Boiler Light-up

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Objectives and other details of modules

Duration – 90 + 75 minutes

Training aids

Power point Presentations

Reading Material

Objective

At the end of the session participants will be able to:

- **Understand and develop comprehensions about:**
  - ✓ Initial checks for boiler Start up
  - ✓ Steps involved in Boiler Cold Start up
  - ✓ Operating procedures & sequence, leading to boiler light up
- **Develop Skills for:**
  - ✓ Initiating the Steps for Boiler Cold Start up
  - ✓ System & Auxiliaries' Line up for Start up
  - ✓ Conducting sequential operations up to Purge Ready

Contents

- ❑ Boiler Light-up Sequence – Brief Overview
- ❑ Electrical System Charging – General Note
- ❑ Establishing Mechanical Systems - General Note
- ❑ Boiler Light-up Activities – Descriptive View

Boiler Light-up Sequence

1. Electrical System Line-up and charging
2. DG Set Trial and synchronization with station supply
3. Auxiliary Steam Supply Charging (conditional)
4. Establish Circulation of Cooling Water System
5. Establish ACW System
6. Establish DM Transfer and CST make-up system
7. Establish DMCW System
8. Establish Compressed Air System
9. Establish main condensate system into operation

Boiler Light-up Sequence contd.

10. Normalize LP Dosing System

11. Establish Feed water system into operation

12. Initial Boiler Filling line-up

13. Boiler Drum Filling with BFP

14. Establish BCW Pumps into operation

15. Starting and warm-up of fuel oil system

16. Line-up of Flue Gas path

17. Establish APHs into operation

18. Put ID Fans into operation

Boiler Light-up Sequence contd.

19. Put FD Fans into operation

20. Furnace Purging

21. Rechecking Boiler line-up for light-up

22. Boiler Light-up with LDO

23. Boiler Pressure raising with HFO

General note on electrical system charging

Pre- Charging Checks

Before charging of any Bus following minimum checks should be completed:

1. All PTWs and cross PTWs on Bus, Transformer and Incomers are cancelled.
2. ***What are PTWs and cross PTWs?***
3. A physical verification of system condition is made to ensure no isolation tags are there and no maintenance/ operation person is working on the system under question.
4. Permission is available from Electrical maintenance team for charging of the system (the presence of electrical maintenance team is favorable). IR healthiness and other tests have been conducted by the EM team. The bus coupler and normal incomers interlock checking has been done. The relays are set/ tested for faithful behavior as per OEM settings/ system requirements.
5. The bus earthing rods are in retracted position.
6. None of the breakers are in closed condition. This can be checked from mechanical indicator available at Breaker. (**What will happen if some of the breakers are in closed condition)**

General note on electrical system charging contd.

Pre- Charging Checks

7. None of the breaker relays are in operated condition (for the breakers not under maintenance).
8. DC Supply is available with the bus.
9. All the breakers are in racked-in and in service/ test position (conditional).
10. All the breakers doors are locked.

Charging Sequence:

- Transformer charging –

a. Simultaneous charging of two or more transformers on same bus are not recommended to avoid very high magnetization inrush current and hence system upset (**On what parameters of system transformer magnetization inrush current depends**).

b. The transformer should be charged on no load i.e. from primary side only.

c. For first charging of transformer after major overhaul or breakdown maintenance, the transformer should be kept charged on no load for some duration to monitor its parameters like oil temeperature, winding temperature etc.

d. Paralleling of transformers is not allowed (**What will happen during paralleling of transformers**)

General note on electrical system charging contd.

Charging Sequence:

- Normal Incomer charging to Bus –

a. The voltage parameter of all three phases of the bus after bus charging should be observed. Any discrepancy should be immediately informed to EMD.

b. The incomer breaker relays should be checked for normal position.

c. This way the other incomer also should be charged for Bus having two sections.

- Incomer/ Bus Coupler Interlock checking – The interlock opening and closing of bus coupler on failure and restoration respectively of normal incomer should be checked for healthiness.
- The loads on bus (drives and transformers) should be charged last. Here, also simultaneous charging of transformers from same bus is not recommended. Also, simultaneous starting of motors should not be allowed to avoid system upset due to high starting current (**why motor starting current is so high and on what parameters it depends**)
- **Note:** For HT drives frequent start and stop is strictly prohibited in view of safeguarding the insulation from very high temperature rise.

