the ahmedabad electricity co.ltd

training centre

sabarmati

boiler,turbine and alternator

emergency operations

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BOILER EMERGENCIES :

(1) Boiler trips on M. F, T.:

(A) CAUSE:

1. Both F.D. Fan loss
2. Both I.D. Fan loss
3. Emergency trip bush putton operate
4. Turbine trip
5. Flame failure

6. Reheater protection operate
7. Air flow less than *3TI,*
8. Boiler drum level High High
9. Boiler drum level level Lo-Lo
10. Furnace draught Hi Hi
11. Furnace draught Lo-Lo
12. Loss of D,C. supply to FSSS
13. Loss of A.C. Power when any elevation in service
14. Loss of all fuel trip

(B) ACTION:

1. Purge the boiler for five minutes with minimum 30% of full load air flow remove all the combustible from the furnace
2. Correct the cause of tripping
3. Relit up the boiler after purge is complete take the boiler on load synchronise T. G.. set as per. Procedure

(2) Drum Revel Lo: and Lo-Lo:

(A) CAUSE

1. Failure of boiler Feed pump
2. Failure of drum level controler
3. In advertant opening of E. B. D.
4. Extra ordinary change in load (sudden reduction in load)@
5. Water tube failure
6. Sudden, tripping of one or more mill

(B) EFFECT : (1) Boiler may be damaged badly

(C) ACTION

(A) If drum level is within safe limit, (drum level Lo alarm at-1 00 mm., Lo Lo alarm and trip at-180 mm),

1 Attempt to control with feed valve

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2. If feed valve is struck up open parallel line valve.
3. Take care while increasing feed flow that running B.F.P. do not trip on feed flow high.

4. If low level is due to tripping of feed pump start stand by pump if it is on manual. If second pump is not available and running pump has tripped one attempt should, be made after checking at the cause of tripping provide there is not electric fault.
5. Check mill tripping, rectify it.

B If water level drop below 180 mm. of normal level allow to trip the boiler on drum level Lo-Le to protect the boiler drum and tubes.

(3) Drum level high and Drum level High High

(A) CAUSE

1. Failure of drum level controller
2. Extra ordinary in crease in load.
3. Sudden increase in firing rate

(B) EFFECT

1. Water may, enter turbine and serious damage to may occur
2. Joints and valves on main steam pipe work leaks
3. Carry over with sharp Fan in super heater temperature will foiiov4 turbine vibration

(C) ACTION

(A) If drum level is within safe limit (drum level Hi at +1 00 min. drum level High High trip at +180 mm). (a-I) Attempt to control 01 with feed valve. (a-2) If feed valve is struck up close scrles valve. (a-3) Attempt to control durm level rising with blow down E. B. D. and C. B. D.' (a-4),.Cloee E_2 valve and allow feed pump to run in recirculation. (a-5) if above measure fail-trip the feed pump.

(B) If high level is due to load rising

If high level rise is above +180 mm. of normal level-allow boiler to trip on drum level High High

If Main steam temperature drop takes place open steam pipe drains,

(4) Furnace draught Hi and Hi Hi

(A) CAUSE

1. Due to faulty operation of Fan control
2. Disturbed combustion

3. Un controlled fuel entry
4. Sudden failing of clinkers in the furnace
5. Soot blowing is in operation

(B) ACTION

1. It it is due to faulty operation of L D. OR F. 0. Fan control, take it on 'manual and maintain the furnace in suction
2. Disturbed combustion : take oil support, check flame condition, check the hinge galc pin and try to control the furnace in suction and adjust, the fuel input-if variation in furnace draught is heavy do not insert burners

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3. If furnace presure has increased beyond limit (+125 MM Wcl at D OR' DR Mm wcl at 'E' Stn). allow boiler to trip on furnace draugh high high.
4. Always operate soot blowers at load more than 80Y, of the rated capacity, keep oil support during soot blowing, never try to change the mills or RFO burners, during soot blow operation, if furnace gets disturbed immediately retract the blower in service and stop it and try to maintain furnace in suction.

(5) Boiler pressure high

(A) CAUSE

1. Sudden drop in load (May be due to variation in the system frequency)
2. Un controlled fuel entry
3. Mai operation of pressure controller
4. Turbine generator Trips

(B) EFFECT:

1. Disturbance in drum water level
2. Safety valves may lift is pressure rise is up to that extent
3. Generator load increase

(C) ACTION

1. Control fuel input and drum level
2. Check R. C. variator hinge gate pin for over feeding of mill
3. Adjust the load on i..nit if it has dropped
4. If T. G. has tripped Fist, boiler will also tripped but S. V. may lift

(6) Loss of 1. D. Fan

(A) CAUSE

1 Fan trips due to any one of the following reasons

a. Electrical motor protection

b. Fan bearing temperature becomes high hight

c. Motor bearing temperature becomes very high

d. Loss of lubrication

e. Loss of C. W. to tube oil cooler

(B) EFFECT

1. Furnace may get pressurised.
2. Corresponding F. D. Fan will trips
3. Due to F. D. Fan tripping, mill trip at ('E' Stn)

(C) ACTION

1. Restore furnace pressure by lowering F. D. Fan if on manual control and maintain furnace in suction (-12mm. WCL)
2. Total air flow declines
3. Reduce the proportion mill group and reduce load tp 50y, and prossure deloading.
4. Ensure that inter connecting damper has opened
5. Restort the I. D. Fan checking cause of tripping and taking corrective action and increase the loading.

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(7) Loss of both the I. D. Fans:

(A) CAUSE As above

(B) EFFECT: Unit will trip on sequential operation

(C) ACTION

1. Restart 1. D. Fan checking cause of tripoing and taking corrective action
2. Purge the boiler-lit up the boiler and take the unit back on load-according to availability, of 1. D. Fan.

(8) Loss of F. D. Fan

(A) CAUSE :

1 F. D. Fan trips due to any of the following reasons

a Electrical motor protection

b Fan bearing temperature very high

c Motor bearing temperature very high

d Loss of lubricarion

e Corres pending 1. D. Fan has tripped

(B) EFFECT :

1. Furnace will go on suction
2. In 'E' Station pulvarisers will trip till bottom 3 pulvarisers remains service
3. Drum level will get disturbed

(C) ACTION :

1. Restore furnace draught by lowering F. D. Fan loading to~12 mm WCL
2. Ensure inter connecting damper has open
3. Reduce the preparation of pulvarisers (if not tripped) and reduce load tp 50@,' on pressure deloading
4. Restart F. D. Fan checking the cause of tripping and after taking corrective action,
5. Restor the load on the unit

(9) Loss of both the F. D. Fans

(A) CAUSE As above

(B) EFFECT: Unit will trip on sequential operation

(C) ACTION

1. Restart F. D. Fan checking cause of tripping and taking corrective action
2. Purge the boiler-lit up the boiler and take the unit back on load according,to availability of F. D. Fans

(10) Loss of P. A. Fans

(A) CAUSE

1. Electrical protection operate
2. Fan bearing or motor bearing temperature very high
3. CLASS *'K* OR M. F. T. Operate

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(B) EFFECT

1. Pulverise will trip till bottom 3 pulvarisers remain in service (at 'E' Station)
2. Bottom two pulvariser will vip (at 'D' Stn)

3. All the pulvarisers tripp if P.A. header pressyre goes down to low valve and if RFO guns are not in service unit will trip on flamo failure

(C) ACTION

1. Reduce the load on unit controlling drum level
2. Immediately close the discharge damper and inlet vave if not.
3. Restart the P. A. Fan checking the cause of tripping and taking corrective action
4. Increase load on it
5. It unit has tripped or all the mill has tripped restart it

(11) Both P.A. Fan trips

(A) CAUSE As above

(B) EFFECT

1. Trips all the pulvarisers on p. A. header pressure low
2. Trips the unit on Flame Failure if RFO guns are not in service

(C) ACTION :

1. Restart P. A. Fan checking cause of tripping and taking corrective action
2. Start the pulvarisers and @g - a the load on unit
3. Purge the boiler and take it on load if it has tripped.

(12) Furnace Slagging

(A) CAUSE

1. lnproper air disttribution
2. Low excess air
3. Excessive negative B. T.
4. Low feed water temperature
5. Soot blowers no operated regularly
6. Check fineness of coal

(6) EFFECT

1. High gas temperature leaving the (S H.1R.H.) furnace zone
2. Super heater gas temperature and reheater will 90 high
3. Fused ash or slug deposite can occur on furnace wall and other surface exposed to h gas temperature.

(C) ACTION

1. Control superheater temperature and reheater temperature with help of spray control burner tilt operation
2. Remove ash deposits with help of wall-blowers and increase beat transfer rate in w wall 2 S. H. and restore spray to minimum and burner tilt.
3. Check the feed water temperature., if H.P. heaters not in service commission if avail or reduce load.
4. Check excess air

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(13) Reheater Protection

(A) CAUSE

1. When mills are in service the gas temperature at reheater zone Will go high and inruficient steam flow thro reheater during low load.
2. Suddenlass of steam flow thro reheater when boiler is at higher load

(B) EFFECT :- 1. Damege reheater tube due to overheating

(C) ACTION

1. while raising the pressure during lit up ensure sufficient steam flow is established before gas temperature risies tp 5400C.
2. In case of closing of H.P. turbine quick closing valve. ALP. t~ae quick cl@ a 9 valve or Ist govering valve at load more than 30% or pulvarbm in service all the pulvarisers should tripped in 'D' Stn. OR unit should tripped operating reheater protection in 'E' Station

[14] High Superheater and reheater temperature

(A) CAUSE

1. Furnace slagging
2. Use of top elevation mill on load
3. High burner tilt
4. High excess air
5. Low feed water temperature C.H.P. heaters not in service
6. Sudden increase in firing rate to increase steam prepare
7. In adequate spray
8. Lodging of socts on the water walls comsiderably

(B) EFFECT

1. Rise in (+ ve) positive turbine expansion
2. Creep rate increase in tube metal, turbine parts, steam piping

(C) ACTION :

1. Check feed water temperature-if H.P. heaters are avadawe put in sorVice-4f notteduce loa
2. Slow down firing rate
3. Acjust mill loading increase loading on lower mill reduce on top mill, change over mill i possible
4. Reduce excess air if More
5. Check spray control and burner tilt
6. Initiate wall blowers and restore spray and B.T. if.

