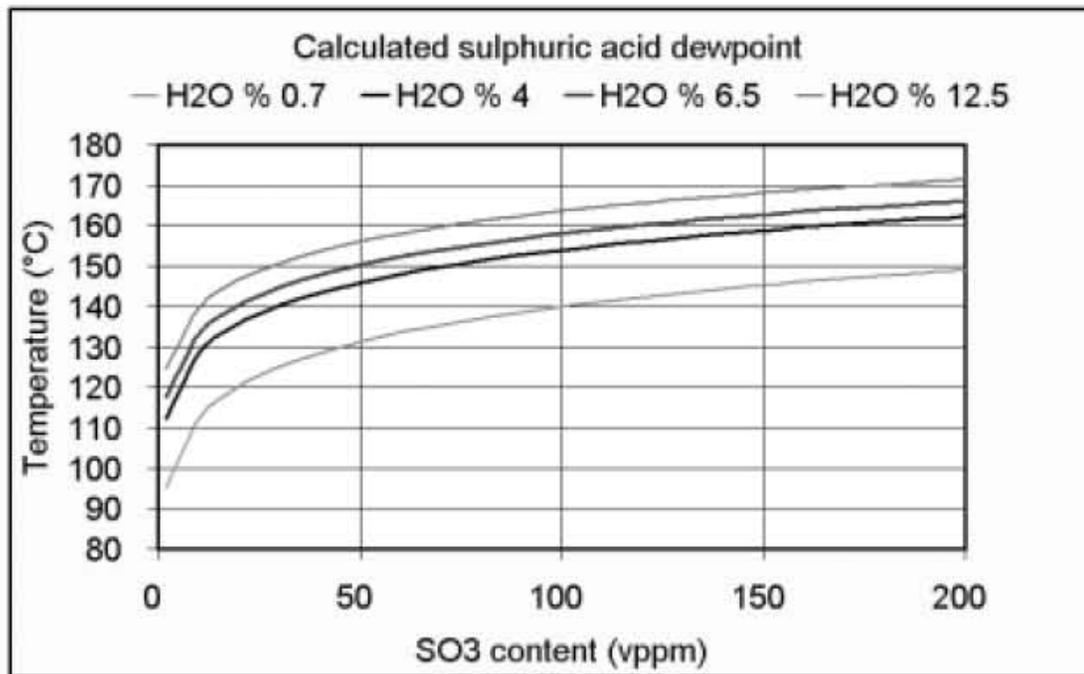


Figure 2: Dewpoint behaviour of SO3 at various water contents of the gas, calculated from the formula of Verhoff

(Formula: $T_{\text{dewSO}_3} = 1000 / \{2.276 - 0.0294 \ln(P_{\text{H}_2\text{O}}) - 0.0858 \ln(P_{\text{SO}_3}) + 0.0062 \ln(P_{\text{H}_2\text{O}} \cdot P_{\text{SO}_3})\}$;
with pressures (P) in mm Hg)