Electrical System Charging and DG set synchronization

1 & 2 - Electrical System Charging and DG set synchronization

The complete charging sequence depends upon the topology of the system. In general topology following is the charging sequence

- 400KV/ 220KV switchyard buses back charging through transmission/ start-up power line.
- Station Transformers Charging
- 11/ 6.6/ 3.3 KV station Buses charging
- 11/ 6.6/ 3.3 KV unit buses charging through ties
- 415V station service switchgear charging
- 415V unit service switchgears charging
- Offsite transformers and buses charging

- **The bus voltages may be maintained using tap changers available with station transformers. (why is it intended to maintain bus voltage)**

- Once charging is complete it is always advisable to ensure availability of DG set. The DG set is started and DG supply is synchronised with Emergency switchgear normal supply from station source.

General note on mechanical system line-up and establishment – The basic definitions

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Permissives, Protections and Interlocks - Definition

- Permissives are set of conditions required to be satisfied before start of an activity to safeguard the system/ equipment/ process. Thus, permissives are implemented in series.

- Once an activity starts based on system parameters, Protections are set of conditions that initiate the closure/ stoppage of that activity to safeguard the system/ equipment/ process. As any condition in the set should stop the activity, they are implemented in parallel.

- Interlocks, as the name itself suggests, are the set of condition for an activity, where one activity initiates another activity to safeguard the system/ equipment/ process.

- To understand the line-up and start-up sequence of mechanical systems, rationale of permissive, protections and interlocks for the system should be understood in detail.
- Once understood for one type of system, the same can be implemented to various systems of same category.

General note on mechanical system line-up and establishment contd. – Water System

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Water System

Note: It is worthwhile to understand that most of the water systems shall be governed by principle of operation of centrifugal pumps. (what are the characteristics of centrifugal pumps)

Permissives

- Source water tank level adequate - minimum flow and churning
- Suction valve open – minimum flow and churning
- Discharge valve closed at starting – motor protection
- Recirculation valve full open – minimum flow and churning
- Bearing temperature normal – oil viscous properties and babbit damage
- Motor winding temperature normal – insulation protection
- Lube Oil Pressure adequate – Oil film and babbit damage
- Suction strainer DP normal – minimum flow and churning
- Suction Pressure Adequate – NPSH and Cavitation

General note on mechanical system line-up and establishment contd. – Water System

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Protections

- Source water tank level Lo-Lo - minimum flow and churning
- Suction Flow Lo-Lo – minimum flow and churning
- Pump started and Discharge valve not opened (open limit switch) in specified time – minimum flow and churning
- Bearing temperature Hi-Hi – oil viscous properties and babbit damage
- Motor winding temperature Hi-Hi – insulation protection
- Lube Oil Pressure Lo-Lo – Oil film and babbit damage
- Suction strainer DP Hi-Hi – minimum flow and churning
- Suction Pressure Lo-LO – NPSH and Cavitation
- Bearing Vibration Hi-Hi – Bearing and equipment damage
- Pump running and discharge pressure Lo-Lo – Various reasons

Interlocks

- Pump started and discharge valve open command (**Integral bypass valve**)
- Pump stopped and discharge valve closing command
- Pump started and cooling water valve open command
- Auxiliary/ stand-by lube oil pump start on lube oil pressure lo
- Auxiliary pump start on discharge header pressure lo

General note on mechanical system line-up and establishment contd. – Water System

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Mechanical line-up

1. Close all drain valves in the system
2. Filling of source tank and putting make-up system on auto
3. Open suction valve
4. Check suction DP of strainers for normalcy, cleaning if required
5. Close discharge valve
6. Open recirculation valve
7. Ensure all the manual isolation valves downstream is opened.
8. System venting – system includes suction line, pump casing and discharge line – This is done to avoid mechanical hammering and pump cavitation. The system is provided with number of vents at aforesaid locations, the same should be opened and kept open till water comes out after initial bubbling. Suction side venting is done before start-up and discharge side venting after start-up.
9. Start lube oil pump and put other on auto stand by
10. Ensure all permissives are fulfilled

General note on mechanical system line-up and establishment contd. – Water System

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Start-up and post start-up observation

1. Start the pump and record discharge pressure and starting current. Starting current should come down immediately after current shoot-up (1-2 sec), if it does not shut down the pump immediately. Discharge pressure should be adequate, if not close the pump immediately.
2. Observe that, the discharge valve and integral bypass valve follow auto sequence.
3. Observe that the cooling water line valve opens on auto.
4. Observe that auxiliary oil pump stops on auto after a time delay (if applicable)
5. Record the normal running, current, pressure and flow.
6. Record the bearing and winding temperatures.
7. Record bearing vibrations.