(15) Low superheater and reheater temperature

(A) CAUSE

1. Dirty S.H. & R.H.
2. Inadequate air flow
3. High spray
4. Low burner tilt
5. Tripping of top elevation mill
6. Too high feed water temperature
7. Sharp increase in load and pressure drop
8. High drum level

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(B) EFFECT

1. Turbine expansion may become negative (reduce)
2. Chilling may occure accompanying thermal stresses.

(C) ACTION

1. Operate long soot blowers
2. Check air flow-increase if necessary
3. Raduce spray if more
4. Take B.T. up word
5. Check feed water temperature
6. Avoid sharp rise in load to boiler pres ure drop

7. If it is due to high drum level-allow unit to trip and opan main steam drain..;.

(16) Ignitor fails to ignite ' (Eddy plate fype ignitor).

(A) CAUSE :

1. power supply fail
2. Low H.S,D. oil header pressure.
3. Improper H.S.D. flow.
4. Atomising air header inadequate.
5. lgnitor air header pressure improper.
6. Windbox furnace P not proven.
7. H.S.D. trip valve does not open.
8. Spark plug dirty defective
9. Power transformer trouble.
10. M.O.V. oil valve defective.

(B) EFFECT

1. Delay in boiler lit up.
2. Main burner does not stabilize.
3. Low ignitor windbox pressure.
   (a) It may he due to ignitor air fan not developing required pressure, air leakages recircuation of air through leaky dampers on stand-by fan.
   (b) Low ignitoriwind box pressure leads to flame proven signal AP lost-clean the H P. and L.P. hose
   (C) Spark plug cooling air will be less carbonise deposits on spark plug, incomplete combustion.
4. High ignitor air pressure and high air flow
   (a) lgnitor flame blowout,
   (b) Over loading of ignitor tan motor.

(C) ACTION :

1. Check the power supply if power supply lamp on fuel firing paneiCP-4 does not glow.
2. Ensure fuel oil header pressure O.K.(14 Kg.) if not check oil pump, duplex strainer recirculating valves,
3. H.S.D. flow is to be measured, clean the strainers, check orifice and adjust the oil flow

4. If atomising air pressure is not 6 Kg cm2 check the station air compressor ranning, clean the air filter replace filter cartidge if require.
5. Adjust ignitor windbox pressure to 75mm.
6. If P does not establish check fan delivery pressure. check air leakage around fgnitor clean the hose.

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7. if trip valve does not open check air pressure, check solenoid check all L.O. cor," rtl does not proven. check H.S,D. header pressure.
8. Clean dirty spark plug, Proken or loose wire replace, check spark plug insulator.
9. Check power transformer for output broken wire, and loose connection.

17 Oil burner fails to ignitor

(A) CAUSE :

1. Oil pressure and oil temperature inadequate.
2. Steam pressure and steam temperature inadequate
3. Oil gun dirty damaged
4. Scanner problem.
5. lgnitor problem.
6. Insufficient auxiliary air.
7. Inadequare combustion air through the damper.

(B) EFFECT :

1. Delay in start of pressure rising if boiler is OFF load.
2. Damage or loss of ignition if boiler is ON load.
3. Unburnt and oil drop in the furnace along with water wall.

(C) ACTION :

1. Check oil pressure and oil temperature.
2. Check oil burner tip free from slug clean it.
3. Check burner orifice size, if, required replace it.
4. Cheek burner is free to insert and is fully advance otherwise on carrier tube local fire take place.
5. Check atomising steam pressure and temperature.
6. Check burner is scavenged properly before entering the oil.
7. Check scavenge valve passing, may destroy the flame.

8. Check auxiliary air is sufficient if not adjust its damper.
9. Check ignitors-full advanced, spark is proper.
10. Cheek flame detector, if required clean it.
11. Check scanner is not faulty.
12. Cheek slag formation at scanner, mouth.
13. Cheek the B. T. zero for initial firing,
14. Adjust the combustion air properly through the damper.

(18) Loss of Coat in one mill

(A) CAUSE

1. R. C. Xariator pin sheared off.
2. Coal interruption.
3. Coal pipe chockaga.
4. RCV trip.

(B) EFFECT :

1. Loss of pressure and load.
2. Mill ampere loading will reduce.

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3. Increase in coal air temperature.
4. Mill differential will reduce.
5. Excess air will increase.
6. Variation in drum level (low).
7. On loss or coal large quality of secondary air enters and no coal with primary air enters the boiler there is a risk of fire blown out-unless, excess air is reduced.
8. No coal flow alarm appears.

(C) ACTION :

1. increase loading on remaining mills.
2. Insert supporting RFO burners to stabilise ignition. if mills are at distance.
3. Control temperature on mill that has lost close hot air.
4. Check, R. C. V. shear pin if sheared OFF replace it, remove stone-big coal which is the cause of sheared off.
5. If coal pipe chockage noticed establish coal flow.
6. If stand-by mill is available start it and load it.

7. Restart the RCV if possible.

(19) Mill trip :

(A) CAUSE :

1. Motor protection acted.
2. No coat flow protection acted.
3. Mill discharge valve closed.
4. Mill motor bearing temp, rise abnormally.

(B) EFFECT

1. Steam pressure drops reduction in load.
2. Drum level may disturb.

(C) ACTION :

1. Check mill tripping reason, make appropriate action to restart.
2. Start stand-by mill available.
3. Maintain generation ateam pressure

(20) Over-loading of the mill

(A) CAUSE :

1. Hinge gate pin stuck up on sheared OFF.
2. R. C. V. speed controller tails if on auto.

(B) EFFECT

1. Mill differential will go high
2. Mill ampear loading high
3. Mill rejection increase
4. Mill out let temperature will be low
5. Boiler pressure increase

(C) ACTION

1. Trip the feeder

2. Observe mill ampear and mill draught
3. Reduce other mill loading so that safety valve do not blow

(21) Flame instability (Flame failure).

(A) CAUSE

1. Oil burner flame is disturbed if it is in service

2. loss of coal in any mill and excess air high
3. Mill in service are at distance - loading is less than 50% and 1. E. to mill is not sufficier
4. Checkage of any one discharge coal pioe
5. Too low OR furnace differential. Do not operate soot blower at low load.
6. Water wall tube failure

(B) EFFECT :

1. Boiler becomes unstable and ignition may lost
2. Heavy fluctulation in furnace draught

(C) ACTION :

1. Determine the cause and correct it
2. It can be visualise by nacked eye of flame detector
3. Check oil burners if required take out of service and clean it
4. Put oil support to coal burner, if flame is not much disturbed or put off
5. Check the mill discharge pipe for chockage-take put that mill from service
6. loss of mill coal take out mill from service adjust excess air and give oil support proper 1. E. available.
7. Adjust the windbox to furnace diffrence to 40 mm if load is less than 30.1' and 1 oo if more than 30(a)
8. Check the furnace for tube failure

(22) Furnace explosion

(A) CAUSE

1. Accumulation of un burnt fuel during lit up
2. Improper burning
3. Inadequate air
4. Starting of mill without proper 1. E.
5. Oil valve leaks-oil dropping inside
6. Improper sequential start
7. Fuel inlet valves are not shut OFF properly when fire is extingnished,
8. Secondary combustion

(B) EFFECT

Furnace explosion can cause extensive damage

(C) ACTION

1. Always purge the boiler with 401' full load air for about five minutes No cut short purging is allowed.
2. Always check the flame with help of scanner pesonal check
3. When boiler load is less than 30.1. keep at least 3 out of 4 RFO guns adjecent,to ry OR mill loading is less than 50'/. and adjucement mill loading sh(Yiid be more than 50"/

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4. Adjust fuel air ratio if it is less
5. Keep oil Suport while soot blowing is in operation
6. Keep close watch on 0_2 /' oxigen content in gas at air heater in let should be 4 to 4.2%
7. Maintain minimum 30% of full load air duriug lit up and low load to ensure air rich furnace
8. Watch fire when ever combustion R gine changed (burbers introduced, taken out of service of furnace draught fluctuates)
9. If ignition is lost, tripped unit and purge the furnace
10. Ensure fuel inlet valve, P. A. Fan, mill, hat air gate to mill are closed and tripped
11. Do not introduce fuel without sufficient 1. E.
12. Regularly check proper functioning of FSSS equipments

(23) Water wall tube failure

(A) CAUSE

1. Starved water wall
2. Suspained flame impingement on water wall tube
3. Block tube, erroded tube, pitted tube, salt deposits
4. Soot blower steam impingement
5. Circulation affedted due to open low point drains

(B) EFFECT

1. Hissing steam leakage noise from boiler
2. Unstabic, flame fluctuating draught
3. Flame failure
4. High feed flow for given steam generation

5. Increase in 1. D. Fan loading

(C) ACTION

1. Every sriift check low point drain valve are closed fully
2. Every shift check the furnace., listen furnace to detect steam noise
3. Check flame not iinpining furn3CC-wnater wall
4. At first diagnosits of tube failure, start load reduction, trip out unit before darnage become serious. Quicker shut down reduces; e*ensive damage.
5. Try to locate tube at low load.
6. Don't allow the drum level to go beload a danger level (-180 M. M.)

24) Economiser Tube Failure

(A) CAUSE

1. Ash erosiom as the prime cause
2. Pitted - correded - thinned tube

(B) EFFECT

1. Increase in 1. D. Fan loading
2. Drop in **flue** gas temperature after economiser
3. Noise in economiser
4. Water coming from economiser hopper
5. High feed water consumption

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(C) ACTION

1. As soon as leakage is detected start laod reduction and trip out boiler at earlies, possible time
2. Try to locate leak through manholes before boiler is depressurised
3. Every shift check economizer hoppers for water leakage.

(25) Superheater - Reheater tube failure

(A) CAUSE

1. Sustaining high metal temperature due to water wall slagging or in adequate steam flow and high gas temperature during hot start
2. Errosion on tubes due to high excess air
3. Blocked tubes
4. Starvation of tubes.

