

TRIP ANALYSIS REPORT

TRIP ANALYSIS REPORT /TAR-010/ UNIT 1 / 14.07.2017

Dt. 17-07-17

OCCURRENCE:

- (a) **Condition:** Unit-1 was in service in CMC mode at 300 MW at 04:06 hrs. on 14.07.2017.
- (b) **Incident:** Turbine tripped on protection MS Temperature Very Low at 04:07:22.467 and Boiler tripped at 04:07:55.774 hrs on MFT (Drum Level V Low). Unit was light up at 04:35 hrs and synchronized at 06:20 hrs on 14.07.2017.

SOE OF DDCMIS ALARM PAGES:

TIME	DESCRIPTION	STATUS
04:01:57	1LAB31AA001 (FDV 37) was opened	
04:02:34	1LAB61AA001 (FDV 35) was closed	
04:05:58.395	Main Steam Temp Low (11MAY01EZ119XE01)	
04:05:58.485	Main Steam Temp Low (12MAY01EZ119XE01)	
04:07:22.017	TP2 Main Steam Temp V Low	
04:07:22.467	Turb. Trip Ch2.3 CMD	On
04:07:22.467	Turb. Trip Ch2.2 CMD	On
04:07:22.963	TP CHNL 1.1 On	Tripped
04:07:25.708	Turbine Tripped	
04:07:25.940	HPBP Valve Fast Open Acted	
04:07:26.220	BP 1 Valve Fast Open	True
04:07:26.220	BP 2 Valve Fast Open	True
04:07:26.809	MDBFP Auto Start	True
04:07:27.209	BP1 VLV > 2% Open	True
04:07:27.209	BP2 VLV > 2% Open	True
04:07:27.515	Gen Breaker Opened	
04:07:33.387	MDBFP C On	
04:07:55.754	Drum Level V Low > 5s	True
04:07:55.774	MFT CH 3	True
04:07:55.874	MFT CH 1	True
04:07:55.950	MFT CH 2	True

BOARD ENGINEERS' FEED-BACK:

At higher load MS Temperature and HRH temperature was maintaining with rated parameters (SH:535 °C & RH: 565 °C) and SH spray source was taken from tapping after HPHs via FDV 35 MOV. When unit load reduced to technical minimum (around 280 MW) as per SRLDC schedule, MS Temp and HRH temp was not maintaining at rated parameters. From Shift beginning, HRH temperature was maintaining below 550 °C. So SH spray source was changed from HPHs discharge header tapping (FDV 35) to BFP discharge header tapping (FDV 37). During that time MS temp was 534 °C and HRH temp was around 540 °C. SH temperature control valves were in auto. When SH Avg. OL temperature reached to 508 °C, all spray CVs were manually closed to 0 %. But MS Temp dropped to 480 °C and turbine tripped.

ANALYSIS from SOE and Trend:

Trip analysis from SOE and trend is made as below:

1. Unit was in service in CMC mode at 300 MW and SH spray was being taken from HPHs' discharge header tapping with FDV 35 in open condition.
2. At 04:01:57, SH spray source was changed to BFP discharge header tapping (SOE). Hence FDV 37 was opened and FDV 35 was closed.
3. At the time of changeover MS Temp was maintaining around 534 °C. Opening and flow of SH Spray CVs: Left side- 98/99 % with 72 tph flow & Right side- 51/52 % with 42 tph flow.
4. At 04:05:58.395 hrs, MS Temp has reduced to 495 04:05:58.395 and Temp Low alarm has appeared.
5. At 04:07:22.017 hrs, MS Temp V Low alarm appeared and Turbine tripped on MS temp low protection at 04:07:22.017. (MS Temp Low trip value:480 °C and Actual value: 476 °C).
6. On tripping of turbine, HPBP fast open command processed at 04:07:25.940 hrs and MDBFP auto start command processed at 04:07:26.809 hrs.
7. At 04:07:31 hrs, HPBP Pr SP was 117 Ksc and Actual Pr was 109 Ksc with BPV 1 at 100 % open and BPV 2 at 98 % open.
8. At 04:07:45 hrs, HPBP Pr SP was 117 and actual MS Pr was 118 Ksc. BPV 1 opening was 0 % and BPV 2 opening was 4.8 %.
9. MDBFP was started at 04:07:33.387 hrs (SOE) and started pumping feed water to drum at 04:07:45 hrs (from trend data). Mean time drum level has decreased from +83 mm at 04:07:31 hrs to -385 mm at 04:07:51 hrs.
10. At 04:07:55.754, drum level V Low protection acted and Boiler tripped on MFT at 04:07:55.774 hrs.

