TRIP ANALYSIS REPORT

TRIP ANALYSIS REPORT /TAR-6/ UNIT 1 / 19.03.17 **Dt. 24-03-17**

OCCURRENCE:

(a) **Condition:** Load: **458 MW** at 22:56:00 hrs. on 19.03.17 with 6 Mills in LP mode and coal flow **240 T/hr**.

(b) **Incident:** Turbine tripped on Generator Electrical protection (Stator earth fault) at 22:56:58 hrs and followed by Boiler tripped on MFT (Furnace Pr VHigh) at 23:08:37 hrs on 19.03.17.

OBSERVATIONS FROM SOE OF DDCMIS ALARM PAGES AND BOARD ENGINEER FEEDBACK:

22:56:58.785	STG1 TRIP Relay 286A operated
22:56:58.785	STG1 TRIP Relay 186A operated
22:56:58.785	Gen Electrical Protection-2
22:56:58.821	Generator Breaker Open (D4)
22:56:58.839	TTS Channel-1
22:56:58.856	Ex FB is Open
22:56:58.949	Speed Control Active
22:56:59	Speed Greater than 3090
22:56:59.067	Main Trip Valve-2 Tripped
22:56:59.1	1HPBP Valve Fast Open Acted
22:56:59.2	HP Stop Valve-2 (RHS) Closed
22:56:59.3	HP Stop Valve-1 (LHS) Closed
22:56:59.3	INTCPT ESV-1 (LHS) Closed
22:56:59.4	INTCPT ESV-2 (RHS) Closed
22:56:59.590	STG1 GR2 Stator Earth Fault (95%)
22:56:59.7	BP-2 Valve Fast Open
22:56:59.7	BP-1 Valve Fast Open
22:57:00.111	TP2 Gen Elect Prot TP CH-1
22:57:00.111	Turb Trip CH1.1 CMD On
22:57:00.563	Over Speed Trip Dev-1 Tripped
22:57:00.563	Over Speed Trip Dev-2 Tripped
22:57:01.1	HP EVAC VLV F/B Open
22:57:01.1	Turbine Tripped
22:57:01.1	NRV COLD Reheat Closed
22:57:02.0	PULV H Tripped
22:57:02.6	MDBFP Auto Start
22:57:05.6	Pulv Motor E Switchgear Disturbance
22:57:10.6	Pulv Motor D Switchgear Disturbance
22:57:13.9	TDBFP1B Suction Flow Very Low
22:57:16.7	TDBFP1A Suction Flow Very Low

22:57:20.6	MDBFP Suction Flow >550 Tph
22:57:27.0	Furnace Pressure Low
22:57:35.1	TDBFP1A Trip Condition Present
22:57:46.9	COND PR FSP-1 VHigh
22:57:47.3	COND PR FSP-3 VHigh
22:57:57.1	EOP (DC) On
22:59:02.4	AOP1 ON
22:59:56.0	EOP (DC) Off
22:59:25.6	HP EVAC VLV Closed
23:02:06.8	TDBFP1B Manual Off
23:07:49.8	Furnace Pressure Low
23:08:04.4	IDF B VFD Manual
23:08:13.4	IDF A VFD Manual
23:08:37.1	Furnace Pressure VHigh CH1
23:08:37.1	Furnace Pressure VHigh CH2
23:08:37.1	MFT CH1
23:08:37.2	MFT CH2

In the GRP PANEL:

186A ,186AX, 286,286AX relays have acted. In GRP2 95% stator earth fault has acted. In GR1 and GR2 low forward has acted.

SIEMENS relay DIGSI Trip report: L3 earth fault has acted.

ANALYSIS:

Unit was in service with a load of 458 MW in LP mode with 6 mills, coal flow 240 Tph and air flow 1557 tph. The turbine trip 1st up cause was generator electrical protection (stator earth Fault-Class A protection) and the boiler was in service for 12 min duration and tripped on MFT (furnace pressure high)

As per trend, current in R/Y/B phase before trip was 12434/12983/12327 A. Suddenly B phase current only reduced to 5946 A. Analysis of trip from SOE, Class-A protection was found acted which simultaneously initiated Generator breaker opening, Excitation field breaker opening and turbine trip.

Turbine stop valve closed within 40 milli Second as per GRP panel record where as in SOE records all stop valves closed within 480 milli Second. Since the generator breaker opened at a load of 450 MW, the turbine speed excursion was found and maximum speed increased to 3218 rpm. The Over speed hydraulic protection was found acted from SOE and the same was also confirmed from Local. As per actual over speed test demonstrated by BHEL, Overspeed protection was found acted at 3300 rpm. However, with the present trip, it was found that the overspeed protection acted at 3218 rpm which is earlier than the demonstrated value (3300rpm).

Subsequently HPLP Bypass came into service and the boiler was in service with 3 mill condition with a coal flow of 49 Tph and total air flow around 1344 tph at the time of

boiler trip. Boiler tripped at 23:08 hrs. on MFT (Furnace pressure very high). On analysis from the trend & SOE, it was found that reduction of air flow in ratio with reduction of coal flow didn't take place. It is because of PCD of both FD Fans were in manual mode due to actuator problem in PCD of FDF-A since 03.03.2017 and it is kept at position of 41%. Also IDF couldn't respond to the fluctuation in furnace pressure as IGV was manual mode for both ID Fans and also VFD. In turn, it lead to tripping of boiler on MFT (furnace pressure high).

CONCLUSION:

Following points were concluded:

- Stator earth fault occurred due to failure of Generator B phase VT1.
- The turbine overspeed hydraulic protection acted at 3218 rpm, earlier than the set value of 3300 rpm. During the checking of last oil injection test for overspeed trip, its striker was found acted at test oil pressure of 1.4 Ksc instead of 1.7 Ksc standard corresponding to 3300 rpm. From that it was concluded that overspeed would act earlier and the same happened during this turbine trip.
- Air flow couldn't be reduced in time as both FD Fans PCD was in manual mode.
- Furnace pressure fluctuation couldn't be controlled as IGV of both ID Fans were in manual mode.

After getting clearance, the boiler was light up at 01:50 hrs and the unit was synchronized at 03:46 hrs on 20.03.16.

RECOMMENDATIONS:

- SOP shall be made ready for checking of VTs during such failure. Already PO has been placed to replace the existing VTs with reputed make VTs
- GRP timing and DCS SOE timing shall be synchronized to remove the present time discrepancies.
- Overspeed striker setting shall be adjusted for 3300 rpm during ensuing annual overhaul.
- FD Fan-A PCD actuator shall be attended at the earliest and total air flow controller shall be put in auto. One spare actuator shall be kept as reserve always.
- IGVs for Both ID Fans shall be made ready for auto operation.

CM/OS(T) ADGM/C&I DGM/Elec DGM/O&C