5. Salt deposition due to high water level in drum. poor quality of spray water

(B) EFFECT

1. Hissing noise notices
2. Flue gas temperature drops
3. High feed water consumption compared to steam flow
4. Overloading on I. D. Fans
5. Errosion of other tubes and damage to S. H. tubes

(C) ACTION

1. As soon as leakage noticed start reducing **the** load and trip the boiler.
2. Listen the 5. H. -R. H. region for steam leakage.
3. Try to locate leakage through manholes before boiler is depressurised.
4. Operate the wall blowers periodically.

(26) (Regenerative type) 5, Air heater : motor trip

(A) CAUSE

1. Binding of seal wlien air heater has fully expanded.
2. Electrical motor has tripped.

(B) EFFECT

1. Air heater becomes unequally expanded and may become immorable if it has rarnainec idle for same time.
2. Side of rotor exposed to gases may expands sufficiently and cause seal to blind.
3. Secondary air temperature distribution on L. H. side and R. H. side inside the boiler may get disturbed.
4. No damage will result as long as temperature of gas entering air heater is not more than 480C'C.

(C) ACTION

1. As soon as electric motor trips. Air motor will start if on auto or start manually.
2. If it has remained idle for some time engage electric motor and start for five seconds any wait for 15 seconds, repeat operation will equalise the exnansion and than run it continuously.

3. If above trial is not successful, use hand crank to rotate the rotor about two ravolution by one man effort only. When rotor becomes free try to rotate as in procedure No. 2.
4. Once the rotor start rotating freely operate soot blowers to make It dust free.
5. Reduction in boiler load, increase in balance draught, opening of gas access door ahead of a. p. heater will helpful to make A. D. H. free.

(27) S. Air preheater fouling .. (Regenerative type)

(A) CAUSE

1. Fuel gas reaction resulting form low cold and gas temperature.
2. Addition of moisture due to boiler or economiser tube @leakage OR due to wet soot blowing.
3. Deposits in air heater basket.

(B) EFFECT :

1. Excessive pressure drop across air preheater.
2. Variation in furnace draught if partially chocked.

(C) ACTION

1. Operate soot blower with proper steam pressure and temperature.
2. If soot blower is not effective, isolate heater and water washed.
3. In worst case isolate heater, remove basket and clean it.
4. Inspect the oil detector regularly.

(28) Excessive notice from A. P. Heater

(A) CAUSE

1. Worked rotor due to excessive expansion.
2. Foreign object in rotor.
3. Bad bearing.

(B) EFFECT

1. Unusual notice.
2. Hunting in electric motor ampere merer loading.

(C) ACTION :

1. Reduce boiler load and admit more cold air.
2. Stop rotor, isolate and inspect visually.
3. Repair-replace the bearing.

29) Air preheater (Regenerative type) Fire

(A) CAUSE :

1. Improper combustion while starting after hot start of boiler.
2. Accumulation of oil vapours and unburnt carbon on air preheater.
3. Inadequate soot blowing.
4. Oil leakage in lubricating system.

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(8) EFFECT

1. Severe damage.

(C) ACTION

1. Check the oil vapour collection during start up on oil detector provided.
2. Check oil burner flame if dirty stop it and get it cleaned.
3. Keep close watch during start on hot end temperature, if unusal increase is noticed investigate immediately.
4. If temperature continuous to rise may around 11000 C to 22000 C or fire is visible shut

Off the fans and isolate; it@ from air and gas path admit the water

Do not try to extenquish with foam and other chemical, steam.

Keep rotating air preheater if fire is noticed at many place. or stopped it if it is at one place near water nozzle.

(30) Fire in Mill

(A) CAUSE

1. Excessive accumulation of pyrite or coat on mill bottom, scrapper box or hot air inlet to mill.
2. High coal air outlet
3. Mill operation with less hot air flow.

(B) EFFECT

1. It is dangerous as combination of air and pulverised fuel dust may produce explosion.
2. Dangerous for human life.
3. Coal air outlet mill temperature increase Raffidly.

(C) ACTION

1. Do not allow the mill coal air outlet temperature more than 9511 C.

2. Rejection should be taken out regularly.
3. Close hot air to feeder when feeder is stopped for more than 3 minutes with coal in it,
4. Operate mill with proper air flow. 28 T/hr. and not @s.
5. Coal with fire should not run from bunker to mil@i.
6. If fire noticed :
    (a) Shut off hot air to mill and feeder
    (b) Continue to feed coal without overloading the mill with cold air.
    (c) if, mill temperature continue to rise, cool the mill by admitting the water from duct and air seats.
    (d) If, paint peeling notice on mill and piping close hot air, coal feeding allow to clear out the mill from coal, maintain cold air flow till @ill is cold-and shut down the m open inspection door and clear the coal where necessary check the lubricants a replace if carbonising noticed.
    (e) After checking the mill from inside and found satisfactory take the nl!li into service

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Ash Slurry System Emergencies

(1) Hydrovector Path A Path B Vacuum Low

CAUSE :

1. H. P. ash water header pressure low
2. L. P. ash water header pressure low
3. Leakages in vacuum lines
4. Segregating valve, cross over valve material handling verve, vacuum breaker valvl passin-l.
5. Hydrovector nozzles are chocked
6. Wetting head nozzles, air washer nozzles are chocked
7. Chockage in air washer, wetting head, collecting tank discharge etc.

EFFECTS:

1. Fly ash hopper evacuation time will increase. Fly ash hoppers mi.1 n:)t 9.3t clean clean complitely results in tripping of E.S.P. field. Prolong or frequent such operation will

have fly ash carry over to atmosphere Et damage 1. D. Fan runner and polute atmosphere.

2. Ash water consumption will increase. It may need to stop slurry operation due to low ash water sump level without evacuation of fly ash hoppers complitely.
3. Ash water sump will becomes dirty as ash collection starts in it.
4. Water may entre hopper vacuum line and to the hopper which is in service.
5. Low H.P. or L.P. ash water header pressure will open vacuum breaker valve.

ACTIONS :

1. Never try to run fly ash syatem at low vacuum (below 150 mm).
2. Check panel vacuum gauges as it may be showing wrong due to impulse line chockage. If so -get it clean.
3. Check H..P. pump/L.P. pump discharge pressure. Switch OFF the pump. Which is discharging less and start stand by available pump. Never run the sistem at low H.P/L.P. header pressure. Ensure vacuum breaker opens when H.P.1L.P. header pressure is low.
4. Check H.P. ash water system for passing of hydro-eiectof valve to bottom ash. If passing get it attended.
5. Check the L.P. ash water system for passing of slurry sump make up valve or its by-pass valve, ash water sump aggitating, valve. If they are kept open adjust opening so as to get wetting need pressure 4 kg/am2.
6. Check the M. H. valve, sagregatting valve, cross over verve aid vacuum breaker valve fir passing. If they are passing get it attend.
7. Check vacuum fine leakages arrest it
8. Check the hydrovector water to ash water sump Dirty Water to A.W.S. is clear indication of hydrovector nozzles wetting head nozzles, air washer nozzles, vacuum line from air water to hydrovector OR ash line from wetting head to slurry sump cheek up. spare the slurry system for cleaning.

8a Periodic cleaning of hydrovector nozzles, wetting head nozzles, and air washer nozzles will reduce this problem.

8b Ensure proper flushing of slurry system with aggitating ash water sump -before and after complition of slurry system.

8c Empty out dirty ash water sump with agitating water in the a.w.s.to remove collection

from the sump.

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1. If in any one path vacuum remains low-spare it, operate second path if valves are no passing.
2. water has entre in the hopper emptying line, stop the system immediately and dry i wifhout ash through it,
3. Prolong operation with low vacuum will have cummulative effect and deteriorate th condition. Spare the system for cleaning

Fly Ash Hopper Vacuum Hish

CAUSES :

1. Material handling valve not opening
2. Fly ash not evacuating properly-due to chocking or some interuption insidethe hopper.
3. Hopper heaters are not working results in chockage of ash inside the hopper.

EFFECT:

ESP hopper level will start rising. when it touches the electrodes it gets short circa of the field and rectifire trips on under volt. This will increase burden on the next E.P. fie, It may result in fly ash carry over to ite chimney. Prolong operation or frequent operatic like this will d,-rnage 1. D. Fan runner and polute the atmosphere,

ACTION

1. Check the operation of material handling valve. If not opening partly or fully get attended.
2. Check the ash slurry sump for ash evacuation rate.
3. Check the hopper heaters regularly. If not working get it attend
4. Check the hopper by opening plug. If chocked try to clean it by poaking through it With bambu keeping in mind that hopper heaters are 'ON'
5. Ramove shep electrode or trapped baffle piebes from bottom plug. If it is not possible remove if from tcilem plug, isolate E.S,P. cas path. electrically and mechanically iss@ permit to remove it. Reduce load to 65 MW.

Bottom Ash Hopper Not Evacuating

CAUSE

1. Low hydroejector pressure

2. Big clinker trapped at the bottom ash gate
3. Any material obstructing' at the clinker grinder
4. Hydroejector to slurry line chock up
5. Hydroejector nozzle chockage
6. Unburnt REO in the bottom ash hopper
7. Forced isolation of ash slurry pumps or concerened HP or ejoctor lines

EFFECT :

1. Delay in bottom ash evacuation
2. Collection in bottom ash hopper for more than 12 hours will till the bottom ash hopp It may start over flowing through seal traph. Furnace draft fluctuation may be noticed
3. It may touch the water wall and damage the tubes, Even it results in water tube. puncti
4. Loss of generation

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ACTION:

1. Check hydroejector pressure, it should be (a) 6 kg/cm2. If not check hydroejector opening, hydroejector flushing valve passing, ash slurry sump bubleing line for passing or more opening. Try to close it if valves are passing get it attend.
2. If big clinker is obstructing the bottom ash flow, operate clinker grinder in forward reverse direction try to open~ciose bottom ash gate, open hydrojector flushing valve. This will help in rertioving the trapped clinker or crack the clinker.
3. If the pressure gauge after hydroejector shows high pressure, clear water or interupted water flow to slurry sump, clinker grinder ampear loading is fluctuating, it is clear indication of bottom ash line to slurry ,SUMP,, hock up. Open hydroejector in let pressure and observe water comingout at the slurry sump. If it does not clear out spare the bottm ash system for cleaning the line.
4. If cleen water is coming at the slurry sump and clinker grinder ampear loading (fluctuating high, no-load current and pressure at the op let of the hydroejector is low, is the intication of any material obstructing the ash, spare, the system to remove it.
5. Clean the hydroejector nozzle if found chocked.
6. Ensure that no unburnt oil is dropping inside the bottom ash hopper. Cheek the burners flame, get the burner clean if found dirty. Frequent check during boiler lit

up is required. Unburnt oil at the bottom ash may result in chockage of hydroejector nozzle or bottom ash line.