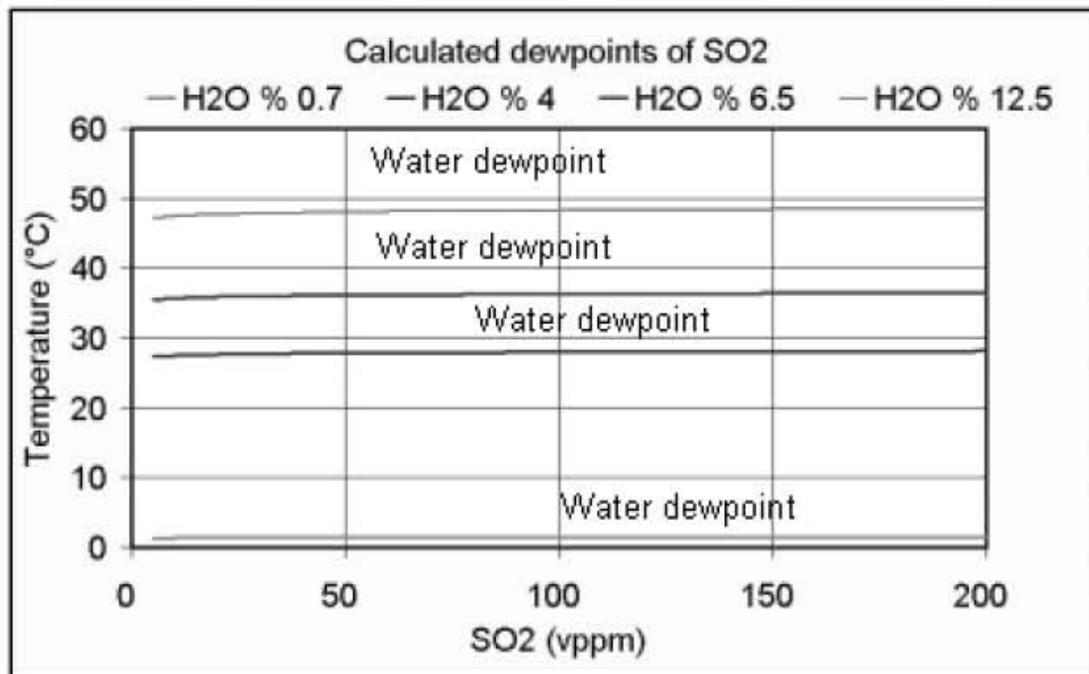


Figure 3: Dewpoint behaviour of SO2 at various water contents of the gas, calculated from the formula of Kiang. The SO2 dewpoints for all gases are lower than is the water dewpoint of the gases.

$T_{dewSO2} = 1000 / \{3.9526 - 0.1863 \cdot \ln(P_{H2O}) + 0.000867 \cdot \ln(P_{SO2}) - 0.00091 \cdot \ln(P_{H2O} \cdot P_{SO2})\}$; with pressures P in mm Hg)





Airbox

1. Check the Airbox is free from bed material. This shall be checked by opening the manhole door.
2. Check the air nozzles are intact and free from damage.
3. Check the fuel line cross is not damaged.
4. Replace all air SS nozzles once in five years. If made of CI replace every two years. Check & compare the DP drop readings taken at the time of commissioning.

Airbox

1. Check bed thermocouples are intact. Replace failed / eroded thermocouples.
2. Check the ash drain pipes are free from damage.
3. Air flush the bed pressure gauge tapping.
4. Back flush the draft gauge impulse line and ensure the line is free from blockage.

PA Fan

1. Inspect the drive shaft bearings and lubricate. Check the dust seal is OK. Replace the bearing if necessary. Carry out trial run to ensure the bearings are OK.
2. Realign the motor and the fan if the vibration readings were abnormal. Remove the cause for vibration.

Fuel feeding system -Bunker

- Do not store wet coal in bunker during boiler shut period. This will cause lump formation.

Fuel feeding system -Feeder

- Check gearbox oil contamination & replace.
- Recondition worn out / broken rotary feeders.

Fuel feeding system – Drag Chain Feeder

- Check & adjust chain tension.
- Clean the feeders.
- Check the flight fasteners have not given way.
- Check gearbox oil contamination & replace.

Fuel feeding system -Feeder

- Replace distorted chutes.
- Damaged chutes cause fuel flow problems

Fuel feeding system -Feeder

- Replace mixing nozzles once in two years.
- Replace broken fuel cross.
- Patch up / replace worn out fuel piping.