CONCLUSION:

From above made analysis, following conclusions are made:

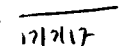
1. Temperature/Pressure for SH spray source after HPHs was 233 °C/ 130 Ksc. Temperature/Pressure for SH spray from BFP Kick off stage was 149 °C/ - Ksc. When the SH spray source after HPHS was changed to BFP kick off stage source with left side spray CVs at around 100 % open and right side CVs at 51 % open condition, SH spray has increased from 72 tph and 42 tph to 115 tph and 58 tph respectively. It is because of kick off stage pressure is min 10 ksc more than the discharge header pressure. As availed SH spray water was 149 °C, which is 84 °C lower than the previous spray water source, more De-superheating has occurred at LTSH outlet to

- Divisional panel inlet and it has resulted in drastic reduction of SH temperature at boiler outlet. Even though SH spray CVs were closed to 0 % at 04:07:25 hrs (around after 5 minutes of source changeover), it couldn't curtail the MS temperature reduction to below tripping value (480 °C).
2. When unit was at 285 MW, MS flow was around 871 tph. Due to less MS flow, the impact of de-superheating at LTSH outlet has reduced SH outlet temperature at a faster rate. SH average temperature at boiler outlet has reduced from 530 °C at 04:04:00 hrs to 476 °C at 04:07:25 hrs. i.e. reduction of 54 °C in a time span of 00:03:25 hrs.
 3. Turbine tripped at 04:07:22.467 hrs and MDBFP auto start command processed at 04:07:26.809 hrs after a time delay of around 4.4 sec. MDBFP started at 04:07:33.387 hrs after completion of SGC auto starting loop and pumping FW to drum was started at 04:07:45 hrs. Total process time from tripping time of turbine till starting of MDBFP was around 11 seconds.
 4. On tripping of turbine, both TDBFPs had unloaded and stopped pumping FW to drum due to non-availability of extraction pressure and inoperativeness of ACVs.
 5. On tripping of turbine, fast opening of both HP Bypass valves had occurred. Tracking of HPBP Pr controller had come to manual and HPBP Pr controller SP was at 117 ksc. On opening of both BPVs, actual MS pressure had reduced below HPBP Pr SP-117 Ksc (at 04:07:31 hrs actual MS pressure: 109Ksc). Due to servo unit problem, BPV1 had fully closed after completion of fast open. But BPV2, which was maintaining HPBP downstream pr in auto w.r.t. controller SP (117 Ksc), had closed to 5 % at 04:07:41 hrs as the actual MS pressure was lesser than the SP.
 6. There was no feed water flow to drum from 04:07:31 hrs to 04:07:45 hrs. Mean time BPV1 had closed to 0 % and BPV2 opening reduced to 5 %. Hence, drum level had reduced to below -385mm and in turn it tripped boiler on MFT.

RECOMMENDATIONS:

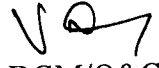
1. From efficiency point of view, SH spray water source is preferred from HPHs' downstream header tapping than BFP kick off stage tapping. In case of any changeover in SH spray source on operational requirement, corrective action shall be taken in proper time frame in order to avoid sudden dropping of MS Temp as this source of spray water temp is less and the pressure is more.
2. In the present case, the process timing from tripping of Turbine to starting of MDBFP was around 11 second which included the time delay of 4.4 second in auto start command of MDBFP after tripping of turbine. The time delay provided in MDBFP auto start after turbine trip shall be removed so that pumping FW to drum by MDBFP can be speeded up.

3. Implementation of recommendations in "committee report on TDBFP unloading in unit1" dated 04.07.2017, shall be expedited in order to make proper functioning of ACVs.
4. As per present logic, on turbine trip, HPBP Pr controller SP comes to manual with generator breaker open the instantaneous tracking value. This value ^{will} be around +5 Ksc from the actual MS Pr at that point of time. Subsequently BPVs will operate in auto to maintain the HPBP Pr SP. In this present case, when HPBP Pr Controller SP was in auto, it was tracking the actual pressure and always keeping the Pr SP at + 5Ksc (i.e. actual is 106 ksc and SP is 111 Ksc). On turbine trip, Controller SP has ^{come} to manual with SP 117 Ksc. So in order to maintain downstream pr w.r.t. SP of 117 Ksc, BPV2 had closed to 5 %. Hence the above said logic may be modified as below:
- "On tripping of turbine, the HPBP Pr controller SP shall come to manual with SP of actual MS Pr before tripping instead of coming to manual with + 5 ksc from the actual MS Pr at that point of time"