7. If time for next bottom operation is likely to extend more than 10 hrs. Reduce the load
8. Ensure proper flushing of bottom ash line after emptying bottom ash hopper.
9. Don't operate soot blowers till bottom ash hopper get cleaned.

Ash Slurry Pump Is Not Discharging

CAUSE

1. Ash slurry line chock up
2. Air lock of the ash slurry pump
3. Air slurry pump suction pipe and bond chock up

EFFECT :

1. Delay in bottom ash and fly ash hopper may re quire to reduce load on will use more oil and reduce load on the unit
2. Slurry sump level remains high. get over flow

ACTION :

1. Stop the slurry operation
2. Flush the slurry line if slurry pump discharge pressure remains high
3. Remove oir lock and when ash slurry pump amper looding comes to normal operating value start slurry operation
4. Operate slurry sump bubling valve with high pressure it will remove the ash collection at the mouth of suction pipe If may help in discharge the water.
5. Spare the system for cleaning of slurry pymp suction
6. Slurry operation at low slurry Pump amper loading should be avoided.
7. Ensure the slurry discharge line flushing time, before after complition of slurry.
8. Operate slurry with starid by. slurry pump if available or with stand by disposa: line if available and if needs.
9. If time to restart the slurry is likely to extend more reduce mill loading, introduce RE0 and if require reduce the load. and don't operate soot blowers.

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E. S. P. rectifier trip :

CAUSE

1. Snap wire causing short circuit. It will trip the rectifire on under volt.
2. Fly ash hopper level high.
3. Trouble with E. P. control panel.
4. Fault in transformer.
5. E. P. supply failure.

EFFECT:

1. Load on next rectifire will increase
2. Fly ash carry over take place resulting 1. D. runner errosion and air polution,

ACTION :

1. Check slurry operation, whether fly ash hopper get emptied. Hopper ash collection may be due to hopper not clean, ash chockage snep wire, collecting plate, hopper beffle plate pieces may restrict the ash flow.
2. If it is due to wire senpping, reduce load to 65 mw, isolate E. P. gas path mechanically and electrically. Issue permit to work on **it.** After attending it no malise t e Isolation and increase the load.
3. Check spark rate, rapping rate, hopper and shaft insulating heaters regularly and ESP ioad current for correct distribution of loacl
4. If it trips frequently, spare to cheek ESP control panel and eircuitary. Get it attended.

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Emergency operations Of TurbinewAlternator And Trippingso (110 MW.)

This high pressure, high temperature and high capacity turbine requires a treat deal of concentration during normal running operation to avoid any emergency or abnormality. It also requires lot of skills while handling it in case of an emergency. Proper analysis and then appropriate remedy should be found out in a short time. Here such emergencies, abnormalities and Drippings of the turbine alternator are liste with required remedies.

(1) Turbine Trip

CAUSE

1. Class-B Operate.
2. Class-A Operate.

3. Mft Operate.
4. Turbine over speed (FEG and REG).
5. Low lubication Oil pressure.
6. Distributing Oil pressure low.
7. Vacuum low (Exhaust pressure high).
8. Acial shift high (HM Et EM).
9. Frequency low.
10. Turbine trip P. B. pressed.
11. Turbine trip emergency leve operated.
12. LPH 1 & 2 level hig@
13. Primary Oil pressure high.
14. Turbine bearing metal temperature high (For 'E' Station)

EFFECT

Turbine trip will actuate class-A MFT.

ACTION

1. Lit up the boiler.
2. Find out the cause of tripping and rectify it.
3. If, it is not possible to roll the tutbine put it on B. G. Unit.
4. If, every thing is 0, K. then reset turbine trip (Class-B) relay.
5. Rail the turbine when turbine speed reduces to 1000 RPM. (if, parameters permits.)
6. Bring the turbine at 3000 RPM after giving required warm up time.
7. Keep watch on turbine differential expansions bg. Vibrations Et eccentricities.

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(2) Boiler Feed Pump Trip

CAUSE

1. Motor protection relay ooerates,
2. Working oil temperature high.
3. Discharge flow high.
4. Disharge pressure low.
5. Discharge temperature high.

6. Sunction Pressure low.
7. Lubrication oill pressure low.
8. Moter bgr. temperature high.
9. Bus (6.6 kv) under voltage.

EFFECT

1. If stand by pump starts boiler drum level maintains.
2. If stand by pump does not start drum level may go very low which may trip the boiler.

ACTION

1. Start the stand bypu'mp if it does not start on auto. Adjust theload to maintain thedrum level and to sustain the stand by pump to preventit's tripping on 'Feed Flow Hi'.
2. See, the proper operation of recirculation valve, warm up valve and C. W. valve.
3. Analize and rectify the fault in the main (first) feed pump. Put it on Auto.
4. Restore the 6.6 Kv-unit bus supply if it has lost and available the pumps.

(3) Condensate Extraction Pump Trips/Pumps Trip

CAUSE

1. Motor protection relay operates or disturbances in tht supply module. (Fuse blown off.)
2. Hot well level Lo-Lo.
3. 415 V auxilliary supply failure.

EFFECT

1. Deaerator level will fall.
2. Hot well level will rise.
3. Condensor vacuum will fall.
4. Unit has to be tripped unless the CEPs can be restored immediately.

ACTION

1. If one CEP has tripped see that the stand by CEP has started on Auto or not, If not, statr it on manual.
2. If the CEPs have found tripped on hot well level lo - lo, build up the hot well leve[quickly and reset the hot well level Lo - Lo ann and start CEPs immediately.

3. Reduce the unit load if stand by CEP is not available to control the d6aerator level and, rectify the problem in the CEP which has tripped.

N.B. Stand by CEP will start on Auto on operating CEP discharge header pressure Lo - L(> protection.

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(4) Condensate Booster Pump Trips

CAUSE :

1. Expander level very high or very low.
2. Trouble in 415 V electrical supply (e.g. It's 415 V module trips)

EFFECT :

1. If full load is being maintained the level in hot well will rise.
2. Deaerator level will fall.

ACTION :

1. Expander level may go very high/very low due to trouble in expander level controller. So, take expander level controller on manual and try to maintain the expander level. If, it maintains start CBP if it is on manual,
2. If it is difficult to control the expander level. CBP will trip frequently then reduce the, unit load to maintain the deaerator level. (if, CBP tails to start then also reduce the load accordingly to maintain the deaerator level.)
3. Also watch the hot well level if it is going very high then close the make up valve (if, it does not close on Auto.) and trip the condensate transfer pump and try to maintain the hot well level.
4. Whenever CBP trips ensure the opening of expander drain to hot well and steam to condenser valves.

(5) Deacrator Level High

CAUSE :

1. Excess make up to hot well and faulty deaerator level regulator.

EFFECT :

1. Risk of water entering to LP turbine gland through steam piping of LP gland if LP gland steam is being taken from deaerator.
2. Risk of entering the water in PROS steam pipings and the temperature of the steam will reduce.

ACTION :

1. Check the operation of deaerator level controller if necessary take it on manual.
2. Change over the LP gland from deaerator to PRDS. (if, it is so).
3. Open deaerator drain, 6 ate. PRDS header drain and LP gland steam drain.
4. Open surplus v/v of the hot well if it does not open on auto.

(6) Deaerator Level Low

CAUSE

1. Mal operation of make up valve.
2. Unauthorised closure of valve between C.E.P. and deaerator.
3. Boiler tube leakage.
4. C.B.P. not running at load more than 8O%.

EFFECT

1. Danger of loss of suction pressure of boiler feed pump.
2. Drum level will go down.
3. To maintain drum level We have to reduce the load on the unit.

ACTION

1. Check the make up valve and set right.
2. Open the valve between CEP and dearator if found close.
3. Feed the boiler until there is some danger of cold water entry and thermal shocks on drum -if water tube leakage is heavy, trip the unit.
4. If suction pressure is low and not increasing -switch OFF the feed pumps to allow unit to trip on drum level Lo-Lo.
5. If C.B.P. trips at full load (or not running) reduce the load to 80 MW. to maintain deartor level.

(7) H P Heater level High

CAUSE

1. HP heater drain to deaerator level controller is faulty. (Not operating properly) or control valve stuck up.
2. HP heater drain to LPH : 5 valve do not open,
3. Deaerator pressure is higher than normal.
4. Inadequate extraction pressure to HP heaters.
5. Tube failure In HP heaters.

EFFECT

1. HP heater's drain to HPDFT (H0-18, 19) will open on HP heater level high. (Provided' inter locks are through.)
2. HP heaters get by passed from water and steam side on auto. (If interlocks are through).
3. If level in HP heaters build up rapidly there is a possibility of water entering into the turbine.

ACTION

1. Take HP heaters' level controller on manual and maintain the level.
2. Check the operation of heaters' drain to HPDFT valves, drain to LPH 5 valve. Open it manually if required,
3. Adjust deaerator pressure it it is more.
4. Adjust the steam extraction pressure-if valves are throttle, Open them.
5. By pass HP heaters matluady;@,if level is very high and are not getting by passed automatically.

(8) LP Heaters 3. 4, 5 Levels High:

(Individually or together)

CAUSE :

1. LP heater 3 level may go high due to difficulty in expander level controller and CBP trips.
2. LP heaters 4 and 5 level may go high due to difficulty in level controlling valves.
3. Tube Failure in LP heaters.
4. 4 Low extraction pressure in LP heaters.

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EFFECT:

1. Possibilities of water entering into turbines if levelllevels islare so hi,.jh and un-controltabf?.

ACTION :

1. Check the level controllers of the heaters. if, require take it on manual @nd try to maintain the level.
2. Adjust the extraction pressure if valves are throttle.