Pressure parts system - Downcomers

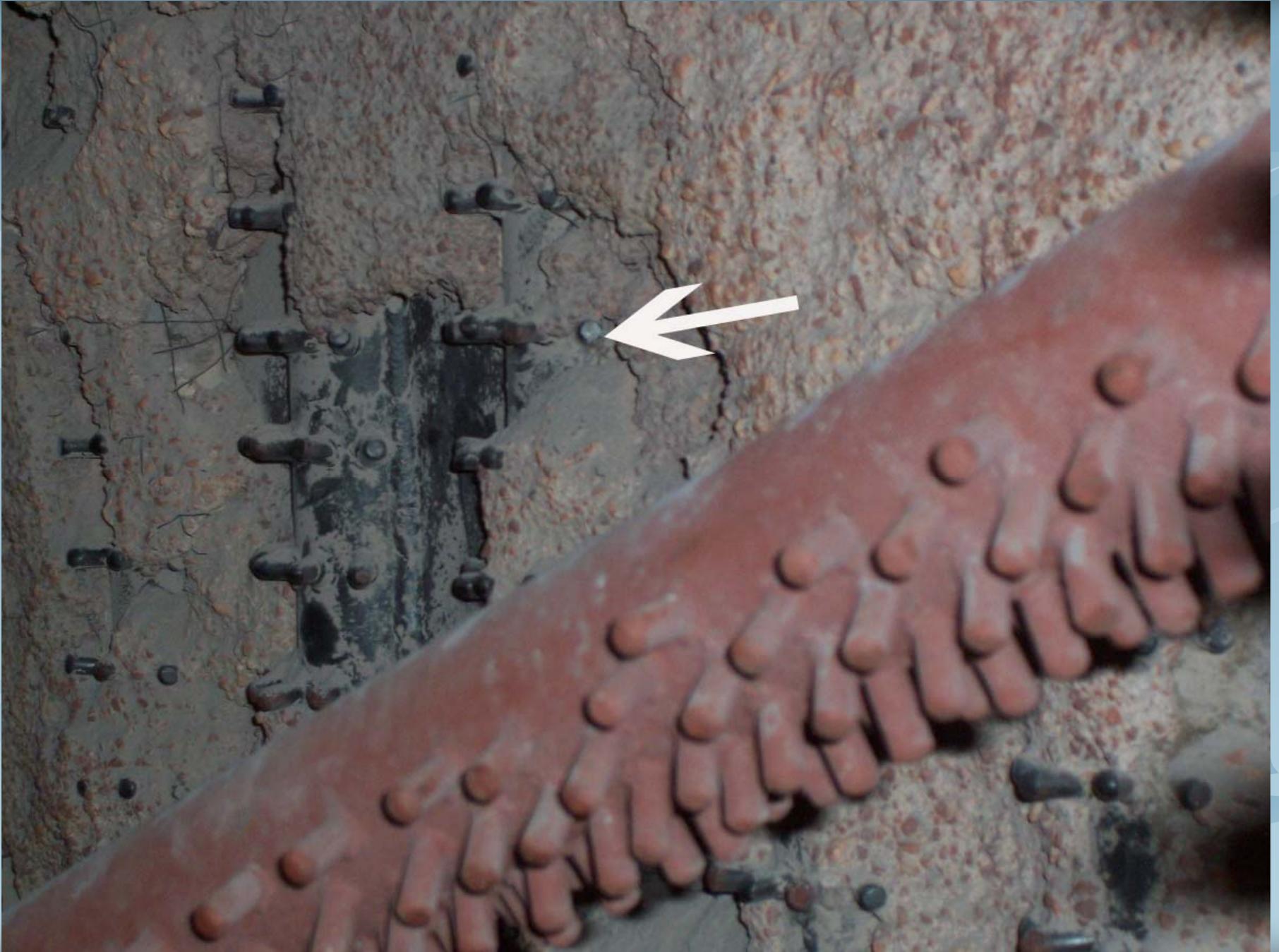
- Wherever spring supports are used, check its loading is not disturbed.
- Check & replace insulation wherever damaged.
- Blow down from Downcomers if drains are provided.

Pressure parts system -Risers

- Wherever spring supports / hanger rod supports are given check whether load is taken by supports. Otherwise diagnose & rectify the defect.
- Check & replace damaged insulation.

Pressure parts system –Bed coils

- Check for preferential erosion of bed coils at bends
- Check studs are not eroded away at fuel feed points.
- Check coils are sagged.
- Check bed coils are swollen at any place.
- Check thickness with ultrasonic thickness meter.