B. S. 
17/7/17
CM/OS(T)


18-6-17
DGM/C&I


18/7/17
DGM/Elec


DGM/O&C

TRIP ANALYSIS REPORT /TAR-010/ UNIT 1 / 14.07.2017 Dt. 17-07-17

Table 1

Time	Load (MW)	Drum Level (mm)	MS Flow (tph)	FW Flow (tph)	MDRFP Current (A)	MDRFP Suct Flow (tph)	Left SH Spray VLV Position (%)	Left SH Spray Flow (tph)	Right SH Spray VLV Position (%)	Right SH Spray Flow (tph)	SH Temp after DESH (°C) (Left/Right)	SH Avg Temp (°C)
03:59:00	284	29	87.1	86.1	0	237	98/99	72	51/52	42	326/340	534
04:04:00	287	-9.3	874	898	0	237	95/96	115	42/42	58	325/325	530
04:06:00	300	63	905	869	0	237	95/95	115	40/42	57	325/331	495
04:07:25	67	125	858	738	0	237	0/0	2.8	0/0	0	392/384	476
04:07:31		83	812	2	0	237	0/0	2.8	0/0	0	393/385	476
04:07:35	0	53	764	2	769	237	0/0	2.8	0/0	0	393/387	476
04:07:41	0	-43	-	2	761	256	0/0	2.8	0/0	0	-	476
04:07:45	0	-203	-	303	245	649	0/0	2.8	0/0	0	-	476
04:07:51	0	-385	-	264	255	789	0/0	2.8	0/0	0	-	479
04:07:59	0	-423	-	554	298	810	0/0	2.8	0/0	0	-	480
04:08:20	0	-398	-	577	312	1071	0/0	2.8	0/0	0	-	485

Table 2

Time	HPBP Pr SP (ksc)	Act MS Pr (ksc)	BPV 1 Position (%)	BPV 2 Position (%)	BPE Temp SP (°C)	BPE 1 Position (%)	BPE 2 Position (%)	BPV 1 DS temp (°C)	BPV 2 DS temp (°C)
03:59:00	110	105	0	-6	300	1.5	-0.5	267	237
04:04:00	113	108	0	-6.7	300	1.5	-0.5	267	237
04:06:00	113	108	0	-6.7	300	1.5	-0.5	267	237
04:07:25	111	106	0	-6.7	300	1.5	-0.5	267	237
04:07:31	117	109	100	98	300	1.5	-0.4	268	237
04:07:35	117	109	82	46	300	1.8	0	269	238
04:07:41	117	116	12	5	300	30	0	283	245
04:07:45	117	118	0	4.8	300	10	0	298	253
04:07:51	117	121	0	4.4	300	10.5	0	316	267
04:07:59	117	122	0	4.1	300	10.5	9.2	330	286
04:08:20	117	123	0	24.4	300	10.5	16.9	340	319

TRIP ANALYSIS REPORT

TRIP ANALYSIS REPORT /TAR-012/ UNIT 1 / 14.07.2017

Dt. 17-07-17

Ref: 1. TRIP ANALYSIS REPORT /TAR-010/ UNIT 1 / 14.07.2017 Dated 17-07-17

OCCURRENCE:

- (a) **Condition:** Unit-1 was in service with 435 MW in LP mode and coal flow 208 tph at 23:25 hrs. on 14.07.2017.
- (b) **Incident:** Turbine tripped on protection IPT Fr DT high at 23:26:36.7 and Boiler tripped at 23:27:59 hrs on MFT (RH Protection). Unit was light up at 00:30 hrs after getting clearance from concerned authority from C&I division and synchronized at 01:43 hrs on 15.07.2017.

SOE OF DDCMIS ALARM PAGES:

TIME	DESCRIPTION	STATUS
23:26:36.275	IP Casing Fr Diff Temp (11MYA01EZ175)	Operated
23:26:36.354	TP CHNL 1.1 On	True
23:26:36.496	IP Casing Fr Diff Temp (12MYA01EZ175)	Operated
23:26:36.764	Turb. Trip Ch1.1 CMD	On
23:26:36.764	Turb. Trip Ch1.2 CMD	On
23:26:36.986	Turb. Trip Ch2.2 CMD	On
23:26:37.285	Turb. Trip Ch1.1 Operated	
23:26:37.642	Main Trip VLV-1	Tripped
23:26:37.669	Main Trip VLV-2	Tripped
23:26:38.714	All ESVs Closed	
23:26:40.062	Turbine Tripped	
23:26:40.425	HPBP Valve Fast Open Acted	
23:26:40.825	BP 1 Valve Fast Open	True
23:26:40.825	BP 2 Valve Fast Open	True
23:26:41.334	MDBFP Auto Start	True
23:26:41.814	BP1 VLV > 2% Open	True
23:26:41.814	BP2 VLV > 2% Open	True
23:26:42.004	Gen Breaker Opened	
23:26:42.939	Run Back 3 Mill Acted	
23:26:43.824	BP 1 Valve Fast Open	False
23:26:43.824	BP 2 Valve Fast Open	False
23:26:46.076	Pulv Motor F Tripped on Run Back	
23:26:47.911	MDBFP On	
23:26:51.555	Pulv Motor E Tripped on Run Back	
23:26:56	Pulv Motor D Tripped on Run Back	
23:26:57	BP1 VLV < 2% Open	
23:27:26	BPE2 Downstream Temp V High	
23:27:31.795	BP2 Priority Close	
23:27:47	BP2 VLV < 2% Open	
23:27:48.420	Both HPBP Closed	
23:27:58.559	Loss of RH Protection Acted	
23:27:59	MFT CH 2 Operated	

23:27:59 MFT CH 3 Operated
23:27:59 MFT CH 1 Operated

ANALYSIS from SOE and Trend:

Trip analysis from SOE and trend is made as below:

1. Unit was in service at 435 MW and 6 mills in service with a total coal flow of 208 tph.
2. At 23:26:36.275 IPT Casing Front DT protection acted (False Pick up) and Turbine tripped on this protection at 23:26:36.764.
3. On tripping of turbine, HPBP Fast open command acted 23:26:40.425 and BPV 1 & 2 opened from 0% to 100% (Trend Data: 23:26:40 to 23:26:45). MDBFP auto start command processed at 23:26:41.334. Generator CB opened at 23:26:42.004 and Runback to 3 Mill Condition acted at 23:26:42.939.
4. After completion of period for BPV Fast open command, BPV 1 closed to 0% (Trend data: 23:26:45 to 23:26:55) and BPV 2 was maintaining the MS Pressure in auto based on pressure controller set point. (Trend data: 23:26:45 to 23:27:45).
5. Downstream temperature of BPV2 increased from 259 °C at 23:26:45 to 377 259 °C at 23:27:30 (Trend Data) leading to Priority close of BPV2 at 23:27:31.795 (SOE).
6. Due to Closing of both BPV1&2, Both HPBP Closed alarm appeared at 23:27:48.420 and lead to MFT on loss of RH Protection at 23:27:58.559.
7. MFT acted at 23:27:59 and tripped the boiler.

CONCLUSION:

Following points were concluded:

1. False Pick up in IPT FR Diff Temperature protection was due to failure in milli Amp converter. It was replaced by C&I Division and clearance was given for light up.
2. The milli Amp converter failure was due to no AC in the control room suspected. The cabin temp was 51 deg cent.
3. BPV1 didn't operate after fast open is servo valve problem.
4. As per logic when any one BP Valves open more than 2 %, BD valve will open in auto. But in this case, even though BPV2 & BPE 2 were open > 2%, BD Valve didn't open, as the corresponding logic was bypassed. Even after spray valve BPE2 opening increased from 0% to 32% (Trend Data), BPV2 downstream temperature increased to more than 370 °C and priority close acted on BPV2. It lead to closing of BPV2 and subsequently Loss of RH Protection acted due closing of all BPVs.

RECOMMENDATIONS:

1. To avoid unit tripping/Equipment tripping due to spurious action of instrument parameters, certain protection parameters for boiler and turbine were modified with acceptance of concerned department HOD and those may be implemented. (Annexure attached)

2. Whenever open or close auto operation for equipments was bypassed due to operational requirement, it shall be normalized within the shift. Foolproof system shall be evolved for this simulation.
3. Trip Committee recommendations provided in trip analysis report point no. 2 & 4 in reference-1 shall be adopted.
4. Control room AC shall always be maintained