General note on mechanical system line-up and establishment contd. – Lube Oil System

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Lube Oil System

Note: It is worthwhile to understand that most of the lube oil systems shall be governed by principle of operation of positive displacement pumps. (what are the characteristics of PD pumps)

Permissives

- Source oil tank level adequate – minimum flow and churning
- Suction valve opened – minimum flow and churning
- Discharge valve opened (generally manual) – motor protection
- Bearing temperature normal – oil viscous properties and babbit damage
- Motor winding temperature normal – insulation protection
- Suction strainer DP normal – minimum flow and churning

Protections

Practically the PD pumps do not have any protection except the electrical motor protection which may have origin in its mechanical parameter disturbance

- Bearing temperature hi-hi
- Bearing vibration hi-hi
- Motor winding temperature hi-hi

General note on mechanical system line-up and establishment contd. – Lube Oil System

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Interlocks

- Stand-by Pump start on discharge header pressure lo-lo

Mechanical line-up

1. Close all drain valves in the system
2. Filling of source tank and putting make-up system on auto
3. Open suction valve
4. Check suction DP of strainers for normalcy, cleaning if required
5. Open discharge valve
6. Open recirculation valve (if applicable)
7. Ensure relief valve is adjusted and through
8. Ensure all the manual isolation valves downstream is opened.
9. System venting – system includes suction line, pump casing and discharge line – This is done to avoid mechanical hammering. The system is provided with number of vents, the same should be opened and kept open till oil comes out after initial bubbling. Suction side venting is done before start-up and discharge venting after start-up.
10. Start the pump and put other on auto stand by.

General note on mechanical system line-up and establishment contd. – Lube Oil System

Start-up and post start-up observation

1. Start the pump and record discharge pressure and starting current. Starting current should come down immediately after current shoot-up (1-2 sec), if it does not shut down the pump immediately. Discharge pressure should be adequate, if not close the pump immediately.
2. Record the normal running, current, pressure and flow.
3. Record the bearing and winding temperatures.
4. Record bearing vibrations.

General note on mechanical system line-up and establishment contd. – Air System

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Air System

Note: It is worthwhile to understand that most of the air systems shall be governed by principle of operation of radial and axial fans. They have similar characteristics to the centrifugal pumps (what are the characteristics of radial and axial fans)

Permissives

- Suction damper/ gate open – minimum flow and churning
- Discharge damper/ gate closed at starting – motor protection
- Bearing temperature normal – oil viscous properties and babbit damage
- Motor winding temperature normal – insulation protection
- Lube Oil Pressure adequate – Oil film and babbit damage
- Control oil pressure adequate – process requirement and flow modulation
- Inlet Guide Vane minimum – Motor protection

General note on mechanical system line-up and establishment contd. – Air System

Protections

- Fan started and Discharge gate not opened (open limit switch) in specified time – minimum flow and churning
- Bearing temperature Hi-Hi – oil viscous properties and babbit damage
- Motor winding temperature Hi-Hi – insulation protection
- Lube Oil Pressure Lo-Lo – Oil film and babbit damage
- Bearing Vibration Hi-Hi – Bearing and equipment damage

Interlocks

- Fan started and discharge valve open command
- Fan stopped and discharge valve closing command
- Fan started and cooling water valve open command
- Auxiliary/ stand-by lube oil pump start on lube oil pressure lo
- Stand-by fan start on discharge header pressure lo

General note on mechanical system line-up and establishment contd. – Air System

Mechanical line-up

1. Open suction gate/ damper
2. Close discharge gate/ damper
3. Ensure all the manual/ actuated isolation gates/ dampers downstream are opened.
4. Start lube oil pump and put other on auto stand by
5. Ensure all permissives are fulfilled

Start-up and post start-up observation

1. Start the fan and record discharge pressure and starting current. Starting current should come down immediately after current shoot-up (1-4 sec), if it does not shut down the pump immediately. Discharge pressure should be adequate, if not close the pump immediately.
2. Observe that, the discharge gate opening sequence is followed.
3. Observe that the cooling water line valve opens on auto.
4. Record the normal running, current, pressure and flow.
5. Record the bearing and winding temperatures.
6. Record bearing vibrations.