Air ingress & ash leakage in SH area

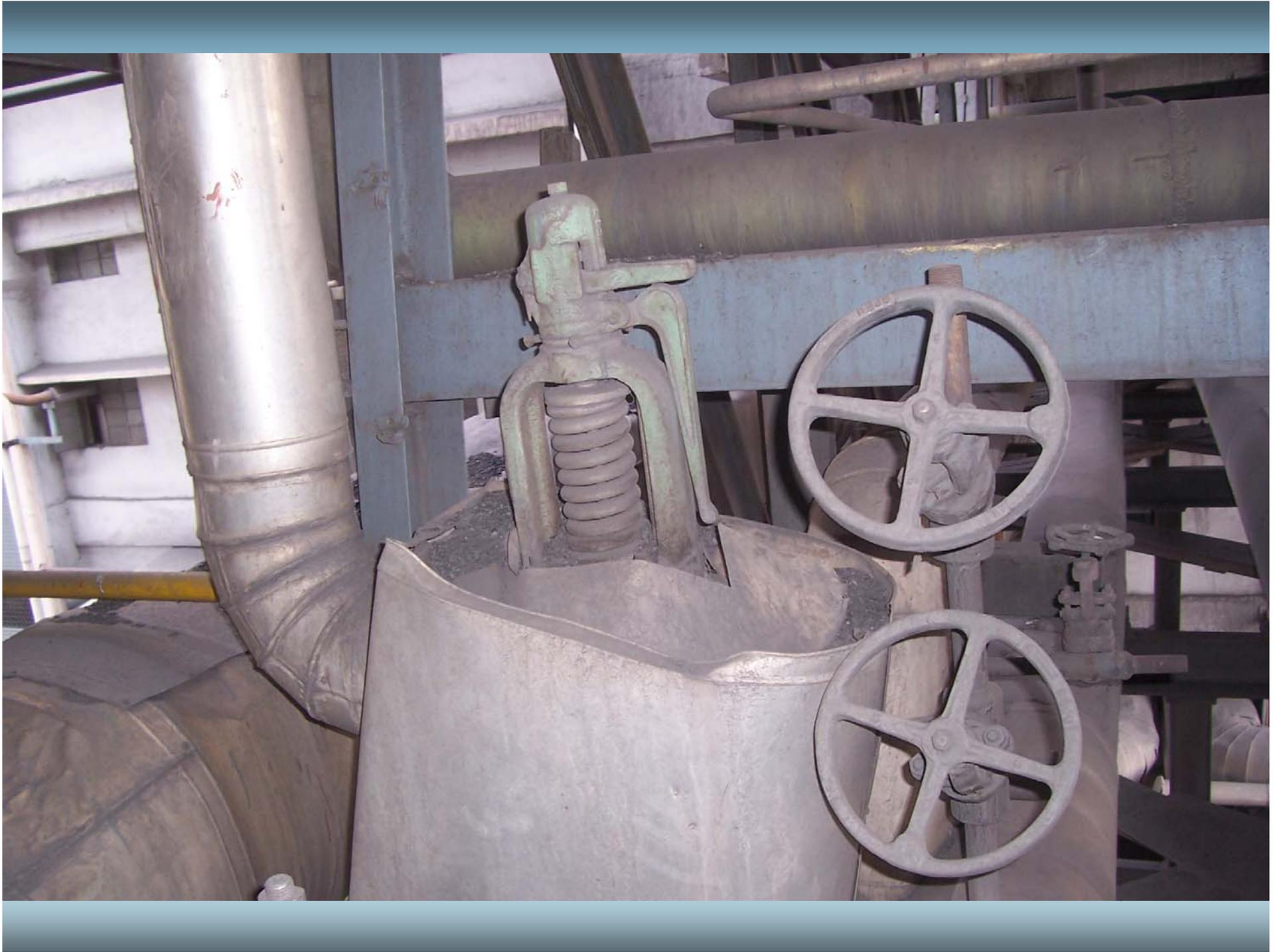


Pressure parts system - Valves

- Replace / attend the valves which were reported to have got passing, gland leakage problem.
- Lubricate the valve stems with temperature lubricant.

Pressure parts system - Valves

- Float the safety valve by hand popping when the boiler is restarted after the annual shut.
- Check the steam discharge pipe is not blocked by foreign material such as dead birds.



Pressure parts system –steam drum

- Check cyclones / Chevron separators are intact. There shall be no sign of short circuiting of steam direct to demister assembly.
- Check there is no sign of carryover inside the steam drum.
- Check whether there is sign of corrosion or presence of corrosion products.

Pressure parts system –steam drum

- Check the feed distributor pipe is not choked with solids.
- Check chemical distributor pipe is not choked with chemicals.
- Ensure the vortex breaker at downcomer is not disturbed.