R. S
17/11/17
CM/OS(T)

18.07.17
DGM/C&I

DGM/Elec

DGM/O&C

TRIP ANALYSIS REPORT /TAR-012/ UNIT 1 / 14.07.2017 Dt. 17-07-17

Time	Load (MW)	Drum Level (mm)	HPBP Pr Controller SP	MS Pr (Ksc)	BPV 1 Position (%)	BPV 2 Position (%)	BPE Temp SP (°C)	BPE 1 Position (%)	BPE 2 Position (%)	BPV 1 DS temp (°C)	BPV 2 DS temp (°C)
23:26:35	433	15.4	160	155	0	0	300	1.18	0	271	259
23:26:40	42.6	17	160	163.7	0	0	300	1.19	0	271	259
23:26:45	0	-20	178	165.9	100	100	300	1.2	0	271	259
23:26:50	0	-63	178	166	84	36	300	5.7	0	273	260
23:26:55	0	-138	178	174	31.3	25.2	300	8.7	0	291	267
23:27:00	0	-239	178	177	0	46.6	300	20	0	313	279
23:27:05	0	-302	178	179	0	47.96	300	23	6.3	338	300
23:27:10	0	-319	178	180.6	0	39.97	300	23.2	13.4	351	315
23:27:15	0	-318	178	182.6	0	31.44	300	23.2	15.1	361	332
23:27:20	0	-334	178	183.5	0	20.4	300	23	18.9	369	351
23:27:25	0	-337	178	184.2	0	34.25	300	23.3	19.9	373	365
23:27:30	0	-316	178	183.8	0	44.58	300	23.4	31.6	374	377
23:27:35	0	-291	178	183.9	0	41.97	300	23.4	32.5	375	386
23:27:40	0	-256	178	185.2	0	17.85	300	23.4	29.9	374	403
23:27:45	0	-239	178	186.8	0	9.9	300	23.5	21.6	374	403
23:27:50	0	-247	178	188.2	0	0	300	23.48	23.3	373	409

COMMITTEE REPORT ON TDBFP UNLOADING IN UNIT1 ON 04.07.2017

PREAMBLE:

On 04.07.2017 at 02:44 hrs, Unit-1 was in service at 375 MW with both TDBFPs in service. At 02:48 hrs both TDBFPs were unloaded and created drum level disturbance. Later MDBFP was started and unit was stabilised. In this regard, a committee has been constituted on 05.07.2017 to study and analyse the root cause for unloading of TDBFPs and to provide suitable recommendations to prevent the repetition of it in future.

OBSERVATION and ANALYSIS:

Board Operator's Feedback:

As per concerned board operators, Unit was in service at 375 MW with TDBFP 1A & 1B in service and MDBFP in auto standby condition. At Around 02:48 hrs, TDBFP 1B suddenly unloaded and drum level started reducing. After observing the situation, TDBFP 1B was hand tripped. But MDBFP didn't come into service on auto. Hence MDBFP was started manually and feeding was given to normalise the drum level. When drum level was on rising trend, TDBFP 1A didn't respond to the variation. Hence it was hand tripped to control drum level.

Trend and SOE:

Trend:

Trend Data is attached in Annexure-A.

SOE:

Time	Description
02:48:41.472	1TDBFPA SPDREF > Actual (100rpm)
02:49:20.195	1BFPDTB_Ref_Rem Old = Remote; New = Local
02:50:13.157	1BTURB_TRIP_HMI TDBFP 1B Hand tripped
02:50:13.515	1BFPC SGC Auto Start
02:50:14.005	MDBFP C AOP Auto Start
02:50:14.015	Rapid Start Up 92 vlv Auto Open
02:50:14.550	MDBFP AOP ON
02:50:14.825	TDBFP 1B Tripped
02:50:28.712	Feed Pump Limiting

02:50:28.722	Runback Feed Pump Acted
02:50:32.167	Pulv Motor F Off
02:50:37.736	Pulv Motor E Off
02:50:39.010	MDBFP C Standby selection removed
02:52:49.527	Pulv Motor D Stop PB Pressed
02:53:22.466	MDBFP Manual Start

OBSERVATION:

Following observations were made from the trend and SOE:

1. Unit was in service at 375 MW with TDBFP- 1A & 1B in service with a feed water flow of 1226 tph and MS flow of 1136 tph and drum level -55mm at 02:44 hrs.
2. SC O/P, Suction flow, Actual speed, Discharge pressure for TDBFP 1A: 39 %, 827 tph, 4852 rpm, 167 Ksc and TDBFP 1B: 48%, 832 tph, 4844 rpm, 167 Ksc.
3. For the same Speed demand, difference in SC output between TDBFP 1A & 1B was found to be around 9 %.
4. Re-circulation valve for TDBFP 1A was in closed condition and for TDBFP 1B was in open condition with a flow of 437 tph.
5. TDBFP 1B was hand tripped at 02:50:13.157 hrs and MDBFP auto start command processed at 02:50:13.515. But Pump didn't start.
6. As TDBFP 1B tripped and MDBFP didn't start on Auto Run back was initiated at 02:50:28.722 hrs followed by tripping of top two pulverisers (Mill 1E & 1F). Total coal flow reduced from 194 tph to 139 tph. Correspondingly load reduction was observed from 375 MW to 297 MW. Again at 02:52:49.527 hrs, Mill 1D was manually tripped and coal flow reduced to 101 tph. Load also reduced to 265 MW.
7. As MDBFP didn't start on auto, it was deselected from remote mode and was started manually at 02:53:22.466 hrs and was loaded to maintain Drum Level.
8. At 02:58:40 hrs, TDBFP 1A was hand tripped.