3. BY pass the heaters (LPH 3 Et 4) if level in LPH 3 and/or 4 is@are high and by ass the beater 5 if level in it is very high and uncontrollable.

(9) Turbine Lubricating Oil Pressure Low

CAUSE

1. Air lock in oil cooler.
2. MOP suction failure
3. Duplex oil fitter chocked up-Line filters chocked up.
4. Leakage in oil lines, flanges, bearings etc.
5. Excessive oil consumption in generator seal oil system.
6. MOP failure.

EFFECT

1. Rise in brg. metal temperature.
2. Turbine trips on lubrication oil pressure Lo-Lo.
3. SOP A, SOPB, ACEOP & DCEOP start on auto at 0.8 ala, 0.7 ala. 0.6 eta and 0.5 ata., lubricating oil pressure respectively.

ACTION

1. Check oil pressure and adjust the pressure by adjusting LO 1 Et LO 2 valves if possible.
2. Check for any nil leakages in the oil ckt.
3. Start S. 0. P.
4. Trip the turbine if oil pressure does not improve.
5. Check the oil cooler, change over the defective one to the stand by. Remove the air look from the cooler if so.
6. Check the oil filters regularly, change over to stand by. If difference in pressure increases
7. get it clean. Check the line filters, spare and isolate then, Nh@-never unit is in shut down and if requires cleaning.

(9A) Lubricationg Oil Temperature Low

CAUSE

1. Water side valves in oil coolers are open more than requited. (Especially at low load and in cold season.)

EFFECT

1. Unstable oil film in brgs.
2. May damage the brg.
3. Brg. vibration may rise.

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ACTION

1. Throttle the cooling water valves of the oil coolers. (if required).
2. If the machine is off load-do not roll the machine till oil temperature attains an acceptable working value.
3. If the machine is cn load-cil temperature should be rapidly raised to the acceptable working value.

(10) Lubricating Oil Temperature High

CAUSE :

1. Failure of C.W. System.
2. C. T. 1 D. fan/fans trip.
3. High C.W. inlet temperature.
4. Oil coolers are dirty. (Heal transfer is very low.)
5. Air locking in oil coolers.

EFFECT

1. Rise in brg. metal temperatures.
2. Bgr. vibration may rise.
3. Rise in seal oil temperature.

ACTION :

1. Restore the CW System.
2. Restart the CTID fan/fans.
3. Bring down the CW inlet temperature, open the CW valves of the coolers if they arGthrottled.
4. Remove the air lock from the cooler it so.
5. Put stand by oil cooler in service if available.
6. Spare and i6olate the dirty oil cooler for cleansing if possible.
7. Trip the unit if lubricating oil temperature rises continuously and is uncontrollable.
8. External cooling of oil cooler can help to bring down the oil temperature.

(11) C. W. Pump.„Pumps Trips/Trip

CAUSE:

1. Motor protection relay operated.
2. 6.6 Kv auxilliary supply failure.

EFFECT :

1. Turbine vacuum will fall.
2. Lubricating oil temperature, seal oil temperature and H2 temperature may rise.
3. Unit will trip on exhaust pressure hi-hi if all CW pumps trip.

ACTION :

1. Restore CW pumpipunips after checking.
2. Restore 6.6 Kv auxilliary supply start the pump-'C' (Which is on station bus), if station, bus supply is available and pump-'C' is available.
3. Start the stand by CW pump Immediately if available.
4. Reduce the load on machine till the 2nd pump cuts in on tee line and if one pump is running. (especially when delays in starting the 2nd pump.)

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1. Trip the unit if vacuum drops considerably.
2. Watch the exchaust load temperature and LP differential expansion. If disturbed try to control.
3. It not a single C.W. pump is put into, service for long time primethe C W. tunnel and start C.W. pump.

***(12) Fire In Turbine Oil System**

CAUSE :

1. Oil leakage from oil lines.
2. Brg. oil collected on laggings and reaches to the ignition point.

EFFECT :

1. Extensive damage to the turbine and surroundings.

ACTION :

1. Take care of oil icakge and try to arrest it
2. Use dry Co -, powder as soon as smoke is detected. Inform the fire section. If the fire is extensive use Co2 powder cylinders.
3. Trip the turbine if fire is beyond control.

4. Expell the H? if fire is near the H2 zone (with Cot).
5. Do not allow the oil to lodge on the loggings. Take corrective action and do not neglect even very small leakage or collection of oil to prevent the fire.

13 Loss of Vacuum : (Partial or Completely.)

CAUSE

1. C.W.P. trip.
2. C.T.I.D. fan/fans trip.
3. Loss of gland steam pressure.
4. Defect in gland steam pressure regulator.
5. Loss of ejector steam pressure. (11 ata.)
6. Improper sealing of valves/glands in the vacuum system.
7. (Air) leakage in vacuum system or puncture.
8. Mal operation of vacuum breaker valve.
9. Busting plate damaged or leaking.
10. C. E. P. trip.
11. Deaerator level control valve stuck up.
12. Mal operation of HPDFT to LPH 4 vent valve when HPDFT is not in the system and connected with the atomsphere.

EFFECT

1. Vacuum may drop slowly.
2. If it drops rapidly-unit will trip on 'Exhaust pressure hi-hi.'
3. Over heating of LP turbine casing and exhaust hood.

ACTION :

1. Start stand by Cw pump if available (if CW pump in service has tripped). Rectify the problem in tripped Cw pump and make, it avaimbie. Maintain the load accordingly.
2. Find out the reason of tripping of CTIT fan/fans if 'So. Put it/thern in to service if available.

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3. In case of 'Gland Steam Lost, please check the 1 1 ate header pressure if it is not proper maintain it'by opening it's cbntr61@ valves bypass valve If required.

If Lp gland steam is being fed from deacrator please check the deaerator pressure.

4. In case of 'Ejector Steam Pressure Lost', see the 11 ata PRDS steam header pressure, if not found proper maintain it as mentioned above.
5. In case of defect In gland steam pressure regulator, put it on manual, Even then if@ it ig giving trouble then bypass the control vlv and maintain the required gland steam pressure.
6. Check the searing water pressure to valves/glands in the vacuum system and maintain it.
7. When the vacuum fails suddenly and cannot be established again or while starting the unit (and while establishing the vacuum) if it is not obtained their may be 'Leakage/Puncture in the System under Vacuum'. So please check the system under vacuum throughly. Find the leakage or puncture and Arrest the leakagelattend the puncture.
8. Check the position of vaccum breaker valve. It should be close while establishing the vaccum or during normal running operation unless anything is abnormal.
9. Check for leaking/damaged busting plate if it is so, then shut down the unit to attend the same.
10. If CEP has tripped start the stand, by CEP (if does not start on auto) if available. Rectify the problem in fault, and Maintain the load accordingly.
11. Check the position of deaerator level control valve. If it has stucked up in close position or if not found operating properly, get it attended. (Meanwhile, One can bypass the control vlv to maintain the deaerator level.)
12. Change over the ejector if the first one is not maintains vacuum.
13. Check the vent/drain valves of HPDFT to LPH : 4 when HPDFT is not in the system. It theylit arelis passing get it attended.
14. If vacuum falls at a slower rate, one may put the second ejector in to service to maintain the vacuum (in the rneantime the leakage may be found.)
15. If vacuum fails at a faster rate, trip the unit immediately. (if not trips on 'Exhaust pressure hi-hi protection.)

(14) Exhaust Hood Temperature High

CAUSE

1. Vacuum falls.
2. C. W. Pump trips.

3. High steam temperature during cold start up.
4. Turbine running at 3000 RPM without synchronizing/or running at low load for a longer period.

EFFECT :

1. L. F. differential expansion will go towards negat4'.ve side.
2. Prolonged high exhaust hood temperature may lead to vibration.

ACTION :

1. Check the reason for the fall in vacuura
2. Start stand by C. W. Pump if available. (Restore the C. W. supply). Start second C. W. pump if unit is running at higher load (> 60 MW.).
3. H. P. drains to condenser hot well should be reduced.
4. Control steam temperature and pressure during the cold start.

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5. If possible, synchronize and load the machine.
6. Charge LP heaters quickly (at 25 Mw. lead).
7. Control gland steam pressure and temperature.
8. Start make up water spray in condenser. (Start make up from TOP.).

If machine is requied to run at 3000 RPM (or at lo,,,ver load) for a longer tinl2,, take following necessary actions to control the exhaust hood temperature.

(a) Keep the vacuum as high as possible (By Keeping 11 ejection in service).
(b) Keep steam temperature and pressure in limit, donot allow them to rise.
(c) Start make up water spray from the top of the hot well.
(d) Keep watch on gland steam pressure and temperature.

(15) High Turbine Bearing Temperature

CAUSE :

1. High lubricating oil inlet tern;3erature to the turbin&. beatings.
2. Excessive vibration of the brgs.
3. Bearing failure.
4. Contaminated lubricating oil, high moisture, dirt etc.
5. Inadequate oil flow or low lnbricating oil pressure.

EFFECT :

1. Result to bearing failure.

2. Increment in bearing vibration.

ACTION

1. Check and maintain the oil temperature, oil pressure, oil lovv flovv throught th3 turbine bgr. If, necessary put 3rd oil cooler in to service, check du;)iex oil filter. if requires change over it. Also cheek the line filters.
2. Check the oil for moisture and contamination periodically. Keep oil contineously in service as per recommendation. Drain the collected water from the MOT regularly.
3. Keep watch an oil cooler out let temperature.

(16) Axial Shift High

CAUSE :

1. Abrupt changes in load. (Fast'pick up of load.)
2. Sudden drop in steam temperature.
3. Sudden drop in vacuum.
4. Lubricating oil failure to thrust brg.
5. Salt/Silica deposition in turbine.
6. Worn out thrust pods.

EFFECTS

1. Overloading of thrust pads.
2. May contribute turbine vibration.
3. Abnormal turbine differential expansion.

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ACTION

1. Cheek the boiler parameters and control the sudden changes.
2. Control the turbine vacuurn.
3. Reduce tihe unit load.
4. Cheek the oil flow. pressure and temperature through brgr.
5. For deposition of the salt, unit shut down is required for washing the turbine.
6. If axial shift has increased rapid lyand is beyond control even after reduction in load, trip the toic@r to rest as rapidly as possible. (By breaking the vacuum).