General note on mechanical system line-up and establishment contd. – Steam lines

Mechanical line-up

1. Open drain and close only when steam starts coming out of it for sufficient time.
2. Open vents and close when steam starts coming out of it for sufficient time.
3. Keep all the supply branch lines in isolated condition.
4. Open the feed line valve slowly to avoid thermal hammering. If available, utilize the integral bypass valve for the purpose.
5. Open the branch lines as per requirement.

Boiler Light-up - Mechanical System Establishment

- Auxiliary Steam Supply Charging (conditional) – If the other unit is operational or start-up boiler is available. Otherwise, this activity is taken up after Boiler light-up with LDO and steam source taken from MS line.

  Auxiliary Steam – HFO heating and steam atomization, Vacuum Pulling, Deaerator pegging etc.

- Establish Circulation of Cooling Water System – As per note – Single source of water supply.

- Establish ACW System – As per note – Cooling of DMCW system

- Establish DM Transfer and CST make-up system – As per note – Unit DM make-up system

- Establish DMCW System – as per note – Equipment cooling water system

- Establish Compressed Air System – as per note – instrument air supply

Boiler Light-up - Mechanical System Establishment contd.

- Establish main condensate system into operation – as per note
- Normalize LP Dosing System – as per note – BFP suction dozing of NH_3 and $N2H_4$ **(mechanical and chemical deaeration)**
- Establish Feed water system into operation – as per note

Boiler Filling

Initial Boiler Filling

A. Pre-start checks

- Boiler water circulating pumps motor cavity is properly filled and vented.
- Sufficient quantity of DM water is available.
- DM Make-up system is available for LP/ HP chemical mixing and diluting.
- Sufficient quantity of chemicals is available.
- Local drum gauge glass and Hydrastep are available.
- Unit equipment cooling water is in service.
- At least one CEP is in service through LPHs bypass valves.
- MDBFP with its auxiliaries is available and in service through HPHs bypass valves.
- Hotwell make-up system is available and lined-up.
- Instrument air is available to the controllers.

Boiler Filling contd.

Initial Boiler Filling

B. Boiler Filling Line-up

Note: All the drains in Boiler water circuit should be closed, all the vents of boiler should be opened, all the drains in steam circuit shall be open

- Close boiler low point drain valve to IBD tank and economiser header drain valve.
- Ensure that CBD and EBD valves are closed.
- Ensure that BCW pumps casing drains are closed.
- Ensure SH and RH fill valve at low point drains are closed.
- Ensure that SF and RH spray block valves are closed.
- Open all the suction spool vent valves of BCW pumps.
- Open all the vents in Boiler water circuit viz. Economiser and drum vents.

Boiler Filling contd.

Initial Boiler Filling

C. Boiler Filling

The Boiler filling rate shall be so chosen that the drum top-bottom level difference is always <50 DegC and feed water and drum bottom metal temperature difference is < 30 Deg C.

- Open the Economiser inlet and recirculation valve.
- Open low range isolation valves and close high range isolation valve.
- Start LP dozing system for chemical feeding.
- Gradually open the low range feed control valve to start boiler filling. Ensure condensate cycle make-up comes on auto for make-up requirement. Ensure that level rise is observed in hydrasteps.
- Close the BCW pumps' vents when bubble free water start coming out of it. Likewise, close the economiser header vents when bubble free water comes out. Keep the drum vent open. Keep the steam circuit drains and vents open.
- Close the low range feed control valve when drum level reaches NWL + 50-100 mm. Take proper care that water does not enter SH circuit. Use emergency drain valve if required.

Boiler Filling contd.

C. Boiler Filling

- Stop chemical dozing pump.
- Ensure that the BCW cooling water lines are lined-up and the pump's discharge valves are full open.
- Start the first BCW pump and ensure that its motor current, motor cavity temperature and DP across pump are normal.
- It is to be noted that when the drum filling is started with BFP, the riser tubes are not filled as they are at higher elevation than drum required level. They are filled only when BCW pump is started. Thus, start of first BCW pump depresses the drum level a lot. Take fresh feed to maintain drum level.
- Similarly, take second and third BCW pumps also in service. The drum level depression with second and third pump is not that severe.