Drum inspection



Pressure parts system –steam drum

- Check the condition of insulation and replace to avoid corrosion.
- Check the condition of demister pads.
- Direct water level gauges shall be in working condition. Replace gaskets / glass if necessary.
- Check the low water level switch is working satisfactorily. Check the functioning by physically lowering the drum level.

Pressure parts system –Lower drum

- Check for loose deposits. If found diagnose for the cause.
- Check baffles if any, are not disturbed.
- Ensure the vortex breaker at downcomer is not disturbed.
- Check the feed distributor is free from deposition of solids.

Pressure parts system –Boiler bank

- Check for erosion of tubes in the boiler bank.
- Check the gas baffle refractory blocks are in good condition.
- Check protective shields are in place.

Pressure parts system- horizontal Superheaters

- Check the SH coils are not touching the waterwall panels.
- Check SH coils are not distorted due to overheating.
- Check for localized overheating spots.
- Check the hanger tube support clamps are in place.
- Check the sleeves at waterwall penetrations are not eroded.
- Check superheater bends are not eroded.





Pressure parts system- Superheaters

- Check the erosion protection shields are in tact and not causing any damage to coils.
- Check for external deposits / ash fouling / ash slagging.
- Check superheater coils are not sagged.

Pressure parts system- Pendant Superheaters

- Check the SH coils are not touching the nose panels.
- Check SH coils are not distorted due to overheating.
- Check for localized overheating spots.
- Check spacer bars are in place and not distorted.
- Check coil to coil pins had not failed.

Pressure parts system- Pendant Superheaters / Economiser

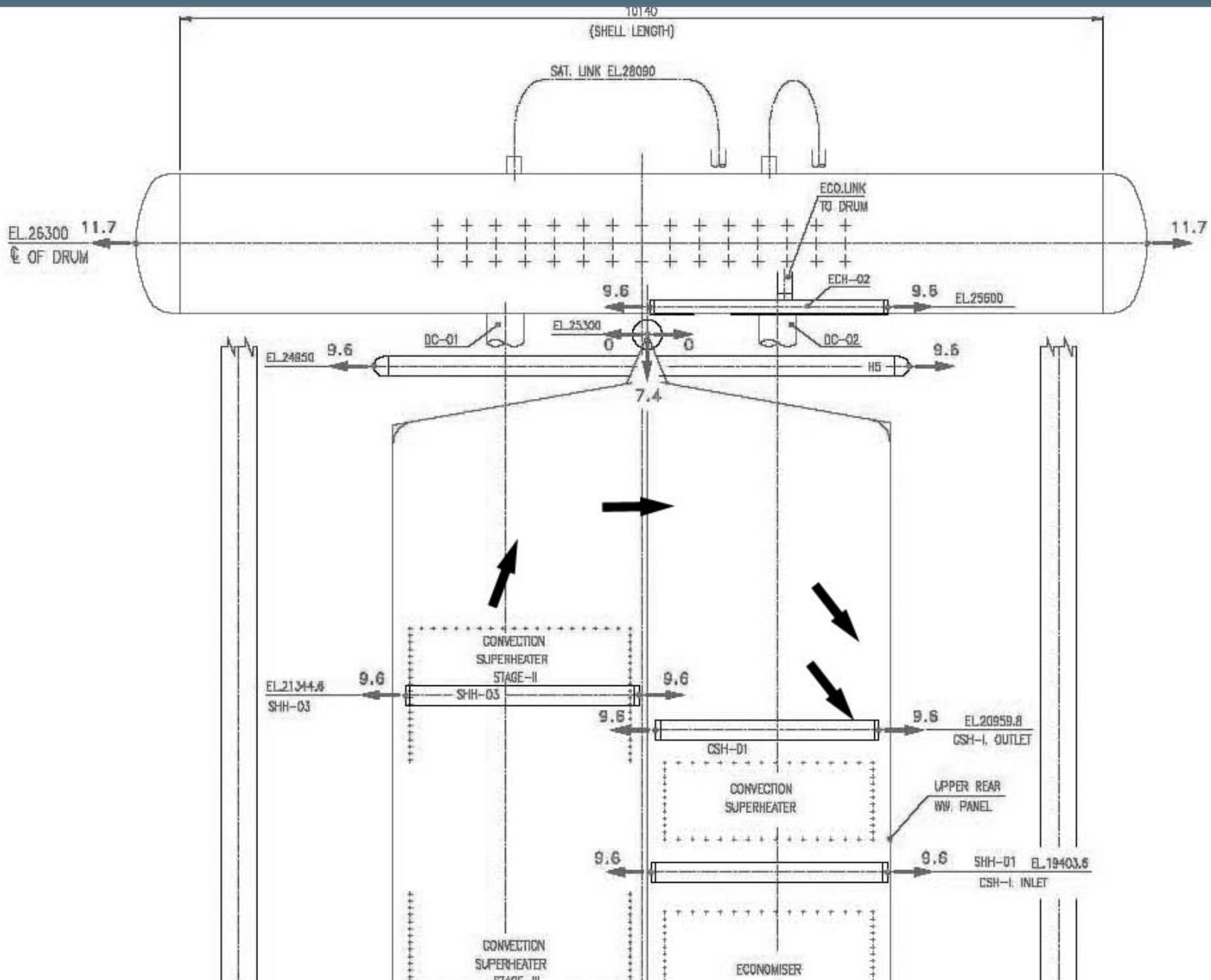
- Check superheater bends are not eroded.
- Check the erosion protection shields are in tact and not causing any damage to coils.
- Check for external deposits / ash fouling / ash slagging.
- Check superheater coils are eroded.