ANALYSIS and RECCOMENDATIONS:

Based on above observations, following analysis was made:

1. From the trend it is clear that when unit-1 was in service at 375 MW with TDBFP 1A & 1B for pumping feed water to drum, the recirculation valve for TDBFP 1A was kept in close condition and for TDBFP 1B, it was kept in open condition. When the suction flow of both pumps was more than 800 tph each, only around 1226 tph was being pumped to drum

and balance water was recirculated to de-aerator. In order to maintain the drum level, speed controller output of both pumps were increased.

2. As per logic, when SC OP reaches around 50 %, MCV of TDBFP will go for 100 % open. On further increase in SC OP, TDBFP speed will be controlled by ACV and subsequently opening of MCV will reduce to 65 %. On reduction in MCV opening from 100 % to 65 %, TDBFP may unload if ACV doesn't open and create disturbances in drum level. At 02:44 hrs, TDBFP 1B was in service with Speed Controller OP 48 % and at 002:46 hrs it was 50.9 %. As SC OP was more than 50 %, TDBFP 1B unloaded due to closing of MCV from 100 % to 65 % and ACV didn't open even though LP secondary oil pressure increased to 2.5 Ksc.
3. Due to above problem, TDBFP 1B was manually tripped at 02:50:13.157 hrs and auto start command for MDBFP initiated at 02:50:13.515 hrs. But MDBFP didn't start on auto as pressure low switch was provided in DMCW upstream of working oil cooler instead of pressure adequate switch. (As MOV was inoperative, the pressure switch healthiness couldn't be checked since commissioning). MDBFP was started manually and loaded to maintain drum level.
4. Since TDBFP 1A alone was in service to feed the water to the drum, SC OP increased to more than 50 % and similar trend happened as in TDBFP 1B. LP secondary oil pressure increased to 3.49 Ksc and ACV didn't open. When the drum level was at +176 with MDBFP and TDBFP 1A in service, TDBFP 1A response to drum level controller was not in synchronous. Hence it was manually tripped by the operator in order to maintain drum level.
5. For same speed demand in both TDBFPs, BFP 1B speed controller Out Put was maintaining 9 % higher than BFP 1A. Hence SC OP for TDBFP 1B increased to more than 50 % earlier than BFP 1A and resulting in unloading of pump due to no response from ACV.
6. Valve characteristics of both TDBFP's were compared with design valves and found that TDBFP-1B opening of MCV is less compared to TDBFP-1A. Valve characteristic is attached in (Annexure-B).

RECCOMENDATIONS:



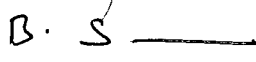
Following points are recommended based on the analysis:

1. MCV closing from 100% to 65%, when Speed Controller Output demand >51% logic may be modified as follows.

"As per the existing logic, "when the speed controller output demand of TDBFP crosses 51%, MCV opening comes to 65% from 100% without ensuring ACV opening". Hence it is suggested to

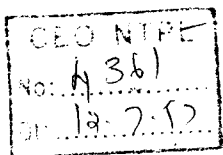
modify this logic as "When the speed controller output demand crosses 51%, its opening is to be reduced to 65% from 100 % only after ensuring demand >51% and open feedback from ACV. So that unloading of TDBFP can be avoided." This can be implemented as trial measure.

2. Valve characteristics of MCV's & ACV's to be adjusted equally.
3. Oil quality in TDBFP 1A and 1B shall be ensured. One time all ACV pilot valve block shall be cleaned with oil stone so that it should be free from any high spot ensuring free pilot rotation. Oil flushing shall be done for at least for 4 hrs.
4. Continuous Operation of centrifuge shall be ensured till oil quality improves.
5. MOV to DMCW working oil cooler was made ready and DMCW to working oil cooler upstream pressure switch is suitably modified as adequate switch by negating the low switch in the logic (not less than 3 ksc) and implemented in Start permissive of MDBFP.
6. When both TDBFPs are in service, the recirculation valves can be closed based on the demand. When Re-circulation valves for any TDBFP is kept open purposefully to tackle any adversary situation at low load, enough care shall be taken to close it during load raising period.
7. During auto start of MDBFP, Close F/B for DMCW 43 (DMCW TG cooling water for working oil cooler) shall be available.
8. Turbine seal steam pressure shall be maintained around 200 mmWC always.
9. Main pump and BP seal leak shall be as per recommended norms. If seal leak is more, it shall be attended immediately to prevent water entry into Pump bearing casing, causing oil contamination.