(17) Eccentricity High

CAUSE :

1. Deflection of turbine rotor.
2. Machine cculci net be put on barring gear after tripping.
3. Improper heating during start up.
4. Improper draining of steam lines and casing.
5. Abrupt drop in M. 5. temperature due to corry over of moisture in gland, deformation of' cylinder.
6. Mal function of eccentricity pick up.

EFFET .

1. Turbine vibration will @,increase.
2. Unusual noise from the turbine.
3. Bearing oil and metal temperature will rise.
4. If, machine is on barring gear, it will draw more power.
5. Eccentricity high alarm will appear.

ACTION :-

1. Strictly follow the start UP procedure while starting. Maintain the steam parameters while starting. Give proper heating and soaking time at required speed while rolling. Drain the steam lines and casings as per recommendations.
2. if eccentricity is not accompined with brg@. Vibration and increment jn the brg, metal temperature. there is nothing wrong with the rotor (turbine).
3. Check the eccentricity pick and calibrate the same if necessary.
4. If eccentricity is high when machine is on barring gear it is due to rotor bent., continue the machine on barring gear for a longer tirre. Soak the w/c at 500 rpm., for a longer time. So that bent rotor may get even out.
5. When eccentricity increases with vibration, reduce the unit load and allow it to come back to the original value and stop the machine for checking for any abnormality.

(18) Differential Expansion High (Positive)

CAUSE

1. High steam temperature.
2. Poor insulationnternai surface of the casing preventing good heat transfer.
3. Salt deposition on the i
4. Gland steam temperature high.
5. Fast rolling or fast pick up of the load.

1. inadequate soaking period.
2. High condenser vacuum, (LP effect on differential expansion).

EFFECT

1. Seal rub can be expected.
2. Metalic rub sound from fhe turbine when interfearance exists.
3. Turbine vibration may increase.

ACTION

1. Use flunge heating in Hp and Mp turbines. (When Hp, Mp differntial expansions are higher ~ards + ve direction.)
2. Soak the turbine properly.
3. It should not incease more than + 3.5 mm. Maintain the steam temperature accordingly. (as per starting diagram).
4. Load the turbine gradually.
5. Cheek the insulation and if found poor get it attended. (shut down requires).
6. Remove the salt deposition by washing if required.
7. If it is beyond control try to control the boiler parameters and if turbine is tripped, drop the vacuum immediately.
8. It LP differential expansion is increasing drop the vacuum to a certain extent. (to an acceptable limit.

(19) Differential Expantion (Negative)

CAUSES

1. Time taken during rolling and loading is more than required.
2. Increment in exhaust hood temperature.
3. Low condenser vacuum.
4. Flange heating valves are passing (HP and MP).

EFFECT

1. Seal rubs can be expected.
2. Metalic rubbing sound from the turbine when interfearance exicts.
3. Increment in vibration.

ACTION

1. During hot start rolling and loading of the machine should be as per the starting curve.,
2. Start 2nd ejector to improve the vacuum.
3. Try to bring down the exhaust hood temperature.
4. If turbine is tripped due to-ve maxiffiurn differential expansions open, the vacuum bkr. to avoid the possible damage,
5. Increase the boiler steam temperature and load the machine little faster.
6. If differential expansion is extremiy-ve and machine has been rolled then do not trip the@ turbine. Control the boiler parameters.
7. Check the passing on the flange heating valves if any and arrest.

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(20) Bearing Vibration High

CAUSE

1. While turbine is passing through it's critical speed.
2. Rapid changes in the turbine inlet steam temperature. (carry over in extream case,.)
3. Low lubricating oil temperature.
4. Vacuum below desired value (to cause LP rotor over beating).
5. Unbalance steam flow through each of the machine.
6. In correct shaft alignment.
7. Gland steam pressure and temperature are not proper.
8. Rotor mechanically unbalance.
9. Eccentricity high.
10. Uneven expansions, (High differential expansions and temperature difference betwapn top and bottom cylinder exceeds.)
11. Over speed of the machine.

EFFECT :

1. Eccentricity may 90 high,
2. If machine is allowed to run at higher iabratiori, vibrations may exceeds the safe limit and may damage the machine.

ACTION

1. Roll the machine smoothly and do not allow the machine to settle on to critical speed band.
2. Maintain the steam parameters. Don't allow any rapid change in the steam temperature.
3. Maintain the lubricating oil pressure and temperature properly. (pressure>l Kg/cm2 and temperature = 42 C. after the coolers.)
4. Try to maintain the turbine vacuum, if it fails. (Prevent the heating of the LP rotor).
5. Check the gland steam temperature and pressure. (temperature 130 C. to 150 C.) (if, found disturb, try to maintain).
6. Check for the balance steam flow through each of the wlc. Check the proper openning of HP/LP GCVS, HP governing valvelvalves and intercepter valves of both the sides,)
7. Ensure that HP and MP pedestal expansions regulariy. It should be equal on both the sides. Check the freeness of the all expansion washers.
8. Try to control the differential expansions. (if. neCe3sary put Hp, Mp flunge heating in to service while rolling and at low load).
9. Control the eccentricity if found high.
10. Reduce the unit load if bragging vibrations are still high.
11. Get the rotor balanced unless it is so.

(21) Curtish Stage Pressure High

CAUSE :

1. Deposition on blandes.
2. High load when HP heaters are not in smir-e
3. Over loading of the machine

EFFECT

1. Full load may not be obtained
2. Axial shift may rise

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3. Thrust load on turbing m3y in-lrea3!.3 and may result in damage of the thrust pade

ACTION

1. Clean the rotor by water w3shing wil3n unit is under shut down
2. Maintain the unit load as permitted by the curtish stage pressure.
3. Put H. P. heatere in servie if not avail able reduce the unit load

(22) Loss Of Barring Gear

CAUSE

1. Barring gear moter trips, fuses blown off
2. Barring gear start permissive are not satisfied. (Dafective pressure switch.)
3. Barring gear motor shift failure.

EFFECT

1. Shaft may start to hog.

ACTION

1. Try to restore the barring gear moter simply as quickly as possible.
2. Rotate the shaft manully as mentioned bolew.
   (a) Continue barring for minimum 16 hrs.
   (b) Rotate the shaft by 1800 after every half an hour for 8 hs.
   (c) Rotate the shaft by 1800 after every hour till the MP top casing temperature reaches up to 1900 C.

(23) Condensor Tube Leakage

CAUSE :

1. Corrosion, errosion of the tubes.
2. Condensor inlet CW pressure high-leads to leak the tube from expanded part.
3. Low CW flow through condenser tubes causing the high terminal difference and weakens the expansion joint.

EFFECT :

1. Conductivity of condensate will go high.
2. Boiler PH will fall and boiler water conductivity will rise.

ACTION

1. Isolate one side of the condenser and ensure. if conductivity fails **after** the isolation or [lot
2. Reduce the turbine load by 50%.
3. Repair the leakage and after bringing bark the con:len3c)r in to service, check the conductiuity.

(24) One Side Quick Closing Valve Or Interceptor Valve Close

CAUSE

1. Mechanical fault in quick closing valve or in the interceptor valve.

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2. Drainage of Oil from the connected servomotor piston.

EFFECT :

1. Will reduce the generator load.
2. Uneven flow on RHSILHS, Reheater/Superheater.
3. May damage the superheater or reheater tubes.
4. Safety valve of superheater/Reheater blows.
5. Unit may trip due to disturbances created in the boiler.
6. Thrust on turbine.

ACTION

1. Try to reopen the valve.
2. Reduce the load on the machine.
3. Reduce the boiler firing rate.
4. While roiling the machine the proper opening of all the above valves. (Before rolling the, machine see that the HPJLP QCV are open or not.

(25) Water Induction In Steam Turbine

CAUSE

1. Cue to carry over cf wet particles from the boiler. maY be due to high drum level or. sudden @ drop in steam temperature, (if considerable).
2. If reheater attemperation is in service. Water particles may carry over through CRH lines. (during shut-c:o%,,n or lew led cperaticn), result in reheat temperature to fall.
3. Defective gland steam temperature controller.
4. GSC tube leakage and GSC drain system fails.
5. Feed water heater tube lefkage and the heater level controller is defective, failure of 'heater level hi-hi' protection. (Heater should be bypassed on operating the protection).
6. Loss of extraction pumps and condensor level-rise-is, excessive.
7. Deaerator level is high and failure of the operation of the over flow valve.

EFFECT

1. May result in the distortion of the valve chest
2. Thermal shocks and heavy leakage of the.,@ts.
3. Chilling of MP cylinder and damage to the MP rotor. (Due to cold reheat spray in service.)
4. Low gland steam temperature will chill the glands and leads to distortion of glands, vibratiory,and,. increase in 6ccentricity,.
5. Damage to the rotor blades, diaphrams and leads to -the vibration.

ACTION :

1. Machine should be shut-down if it is rolled and open the steam drains fully.
2. If the machine is running on load, stop the ingress of water. Increase the steam temperature by openning the drains.
3. If unit is on load and if Joints of the turbines are found heavily leaky. (due to water induction), Stop tbg,mao correct the steam parameters.

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(26) H2 Pressure Drop Below Promil;sive Value

CAUSE

1. H2 leakage is more.
2. H2 seal oil system is not proper.
3. Lower H2 temperature.
4. Instrument is defective,

EFFECT

1. Low H2 pressure alarm will appear,
2. Setting : 1,9 Kg/Cm2 for 2.00 Kg/Crn2 range, 200 mm wc for 500 mm wc.
3. Heavy H leakage may lead to fire if neglected.

ACTION

1. Increase the H2 pressure to 2.1 K9/CM2 1 70Omm wc if found dropped.
2. Check the gas leakage and it defected try to attend it check the seal oil system throughly
3. If the drop in pressure is more switch over it on low range i. e. 2.00 Kg/Cm2 to 500 mm wc and reduce the load accordingly.

4. If still the drop in pressure is more and not improvi@ng (more than 24 m@ 1 day), expell H2 with C02 and operate the machine with air cooling, (load the machine accordingly).
5. If machine is operating on 500 mm wc range and H2 pressure drops below 150 mm wc, stop the machine immediately.