Economiser supports failures













Pressure parts system- Pendant Superheaters

- Replace / attend the valves which were reported to have got passing, gland leakage problem.
- Check the condition of the spray nozzle. Clean the nozzle from any dirt accumulation.
- Clear the strainer ahead of spray nozzle.
- Remove insulation of DESH once in three years & verify damage due to cold water impact. (In case the sleeve tube is worn out such damages are experienced.)

Pressure parts system- Pendant Superheaters

- Look for external corrosion of tubes near the cold ends of the coils.
- Check the Economiser coils are not touching the water wall panels.
- Check Economiser support beams are in tact.
- Check expansion joint at Eco casing is not failed.
- Check economiser support clamps are in place.
- Check the sleeves at water wall penetrations are not eroded.
- Check economiser bends are not eroded.

Pressure parts system- Pendant Superheaters

- Check the erosion protection shields are in tact and not causing any damage to coils.
- Check economiser casing insulation is proper.
- Check for any sign of preferential erosion of economiser coils at entrance and exit.
- Check for external deposits / ash fouling.
- Check for any localized erosion spots.
- Check the inspection doors are not leaky.
- Check for any local ash accumulations which are likely to cause erosion.



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Deposits in superheater – fuel characteristic







Piping system

- Check pipe hangers / Support setting is not disturbed,
- Wherever the drains are available, operate the drain valves when the boiler is shut.

**A main steam line
has come off the
support. It is a
safety problem
when the pipe
collapses due to
thermal
expansion**



521	UNITS
	Kg
6.73	SPRING RATE /mm
733	PRE-SET LOAD
674	OPERATING LOAD
5653	SERIAL NUMBER
360	LOCATION MARK
955	MAX. LOAD

PIPE SUPPORTS INDIA (P) LTD.
 DOOR No. 6, PLOT No. 29,
 INDUSTRIAL ESTATE,
 PERUNGUDI,
 CHENNAI - 600 096, INDIA

TEL : 91-44-24961003
 FAX : +91-44-24961395

INSTALLATION

TYPES TS1, 2, 3, DS, ES & TA

1. CONNECT UPPER & LOWER SUSPENSION CONNECTIONS.
2. TRANSFER PIPE LOAD TO SPRING UNIT BY ROTATING TURN BUCKLE CLOCKWISE
3. PRESET/MULTI-LOCKNUTS ABOVE PISTON SHOULD NOW BE FREE TO ROTATE
4. PRESET/MULTI-LOCKNUTS BENEATH PISTON ARE NOW READY TO CARRY HYDRAULIC TEST LOAD/LAGGING ETC.
5. ON COMPLETION OF HYDRAULIC TEST ETC., UNSCREW ALL PRESET/MULTI-LOCKNUTS FROM PISTON AND BOTTOM PLATES.