Establishing Boiler Air and Flue Gas Systems

- **Starting and warm-up of fuel oil system** – as per note – If the auxiliary steam is not available, this activity can only be taken-up after boiler light-up and auxiliary steam charging through MS source. The HFO temperature is to be maintained at 120 Deg C using HFO heaters.

Line-up of Flue Gas path and putting APH in operation

Additional checks

- APH peepholes and manholes are closed.
- APH fire water system is charged.
- APH fire sensing system is available.
- APH soot blowers are available and in retracted condition.
- The PA, SA and FG inlet and outlet dampers for APH are closed.

APH Operation

- The lube oil system line-up and start-up as per note.
- Start the APH with air motor. This is done to avoid starting of APH main motor on load.
- Start APH main motor and ensure that the air motor cuts out on auto.
- Flue gas and secondary air inlet and outlet dampers may be opened.

Establishing Boiler Air and Flue Gas Systems contd.

Putting ID Fan into operation

Lube Oil system and air system checks – as per note

Additional checks

Note: The ID Fan suction damper/ gate works has the same function as the FD Fan discharge damper/ gate i.e. fan loading.

- The slag bath is filled and trough seal over flow is established. The corresponding HP/ LP ash water pumps are running.
- The economiser ash hoppers flushing apparatus is filled with water.
- The ESP hoppers gates are closed tight.
- Boiler observation and access doors are closed. One or two access doors may be kept open to give suction to ID Fan. Alternatively, the FD Fan circuit may be kept through for giving suction path to ID Fan.
- The access doors cooling water is in charged condition.

ID Fan operation

- Start the fan and observe its parameters like starting current, motor and bearing temperatures, vibrations etc. Modulate the IGV for fan loading and maintaining negative pressure in Furnace.

Establishing Boiler Air and Flue Gas Systems contd.

Putting FD Fan into operation

Lube Oil system and air system checks – as per note

Additional checks

- One ID Fan is running.
- Windbox manhole doors are closed. SADs are available and modulating from CCR.

FD Fan operation

- Start the fan and observe its parameters like starting current, motor and bearing temperatures, vibrations etc. Modulate the BP of FD and IGV of ID fan for fan loading and maintaining negative pressure in Furnace.
- Open the scanner air fan inlet dampers.
- Putting Scanner Air Fans into operation – as per note

Furnace Purging

Furnace purging is done before boiler light-up to ensure that any incombustibles in the Furnace and APH are removed from the circuit to avoid furnace explosion due to unwarranted and uncontrolled burning of these left out combustibles when fuel supply is given for light-up.

Furnace Purging Permissives

- Burner Tilt Horizontal and air flow < 40%
- PA Fans OFF.
- Drum Level normal.
- Air Flow > 30%.
- All Feeders off.
- All LONVs and HONVs closed.
- Windbox to Furnace DP satisfactory.
- No Boiler trip command.
- Aux Air dampers modulating

Furnace Purging

Furnace Purging Permissives

- All hot air gates of mills closed.
- All scanners sensing no flame.
- All pulverisers are off.
- HO trip valve is closed.

Furnace Purging Operation

- As these permissives are satisfied, purge ready lamp goes on. Push the Push to Purge button to start purging cycle of 5 minutes. Ensure that none of the permissives are lost during the purging else the cycle will be disrupted.
- As the purging cycle is completed, Boiler MFT can be made to reset.
- The Boiler is ready to be lighted-up. The HOTV and LOTV may be opened to proceed for Boiler light-up.

Line-up for Boiler light-up – Additional Checks

Boiler Line-up for Light-up

Additional Checks

- All the wall blowers and LRSBs are available and in retracted condition.
- Furnace temperature probes are available.
- Boiler spring loaded safety valves are in gagged condition if light-up is done before safety valve setting. If safety valve setting has already been done, the gagging should be removed.
- Bottom ash equipment such as clinker grinder, hydraulic pumps, jet pumps etc. are available.
- Again ensure that Boiler water circuit drains are closed. All Boiler vents are open. All Boiler steam circuit drains are opened.
- Ensure that Boiler stop valves along with IBVs are closed.
- Start-up vents are open full.
- The SCAPH is charged. If the aux steam is not available, this activity to be taken after Boiler light-up. **(Purpose of SCAPH and cold end corrosion).**

Boiler Light-up – Oil Firing

Boiler Light-up operation – Taking Oil Guns in service

- Increase the LDO and HFO pressure to set value. Wait till HFO temperature reaches 110 Deg C (if aux steam is available).
- Insert the furnace probe till it advances 80-100%.