(26) HIGH H2 Gas Pressure

CAUSE

1. Injection of more H2 cylinders.
2. Internal generator fault,
3. H2 CBP not in service.

EFFECT

1. High pressure alarm will appear.
2. H2 leakage may develop.

ACTION

1. Lower the pressure till alarm resets.
2. Internal fault in genrator may heat. the H2 and so H2 pressure may rise, in such a condition trip the machine immediately if it doesnot trip on generator protective relays.

(27) H2 Purity Loiv

CAUSE

1. H_2 leakage is more.
2. injected H_2 may be of, impure quantity,

EFFECT

1. If the purity fails rapidly and (Below acceptable limit), it is still failing, may lead to H_2 explosion.
2. H_2 purity low alarm will appear.

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ACTION

1. Improve the H2 purity and pressure. (By replacing impure H2 with the pure one'

2. Don't allow the purity to fall below minimum acceptable @limite. (92%). If it is not impvoving and stiii failing, shut the unit and expert the H2 with Co2 and Co2 m'th air. as there is a risk of H2 explosion.

(29) Water, Oil in Generator

CAUSE

1. H_2 dryers are not properly regen erated.
2. H_2 cooler leakage.
3. Due to moisture condensation. (upto same extent it is permitted), and longer operation without the vacuum treatment.

EFFECT

1. Water oil in generator alarm will appeja@ and after certain waterjoil level accumilation in the generator if the alarmdoesnot appear and if level increases to a unsafe value it may leads to a dangerous electrical fault and explosion.

ACTION :

1. Drain the water/oil from the generator regularly.
2. Check for the staisfactory operation of the H2 dryers/heaters.
3. Check H2 coolers for leakage.
4. Check for the proper operation of the vacuum pump.

(29) 8. C. W. System Failure

CAUSE :

1. BCW pump trip.
2. Heavy leakage in BCW system.
3. Auxilliary (415 V) supply failure.

EFFECT

1. Low BCW flow or total failure of the BCW system damage the auxiliaries condiderably.

(a) BFP motor wdg. temperature may go high, may be required to stop.

(b) A. C. Plant will trip.

(c) The auxilliaries which are being fed to C. W. from the BCWsystem will be required,lo stop like, compressors, CEP, CBP, ID, FO, Mitis, Air-heaters, BFP, SOP etc.

ACTION :

1. Start 2nd BCW pump if available.
2. If both the BCW pumps are not availab$e put emergency BCW line in to service.
3. Reduce BCW consumption by throtting valves or shuting down the stand by auxilliaries.
4. If bearing cooling water is,not pouible to fe~e in a short time trip the unit. Shut the unrequired auxilliaries immedi ately.

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(30) Instrument Air Failure

CAUSE :

1. Sudden increase in air consumption.
2. Sudden line leakage develope.
3. Control compressors
4. 415 V auxilliary supply is not available.

EFFECT

1. All the auto controls using control air will become inoperative. (Control valves close of' openfully or may remain as it is as the case may be.)
2. Burner tilt gradually slip down to extream minimum position.
3. BFP @ecirculating valve will open and the BFP may trip on feed flow high.
4. Ash handling operation is not possible.
5. Boiler drum level, deaerator level, hot well level, HP & LP heaters level expander level etc. will have to maintened by operating the local valves. (Mav be bypass valves.) warm up valve of the spare feed pump will close and hence it will not be available. (If starting inter lock is through).
6. Unit may trip due to disturbances.

ACTION

1. Lock the burner tilt at horizontal position b3fora the air pressjra drops b-,ij.,,v, certain value.
2. Try to put the control compressors into service and if not possible or not maintaining,, the required pressure open station to control air inter canna-.ting v31v3, if .-,tation can,),3s3,jrs are available,
3. Isolate the leaky air line if possible and restore, the system back.

4. Restart the unit. if it has tripped after taking corrective ar--,ijn fir in;trimgnts. Emergencies in Alternator and Trippings [11OMWI Loss of prime mover

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Emergencies in Alternator and Tripping [110 MW]

Loss of Prime mover :

CAUSE

1. Sudden closing of boiler or turbine stop valves.
2. Sudden closing of quick closing valves may be due to insufficientloil flow. or quick closing oil drain out.
3. If lurbine-atternator do not trip even after boiler trips. (Boiler trip to turbine trip link may be out of circuit.)

EFFECT :

1. If this happens because of sudden closing of stop valves or quick closing valves, boiler, pressure will shoot up, boiler safety valves will blow and drum level may disturb. TurbinGgoverning valves will open fully. And generator load will fall drastica y.
2. Unit may trip on low forward power protection.
3. Defective turbine trip ckt. may not allow the turbine to trip even after boiler the tripped (or if quick closing valve open contact is not through then in such a case motoring of the n/c will take place which may damage the turbine stages.

ACTION

1. Try to open the stop valves if they are found closing.
2. if stop valves/quick closing valves are/is found closed and if tufibne is not found tripped@ trip the turbine and generator manually immediately.
3. Open the stop valve and restore the unit after rectitying fault.

Loss of field

CAUSE :

1. Field breaker when the mlc is on load.
2. Excitation control system fuse blown off.

EFFECT

If protection CKt. is o k. m/c will trip on Loss of excitation'

1. When the m/c runs without an excitation, it will run as an induction generator and wit[start drawing reactive power from the system and will deliever active power to the system so if system is capable of providing reactive power to the faulty m/c without considerable dropping in the system volt. than the unit will trip after time dealy. Bt if the system is uncapable to do so than the systemvolt will fall (FALL) rapidly and hence n-lc vvill trip irrmediately without any time delay (loss of excitation with u/v in the,

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system). If in the later condition m/G i . s allowed to run (does not trip) than disturbances occur.in the whole system. (may result in cascade trappings of the units)

2. If mlc is allowed to run as an induction gen!arator than the generator rotor will be overbmated in a very short time May result in considerable damage to the rotor
3. Generator will tend to over speed and the load on the m/c will fall
4. Generator terminal voltage will fall (FALL)

ACTIONS

1. *If* mle does not trip on 'Loss of excitation' protection then trip the m/c immediately to prevent the overheating of the generator rotor andto make the system safe from disturbances
2. Check the AVR, chack it's fuses tf found blown off Rectifg the proble put the @/c back in'to the system
3. Don't try to synchronise the m/c in 'Loss of excitation' condition
4. Raise the excitation along with the raising of the 'ene rator load accordingly.

Unbalanced Stator Current

CAUSE :

(Negative phase sequence protection)

1. Due to unbalance 3-0 loading in any external circuits like feeders interconnector grid feeder etc.
2. Due to Ph-Ph, Ph-n, or opening of any phase, fault inside or outside the generator.

EFFECT

1. Unbalanced three-phase stator currents cause double system frequency current to be induced in the rotor iron known as nagative phase sequence current These may

damage the rotor considerably following the overheating',due'to fhe unbalance currents in the stator

2. Unbalanced current may also cause severe vibration.

ACTION :

1. Isolate faulty CKt from the busbar
2. Reduce generator KVA loading
3. If these currents will flow for a longar time unit will trip on 'negative phase sequence protection' Find out the cause of tripping Genrator Operating with Excess lagging or loading P. F.

CAUSE

1. M/c operating with leading P, F, due to high system voltage, Loss of excitation
2. M/c operating with lagging P, F, due to low system voltage, M/c is feeding the fault

EFFECT :

1. Operation of generator with excess lagging power factor will overheat the rotor due tc> increase infipid current ofcourse in AVR, one additional feature has been introduced to limit the rotor current and hence ultimately to protrct the rotor from over loading. This feature, is called 'Rotor current limiter'
2. Over heating of the ends of the stator core and structure of the m/c due to eddy current set up by armature reaction leakage flux
3. In case of excess leading P, F, of m/c is allowed to run, m/c may cause stability

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limit and may become unstable. This is also being looked after by AVR. Introduction of 'Rotor angle limiter' feature provides stable operation of the mlc. It wili'n-,)t allow the excitation to go below acceptable value (towards leading side).

4. When m/c is allowd to run at excess tagging power factor stator current may 1 cross the safer limit provided unit load is nearty full (MW). This will be looked after by the stator current limiter an additional feature of AVR, which limits excitation current to prevent over loading of the stator winding in case of an excess lagging P. F. operation.

ACTION :

1. Try to run the m/c within safer stability region of tagging/leading P. F. 2 , In case of excitation failure rn/c will trip on 'L(2ss of excitation' which prevents til-3 unStable operation of the mlc. If the m/c does not trip in this condition, trip the m/c immediately.
2. Use O. L. T. C. of generator transformer for stabilised operation.
3. Raise the excitation along with the rising of generator load put AVR on auto.

NOTE

Introduction of capacitors in the system (at receiving end) will helo stabilizing operation.

Rotor Temperature High

CAUSE

1. H pressure is low and m/c is running at higher load.
2. Trouble in H? cooling system.
3. High excitation current
4. Hot spot developes in rotor.
5. M/c runs without excitation or with unbalanced stator current.

EFFECT

1. Rotor temperature high alarm will appear (at 900c).
2. If mlc is allowed to run when the rotor temperature is rising rapidly, **hot** spot in rotor may develope. Rotor insulation may puncture which may **result** in the rotor earth fault.

ACTION

1. Rectiy the problem in H2 cooling system if any Establish the proper cooling water flow through H2 COOiefS. Cheek the cooling water temperature. Check 'Hot' and 'Cold' Ha temperatures.
2. Check and maintain H2 pressure. If it is not possible to maintain the Hz pressure reduce the load accordingly. If H2 leakageismore. Shutthe unit Expell H2 Run the unit wit[., (600 mmwc pressure). Air and maintain the unit load accordingly.
3. Reduce excitation current and check @the balance current through all the three phases of the stator.
4. It than also rator temperature is increasing shut the unit and checking of the rotor is. essential.