Piping support not proper



Piping support already exceeded permitted load on spring



Buckstay

- Check the buck stay corner links permit the free expansion of water wall.
- Check the seismic guides are functional.

Buckstay corner links



Boiler seismic guide



Ash hoppers

- There shall be no accumulation of ash that can lead to corrosion / mechanical damage to the hoppers.
- Hopper maintenance doors shall be leak proof.
- Hopper flanges shall be leak proof.

Deaerator

- There shall be no indication of deaerator tower corrosion
- Trays shall be free from suspended impurities / plugging
- All spray nozzles shall be intact.

Deaerator



Deaerator



Duct system

- Look for leakage in flange joints and rectify.
- Check internal duct supports are not eroded.
- Check anchors / guides are in tact.
- Check for unusual ash accumulations inside gas flow path.
- Check flow splitters / straighteners are not eroded.

Leakage in duct expansion joint



Isolation dampers / Gates

- Check damper flap linkages are not eroded away.
- Check flange ropes have not given way.
- Check lip seals are in tact.

Regulating dampers

- Check damper flap linkages are not eroded away.
- Check actuator linkages are working.
- Check flange ropes have not given way.

Fabric / Non metallic expansion joint

- Check fabric is not deteriorated punctured.
- Check mechanical / rain protection cover is in tact.
- Check flange ropes have not given way.

Metallic expansion joint

- Check expansion joints are corroded away. If insulation is poor this is experienced.
- Check the condition of expansion joints that are vulnerable for rain water accumulations.

Mechanical dust collector

- Check for accumulation of ash in the MDC cones.
- Check for erosion of MDC cones, Inlet vanes, Outlet pipes.
- Check the sealing rope between the tube sheet and the MDC cone is in tact.
- Check the ash is freely discharged from the feeder.

Mechanical dust collector

- Check the ash feeder is free from air ingress. If air ingress is observed, then the rotor needs reconditioning to reduce the clearance between stator and the rotor.
- Check the insulation of the MDC is intact. Repair the insulation wherever necessary.

Electro static precipitator

- Check all heaters are functioning.
- Check for cold spots inside ESP casing. Diagnose and rectify the cause. In most case it could be the insulation damage.
- Check the support insulators of emitting / Collecting electrodes are intact. If found cracked replace to avoid mishaps.
- Check all doors are leak proof without outside air ingress in to the ESP.

Electro static precipitator

- Check the rapping system is functioning properly. Replace broken hammers / anvils.
- Check hoppers are not flooded with ash.
- Check & replace insulation wherever disturbed.
- Check ESP roof cover is not damaged. Water stagnation over the roof brings down the life of ESP.

Chimney

- If the refractory is internally lined check the condition.
- Check for corrosion of chimney at the bottom and at top.
- Look for localized corrosion at places of attachment welds such as flanges / vortex breakers / ladder supports.

Coal preparation system

- Check crusher condition and recondition / replace hammers.
- Inspect vibratory screen and replace damaged screen cloth.

Ash handling system

- Replace ash feeders/ Rebuild rotors for required narrow clearances.
- Check contamination of gearbox oils and replace.
- Replace seals of dense phase ash transmitter vessels.
- Replace eroded bends of piping.
- Replace vent filter bags if punctured.
- Check the condition of screw flights of ash conditioners & replace / recondition flights.

Instruments & controls

- Calibrate drum level transmitter & deaerator level transmitter if not tallying with local level gauge.
- Initiate trip signals and verify the trip actions are working.
- Calibrate steam flow transmitter if error was present.

Instruments & controls

- Drain condensing pots and fill fresh water.
- Check the actions of standby control valves, motorized isolation valves which were not checked for, when boiler was in service.
- Calibrate draft gauges/ pressure gauges / temperature transmitters.

Instruments & controls

- Back flush impulse lines of draft transmitters before connecting back.
- Calibrate fuel flow meters.
- Calibrate I/P converters of control valve / Dampers as required.

Sample coolers & on line analysers

- Calibrate all pH, conductivity, O₂, SiO₂ on line analyzers.
- Replace electrodes as per time schedule.

Sample coolers & on line analyzers

- Calibrate O₂ Gas analyzer every six months. Cross check O₂ value with Orsat analyzer. Excess air affects the fuel consumption.