  Note: The HFO should be taken in service only if the furnace temperature reaches > 200 Deg C. The light-up should start with LDO guns only.
- Press pair 1-3 start button for LDO/ HFO and observe the following sequence:

- AB-1 oil gun advances
- The spark rod advances.
- The ignitor is ignited for 15 secs.
- The atomising steam/ air valve opens.
- LONV/ HONV valve opens.
- Discriminating scanner senses flame.
- HEA ignitor is retracted after 15 secs.
- AB-3 oil gun advances after a time delay of 30 secs.

Boiler Light-up – Oil Firing contd.

Boiler Light-up operation – Taking Oil Guns in service

Note: it is advisable to start the gun after scavenging first. The scavenging is done to ensure gun nozzle cleaning and dislodge any oil accumulation in the gun and hence choking. The scavenging sequence has following steps:

- Press corner gun scavenge button.
- Oil gun advances
- The spark rod advances.
- The igniter is ignited for 15 secs.
- LONV/ HONV valve remains closed.
- Atomizing steam/ air valve opens.
- Scavenging valve opens.
- Scavenging valve closes after 15 secs.
- Atomizing air/ steam valve closes.
- HEA igniters is retracted after 15 secs.

Boiler Pressure Raising

- With the corner gun taking in service the corresponding corner SAD shall also be opened.
- After establishing the AB elevation LDO/ HFO guns as indicated by discriminating scanner, the next elevation HFO guns may be taken in service.
- The rate of rise of Boiler metal temperature should be maintained as per OEM guidelines. For, very cold start-up it is advisable to maintain rate of rise of drum metal temperature at 1.5-2 Deg C / minute and rate of rise of steam temperature at 5.0 Deg C/ minute.
- HFO guns should be taken only when furnace temperature as indicated by temperature probes reaches > 200 DegC.
- The gun shall start in the same sequence as described earlier.
- As the guns are taken furnace pressure may become slightly positive. Adjust the ID fan IGV to maintain -10 mmwc furnace pressure. Alternatively, the Furnace pressure control can be kept on auto.

Boiler Pressure Raising contd.

Boiler Pressure Raising

- As the guns are taken into service, Oil header pressure drops, maintain the header pressure at recommended value. In case of HFO, the temperature also may drop, maintain the temperature by adjusting the heater input steam flow.
- At drum pressure of 2 KSC the drum vents are to be closed.
- The CBD opening and HP dosing should be done as per chemistry recommendation.
- The manual SH vents also shall be closed at drum pressure of 12 KSc or MS pressure of > 2KSC. The start-up vent shall remain full open.
- Ensure that the Furnace temperature does not exceed 540 Deg C, in view of no steam flow in Reheater section, as HP/ LP bypass is not charged.
- The elevation fire is proven once 3 / 4 scanners are proven. The flame failure protection is armed. In the event of 1 or no scanners sensing flame, the elevation will vote for Boiler Flame Failure Protection.

Boiler Pressure Raising contd.

Boiler Pressure Raising

- In case of Aux steam not available, once the main steam pressure reaches 12-16 KSC, the aux steam header shall be charged from MS source. The HFO gun shall then be taken into service after HFO heating.
- Before putting HFO gun into service, APH steam blowing shall be necessarily started to avoid any oil accumulation and unwarranted fire at later stage when APH inlet temperature approaches 200 Deg C.
- When sudden steam flow is taken from drum viz. MS stop valve opens, HP Bypass opens, drum swelling can take place. Avoid ingress of water in SH circuit by reducing the flow first. The drum swelling is followed by fast level depression. Avoid water starvation by increasing the FW flow fast. (**What is Drum Swelling and Sinking, Drum Swelling and role of TDS**).
- Once furnace temperature approaches 400 Deg C, we can start with putting mills into operation.

Boiler Pressure Raising contd.

Boiler Pressure Raising

- If auxiliary steam was available before light-up, the parallel activity of vacuum pulling and HP/ LP bypass charging could be carried out. If it was not available, Boiler must maintain oil firing to cater Aux steam header charging and condenser vacuum pulling. After vacuum pulling only HP/ LP bypass can be charged. **(Why)**
- After LP bypass charging only, reheater steam flow is established. Proceed with Mill firing.

Thank You