G.T. Winding temperature high

CAUSE :

1. Overloading of G. T.

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2. Failure of cooling system.
3. Developement of fault inside the G. T. winding

EFFECT :

1. G. T. Winding temperature will raise. ani mic will trip when it reaches to 105^{o} c.

ACTION :

1. Watch G, T, temperature, particularly at higher load and at a higher arnbient temperature.
2. Check the auto start operation of the cooling fans and as and cooling pumps according to the rise in temperature. If auto start operation is foind improper, start the fans/pumps manually. If they are not starting reduce the unit load accordingly.
3. Start the stand by fan 'manually' Rotor Earth Fault

CAUSE

1. Rotor earth fault may develope due to excess or very low rotor temperatur.
2. Rotor EIF may develope due to excessive wear of brush gears and carbon deposits
3. Due to weak insulation near sliprings and high m.)ch3nicgi stresses.
4. Failure of bearing pedestal insulation.

EFFECT

1. With one rotor earth fault m/c can run without any harm-lst rotor earth fault alarm will appear
2. With second rotor earth fault m/c will trip Portion of rotor field will b3 lost. It may becornlunstable, mechanical vibration may be n3ticed, rotor may b:)co.n3 eccentric

ACTION

1. As soon as lst rotor earth fault is noticed, put the 2nd rotor earth fault C t, in service.
2. Take out the File from service to check for the rotor earth fault

3. If m/c does not trip on operating 2nd rotor earth fault protection trip the m/c immeditately
4. When m/c is running with lst rotor earth fault anJ (When 2nd rotor EIF CKt in service), don't carry out any maintenance on rotor sliprings or on brush gears Generator Trips Due to External or Busber Faults

CAUSE :

1. Bus-zone protection operates
2. LBB-prolection operates
3. Generator trips on back up protections
4. Gen. trips due to under freqhency of the grid (47,5 cls)

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EFFECT

1. All the unit auxiliary supply will change over to the station bus,
2. Import from GEB will increase if tie-lines are in service.

ACTION

1. Analyse the fault and isolate the faulty Ckt, from the busbar and restore the unit and other auxiliaries.
2. If the mlc has tripped on grid frequency, synchronize the mlc with the grid when the system frequency improves.
3. Major Grid Fault

CAUSES

1. Severe Ph-Ph or Ph-n fault in the grid.
2. Sudden tripping of one or two bigger generating set/sets. (210 MW, 110 MW etc). especially when the power situation is tight (frequency is already lower).
3. Sudden cutoff of bigger load from the grid.
4. Sudden disconnection of the interconnections, especially when heavy impoitlexport of power is there. (such as Cj'CB@MSEB interconnection, A.E.Co/G.E,B. interconnection).

EFFECTIVES

1. Machine can be overloaded considerably. Especially when it is feeding heavy fault.
2. Grid may take more reactive power@f@bm the generator.

3. Heavy drop in the voltagelfrequency observed.
4. Bigger auxiliaries which are having under voltage Drippings may trip and may result the m/c to trt'p
5. Chances of exErspE(dirg cf lee rr/c when the bigger load cuts off immediately or interconnectors trip. when we are exporting the power.
6. M/c trips on under frequency, vvhen lee grid frequency goes down due to tripping of large capacity generatincj unit,or due to tripping of interconnections (tie lines) when we are importing the considerable amount of power.

ACTIONS :

1. As far as possible never trip the m/c unless absolutely necessary as it may worsen the condition of the grid. Even m/c is not earring the load still supply reactive power which grid essentially requires.
2. if the unit trips due to auxiliary failure restore the auxiliaries and put the unit back into the service.
3. If the system frequency is failing continuously disconnect the interconnection between GEB if (a) we are exporting more power to the grid. Maintain our system voitage,and frequency. (b) If we are irrporting more power. first cut of line lcad and then disconnect the interconnection otherwise our system will collapse.
4. Don't allow lie rr,/c cverspeed along with the system frequency. if it is not possible. disconnect the interconncetion between GEB if Tie-line parameters permits. And maintain

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the frequency seperatel *V* within safer limit.@.(wlhen we are exporting the power and system frequency is rising don't immediately break interconnection to prevent ovre speed.

Very High System Frequeney,

Cause :

1. Sudden, tripping of forge load or cascade tripping of feeders.
2. Excess generation in grid.
3. Tripping of GEB-AECO interconnection when we are exporting more, power.

EFFECT

1. Overspeed of the m/c
2. Unit tripping on over speed if speed exceeds tothat extent
3. Heavy vibration may appear in turbine

ACTIONS

1. Restore the load quickly to control the frequency.
2. Reduce the generation to cqntrol the frequency. This will help us very much in case our system is separae from the grid.
3. Trip the m/c in extreme case when freqoences crosses 52 cls
4. Very Low System Frequency

Causes :

1. Sudden tripping of large generating set.
2. Grid demands more generation
3. Grid feeders trips@and we are drawing ntore power from the grid.

EFFECTS.

1. Sustained operation of the turbine with lower frequency is injurious to the turbine b@s..
2. Unit will trip if the frepuency drops us to 47@5 Us
3. If m/c does not trip at 47.5 m/c or failed to, trip at 4.7i5 cls. turbine speed may enter in to the critical region and damage the m/c considerably resulting in higher vibration. In such a condition trip the m/c immediately.

ACTIONS :

1. Increase the generation if possible.
2. If grid feeders (tie lines) trip, try to maintain our system frequency independent by. suddenly cutting-off the Load, Large sheding etc.

NOTE :

Under frequency Feeder tripping relay will help to impyqve;the system frequency.

6.6 KV bus supply failure

CAUSES

1. While changing over auxilliaries from station to unit bus, UAT, inc, rne d as , t, ho on, ono Idor (on) but UAT-ICT tie~bkr. trips.

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2. While changing over auxilliaries from unit to station bus. UAT-4CT tie bkr. d as not hold on or 'ON' but UAT incomer bkr, trips.
3. 8.6 KV UAT incomers trip due to heavy voltage dip in the system (on operating under voltage protection) and UAT-ICT tie bkrs. do not get 'ON'
4. When mic trips-auto change over failure from UAT fo ICT
5. When generator bkr. is switched off auto change over system will by pass and 6.6 KV unit bus supply will fail.
6. Due to major fault in the system (like 132 KV bus fault) unit trips and station supply is also not available due to outage of ICTS.
7. When one ICT trips and 6.6 KV bus coupler did not close on auto.
8. When unit trips with a very heavy voltage dip 6.6 KV auxilliaries will trip on under voltage protection. (or there is a very heavy volt, dip in the system. when unit is running).

EFFECTS

1. All 6.6 KV auxilliaries which are on the unit bus will trip, and unit may trip due to failure of auxilliaries.
2. All the 41 5 LT station service X'mer. will trip from the HT (6.6KV) sides which are being from. the unit bus. And hence auto-ch@nge over will take place at LT sides and@ if @auto change over at LT sides faillfails 'respectively LT auxiiiiaries also will not be available.
3. It 6.6 KV station and@unit@bus supply, is not available then all HT LT auxilliaries will not be available for the operation.
4. L. T. auxilliaries lighting supply on NIE bus will get supply from N/E incommer from A/B station.

ACTIONS

1. Charge 6.6 KV bus. Reset u/v relay. And put HT auxilliaries in service which are available. Restore LT Xmers supply frorn HT side, and normalize them from LT sides.
2. In case of total auxilliary supply failure (HT & LT. both,) Try to restore first station bus supply, then switch on tie-Bkr. (UAT-ICT). Normalize the auxilliaries, L. T. Xmers.

3. In case of total auxilliary supply failure 'ensure that A. C. E, 0. P. is 'ON' or not (which is from NIE bus) put the m/c on B. G. unit.
4. Restore the-titiit after normalizing the auxilliries if unit has tripped.

NOTE : Do not switch OFF generator bkr as Far as possible.

Generator Trips On Class A And Cgass B. Protection

CAUSE

(A) CLASS A TRIPPING

A-1 G. T. over fluxing relay

A-2 G. T. over all dfiferential protection relay

A-3 UAT differential protection relay

A-4 Generator differential protection relay

A.5 Generator stator wdg. EIF protection relay

A-6 Genrator rotor EIF protection rally

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A-7 Pressure switch UAT/OLTC protection relay

A-8 G. T. buchhofz protection relay

A-9 G. T. H. V R. E/F protection relay

A-10 UAT buchhoiz Protection relay

A-1 1 G. T. stator widg. inter turn fault protection relay

A-1 2 Genrator low forward power relay

A-1 3 Mulsifyre protection power relay

A-1 4 132 KV bus bar protection relay

A-1 5 L.B.B. protection relay

(B) CLASS B TRIPPING :

BI G. T. stand by E/F protection relay

B2 Generator over voltage

B3 Generator U/Frequency stage Ill

B4 Generator back up impedence relay

B5 Generator negative phase sequence relay

B6 Generator field failure protection

B7 G. T. winding temperature Hi

B8 UAT winding temperature Hi

B9 G. T. oil temperature hi

B10 UAT oil temperature hi

Bll UAT o/c protection

EFFECTS :

1. Unit will trip on class A or class B first up as the case may be
2. It may have effect on system voltage and frequency as per the kind of fault
3. UAT to ICT auxilliary auto change over will take place
4. If generator has tripped on class A it will operate class B and MFT relay immediately
5. If generator has tripped on class B it will operate MFT immediately and class A trip through low forward power relay with 2 sec. time delay during which trapped steam energy will be consumed.

ACTIONS :

1. Class A faults are internal fault with electrical equipments which requires total shutdown of generator. Not a single try should bemade to synchronise the generator withoutproper checking of the fault in the equipment
2. Class B faults are considered as an external faults which are less harmful. After proper checking of an equipment and rectifying the fault take back the unit,
3. Ensure that at the time of tripping the following operation has taken place, it not, do it mannually.

(a) Gland steam is changed over to condenser

(b) All QCV and NRF lap valves of all the extraction are closed

(c) AVR change over to manual from auto

(d) G. T. coolers are tripped

(e) Field breaker is tripped

After proper checking and rectifying the fault take back the unit.

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Sparking to Brushes

CAUSE :

1 Dirt in the brushes

2 Worn brushes

3 Carbon deposition

4 Inadequate Spring.tension

EFFECT :

May damage the commutator

May 1.)ad to rotor earth fault

ACTION

Check for the sparking regularly

Reduce the excitation if sparking is more

Call for maintenance of brush gear.