- | | | |
|-----------------------------|---------|--|
| 1. Shri. S Ganapathi. | DGM/C&I |  |
| 2. Shri. S. Anandan. | DGM/TM |  |
| 3. Shri. B. Surianarayanan. | CM/OS |  |


- Let us take ~~more~~ more feed back from other NLCL/NTPL stations regarding logic modification

Action plan may be made for implementing ^{the} recommendations particularly in #2 during forthcoming ^{over hauling} ~~SD~~ ^{SD}



CEO/NTPL




11/7/17

TRIP ANALYSIS REPORT

TRIP ANALYSIS REPORT /TAR-013/ UNIT 1 / 08.08.2017

Dt. 08-08-17

OCCURRENCE:

- (a) **Condition:** Unit-1 was in service with 505 MW in LP mode with 6 mills in service at 7:53 hrs on 08.08. 2017. Both UTs were not available due to breaker problem and the HT buses were fed from station transformer no1 and ST2 was under LC.
- (b) **Incident:** Boiler tripped at 7:55:40 hrs on 08.08.17 on MFT (Both ID fans off) due to electrical bus failure on over current because of overcurrent in ST-1 (primary 227 A for 5.9 seconds) due to starting of MDBFP in Unit-2 for hydro-test purpose. LPT rupture diaphragms opened because of both CW Pump tripped during this unit disturbance. Unit-1 was light up at 16:37 hrs and synchronized at 20:46 hrs on 08.08.2017.

SOE OF DDCMIS ALARM PAGES:

TIME	DESCRIPTION	STATUS
07:55:39.771	ID FAN A-1	Off
07:55:39.771	ID FAN A-2	Off
07:55:39.999	IDF B VFD CH1 Tripped	
07:55:39.999	IDF B VFD CH2 Tripped	
07:56:39.771	ID FAN A-3	Off
07:56:39.771	APH A Motor	Off
07:56:39.792	APH B Motor	Off
07:55:40.009	Both FD Fans On & IDF B Off	True
07:55:40.009	IDF B & A Protection acted	True
07:55:40.148	Both ID Fans Off	True
07:55:40.164	Cond Tr PC Tripped	True
07:55:40.168	MFT Ch1	True
07:55:40.174	IA-1 Tripped	True
07:55:40.174	IA-2 Tripped	True
07:55:40.174	SA-1 Tripped	True
07:55:40.213	MFT Ch2	True
07:55:40.350	IDF A VFD CH1 Tripped	
07:55:40.350	IDF A VFD CH2 Tripped	
07:55:40.360	Both FD Fans on IDFA Off	True
07:55:40.360	IDF A Protection Acted	
07:55:40.395	MFT CH-1 TP1	
07:55:40.395	MFT CH-2 TP1	
07:55:40.398	MFT Ch3	True
07:55:40.719	0BA-0BC Tie Close	Not True
07:55:40.767	1CA Bus-B UV	Failure
07:55:41.148	All FD Fans Off	True
07:55:41.195	TP CHNL1.1 On	True

07:55:41.370	RTS 1 On	
07:55:41.385	Turb Trip Ch1.1 CMD	On
07:55:41.385	Turb Trip Ch1.2 CMD	On
07:55:41.602	Main Trip VLV-1	Tripped

ANALYSIS from SOE and feedback from board engineers.:

1. Unit was in service at 505 MW and 6 mills in service.
2. ST2 was under maintenance due to low insulation resistance of R phase and Y phase 11KV cable between OBC winding and OBC incomer breaker.
3. At 07:55:35 MDBFP-2C was started for unit-2 boiler hydraulic test after raising bus voltage.
4. At 07:55:40.168 unit-1 tripped on MFT (both IDFs Off) on loss of 11kV, 3.3 KV and 0.4 KV supply. All the running equipments tripped in unit-1 & 2. Meantime DG set came in auto and 0.4kV supply was fed ^{to} N/E bus. In Unit 1, as 24V C&I Supply MCB tripped in CRE 61 Panel, the alternator breaker from DG set was closed manually and subsequently MCB was normalized.
5. DC driven equipment for all critical equipment were in service.
6. On failure of 11 kV & 3.3 kV all running equipments tripped and some of the critical equipments are mentioned below:
 - a. CW Pump-A & B.
 - b. Vacuum Pump-A&B tripped.
 - c. ACW-B tripped.
 - d. CEP-B & C tripped
 - e. HPCF-1 tripped.
 - f. TG DMCW –A & B tripped.
 - g. SG DMCW-B tripped.
 - h. AOP-1 & JOP-1 tripped.
 - i. HPBP OSU-1 & 2 tripped.
7. On Turbine trip, both HP Bypass valves (BPVs) opened 100 %. But BPVs couldn't be closed neither in remote nor from local due to non-availability of both OSU Pumps.
8. Condenser vacuum breaker got opened due to tripping of HPCF pump. LPBP was closed immediately to stop steam dumping inside condenser. Close command for Boiler stop valve (MSV-1&2) was given. Seal steam for both TDBFPs and main turbine was isolated. Meantime, LP Turbine rupture diaphragm (boiler side) got opened.

CONCLUSION:

Following points were concluded:

1. When MDBFP was started in unit-2, heavy current drawl was noticed momentarily. Hence, primary current (227 A) in ST-1 exceeded for more than 5.9 seconds and it tripped on Inverse definite over current protection. As ST-1 was only in charged condition, 11kV supply failed and subsequently 3.3 kV and 0.4 KV supply failed.
2. Due to non-availability of Cooling water inside condenser on tripping of both CW pumps lead to LPT rupture diaphragm explosion though vacuum breaker was in open condition.
3. Both bypasses could not be closed immediately and steam continuously supplied to condenser. this led to failure of explosion diaphragm even though vacuum breaker was opened.
4. The ST1 was charged and the system was normalized and 0BB was charged and TIE was availed for 0BD bus. The circulating water pump house service transformers are in 1BA and 2BB bus. 1BA bus gets power supply from 0BA bus and 2BB bus gets power supply from 0BC bus which in turn gets supply from 0BA bus as ST2 is under maintenance. There was a minor breaker problem in 0BA incomer breaker and that was attended and then the 11KV and then 3.3KV buses and then 0.4 KV buses were normalized.

RECOMMENDATIONS:


1. To prevent LPT rupture diaphragm explosion during station pullout conditions, following suggestions shall be adopted/implemented:
 - a. Tripping of boiler on tripping of all CW Pumps(1A,1B,1C/2A,2B,1C).
 - b. Protection closing of line drain MOVs before HPH 6A & 6B on tripping of both CW Pumps.
 - c. For Turbine valve MCC one supply is from unit service Transformer 1DA and other supply is from N/E bus 1DG. Whenever the main supply from 1DA fails the power supply will automatically changeover to N/E supply source once the bus gets supply from the DG set. This changeover has to be checked during the next available opportunity.
 - d. One HPBP OSU supply shall be taken from Normal/Emergency bus (1DG/2DG). Now both the HPBP OSU are getting supply from Turbine MCC bus (1KA/2KA).
 - e. HRH ERVs shall be opened to reduce the accumulated pressure in RH coils.


2. The Normal Inverse setting of station transformer 1 and 2 may be revised from 175A 0.22sec TMS to 180A 0.26 sec TMS. However, when only one station transformer is feeding the entire station loads before starting MDBFP it should be analyzed case by case and then only it should be taken into service. The overloading capacity of transformer depends on the normal loading status of the transformer just before overloading and the average ambient temperature of medium. It may be noted that NTPL Station Transformers capacity is 63MVA each only but power stations of similar capacities are having station transformers of capacity 80MVA each.
3. The load on the CHS, shore unloader may be temporarily stopped before starting MDBFP whenever one station transformer is feeding the entire station load.
4. As station transformer capacity limitation comes when one station transformer is feeding the entire station, the process of starting TD BFP with AST without entirely depending on MD BFP in such cases may be explored and expedited.

B. S. —
CM/OS(T)


DGM/C&I


DGM/Elec


DGM/O&C


26/8/17

CEO/NTPL may pl. like to see.

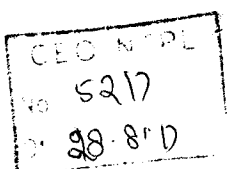
What is recommendation for setting of ST when one ST is in service.

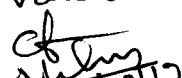
Reason for tripping HT side is not analysed.


28/8

The Settings have been revised to 185A 0.26sec for Station Transformer.

For HT side tripping the individual LT side load current is within the threshold values but the HT side current is crossing the set value.



Submitted to GMR/Co.4 
→ CEO/NTPL