TURBINE AUXILIARIES PERFORMANCE MONITIRING & ANALYSIS

EEC WORKSHOP
25.09.2013-27.09.2013

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Heat Balance Diagram

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HBD shows Pressure, Temperature, Enthalpy and Flow at various points

HPT Inlet

16.67	538
3397.2	1863750

IPT Inlet

3.439	538
3536.8	1585974

Extraction 1

6.133	389.0
3147.08	134071

Extraction 2

3.821	324.5
3034.4	114767

RH Flow+Extraction2+Extraction1
1585974+114767+134071=1834812
+ Gland Seal Leakoff from HPT to IPT (18000)+ESV Spindle Leak off (7000) = 1859812

Therefore HPT rear Seal Leak off = 1863750-1859812
= 3938

Figures in () are separately given

Heat Balance Diagram

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- 18000 Kg/h is 1% of Main Steam Flow. It can't be measured.
- Suppose it is 2% then Heat Rate will actually go high by by 4 Kcal/Kwh but since only 18000 Kg/h is considered for Reheater Flow the PG Test result will be higher by another 4 Kcal/Kwh

Heat Balance Diagram

- In some 130 MW/150 MW designs the flow increses 4 to 5 times due to vibrations and creating problems with acceptance of PG Test Results.

Heat Balance Diagram

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- Extraction 1 Calculation
- Extraction Line Pressure Drop = 3%
- HP Heater side Pressure = 5.98 Mpa
- Saturation Temperature = 275
- FW Outlet Temperature = 275-(-1.7) = 276.7
- Extraction 2 Calculation
- Extraction Line Pressure Drop = 3%
- HP Heater side Pressure = 3.71
- Saturation Temperature = 245.9
- FW Outlet Temperature = 245.9-(0) = 245.9
- HP Heater 1 Drain Temperature = 245.9+5.6
  = 251.5

Heat Balance Diagram

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- Feed Water Flow = 1863750
- HP Heater 1 FW outlet Enthalpy = 1214.98
- HP Heater 2 FW outlet Enthalpy = 1067.2
- HP Heater 1 Drain Enthalpy = 1092.73
- Extraction 1 Flow by Heat Balance
  =1863750*(1214.98-1067.2)/(3147.08-1092.73)
  = 134071

- During Monitoring TTD can be determined by the difference of Saturation Temperature and FW Outlet Temperature
- DCA is Heater Drain Temperature minus FW inlet Temperature

H. P. Heaters

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- H. P. Heaters contribute to approx 3% to Heat Rate and their proper operation is necessary. TTD and DCA are the parameters for their performance. For proper DCA the setting of normal drip level has to be correct. TTD is achieved automatically.

- Sometimes there is by passing of Feed Water due to leakage in man hole partition in the Water Box which will increase the TTD superficially.

- There may be a bypassing of Feed Water through Group Protection by pass valve which will is shown in the difference between Final Heater oulet and Economiser inlet temperature.

H. P. Heaters

- There may be a passing in alternate drain to flash tank.

- As per TDP-1 there is a requirement that in the event of rise of level in the Heater to high level the alternate drain valve starts opening and the valve opens fully when the level is high-high. Due to this requirement the valve gets operated at high level and develops passing on full closure.

- In Chinese units there is no controller to open the valve at high level and the valve is set to open fully only on high high level. The valve remains closed in normal operation and does not develop passing.

L. P. Heaters

- In Pressure measurement below 240 Kpa absolute the water leg is very critical and incorrect water level correction gives incorrect readings.

- This results in reporting of wrong TTDs of L. P. Heaters (mostly negative) aginst positive (+2.8 degC) design values.

Exchange of Auxiliry Steam

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In a power station auxiliary steam headers are interconnected and it is difficult to properly monitor unit wise DM Make up.

In one station TDBFPs were drawing steam from Auxiliary Steam Header and the unit was drawing this steam from another unit resulting into zero make up. In fact Operation was draining out water since the actual leakages in the Unit were much less than requirement of TDBFP steam.

For proper monitoring the inter connecting valves should be closed for some time to get real requirement of make up.

Monitoring of Cooling Towers

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The plant should have mechanically aspirated Psychrometer to accurately measure the wet bulb temperature and calculate the approach. This should be done when the Wet Bulb Temperatures are highest (in rainy season).

In Winter it is possible to run at loads much higher than 60% with one CW Pump (in two pumps per unit configuration).

With one pump the range becomes double which improves the performance of the Cooling Tower.