**PRELIMINARY REPORT**

**M/s. COASTAL ENERGEN PVT LTD,POWERMECH PROJECTS PVT LTD** entrusted **M/s. VIBRANT NDT SERVICES**, Chennai for On Line Helium Leak Inspection of Unit #01, 600MW, Steam Turbine to identify the Air Ingress Points in the Condenser Negative Pressure Parts and its associated lines.

The NDT Team of Vibrant NDT services, Chennai carried out this Helium Leak Testing from 04.09.2024 to 07.09.2024.

The contents of the report are based on the observations / results of inspection carried out by

Vibrant NDT Services team at PMPL.

**PREPARED BY**

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NDT ENGINEER

**EXECUTIVE SUMMARY**

M/s Vibrant NDT Services inspected **600MW** Steam Turbine for identifying the air ingress points in the condenser negative pressure parts. The inspection was carried out in all the negative pressure parts of the condenser which includes the steam Turbine, Vacuum pumps, exhaust hood RHS horizontal parting plane, exhaust hood LHS horizontal parting plane, vertical parting plane & Condenser connecting Flange, Gland Steam Condenser, LP heater side, flash tank, hot well, rupture disc & all associated Pipeline, valves, welding and flanges etc. In this process, total of **44 leaks** were identified. The identified leaks are tagged for repairing action.

**EQUIPMENT DETAILS**

Make : Adixen

Model : ASM 310

Roughing pump capacity : 10 m3/hour

Sensitivity : Vacuum method 10-12mbar-l/sec

Sniffer method 10-7mbar-l/sec

Tracer gas : Helium

Calibration Method : Auto Calibration

Calibration Standard (Inbuilt) : 1.3 x 10-7 mbar.l/sec

**TRACER GAS**

Utilizing the Inert, lightness and high penetrating capacity of Helium gas, Helium is used as a tracer gas. Helium gas is a very light gas which can penetrate even through the minutest crack on the surface and hence its application would help in detecting surface cracks, which otherwise could not be easily identified. It is a harmless gas and hence there is no personal danger involved in using this gas. The gas is eco-friendly.

**INSPECTION TECHNIQUE**

The most sensitive and sophisticated Adixen Helium Leak Detector connected to the system’s Air Removal System detects even low traces of helium.

Helium is applied to the various components within the vacuum boundary of a turbine / condenser system. In case of a leak, the injected helium enters the steam side of the condenser and is removed by the air removal system; the same will be correspondingly detected by the Leak detector connected to the air removal system.

This same procedure will be adapted to all the negative pressure parts individually while the unit is in service. All the leaky spots identified will be tagged for further repairing action at your end.

Helium inspection being Qualitative inspection, only samples of the off gases from the ejector is analyzed by the mass spectrometer. The entire off gases can be monitored, however the cost and time involved in the inspection becomes high. Hence the leak rate observed is categorized based on the experience of the Inspection Engineer.

Leak indications are specified in mbar.l/sec. Based on the leak rate the leaks can be categorized as medium, large, very large and severe

Each leak is recorded with location, analyzed value, and size (medium, large, very large and severe).

**LEAK RANGES**

Although Helium inspections are classified primarily as a qualitative inspection, enough information is collected for the project manager to assess each identified leak and provide the Customer with sufficient information to allow proper intensity, maintenance and scheduling of repairs.

At times the Inspection Engineer may change the leak size designation so that it is consistent with project goals and unit operating parameters.

**UNIT #01 HELIUM LEAK LIST**

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| **Sl No.** | **Description** | **Leak Value mbar.lit /sec** | **Leak Size** | **PPM** |
| 1 | LP FLASH TANK ATTEMPERATION DRAIN VALVE PASSING(OPEN TO ATMOSPHERE) | 1.9 x 10-5 | MEDIUM | 19 |
| 2 | CRH DUMP-2 DRAIN VALVE PASSING | 2.5 x 10-5 | MEDIUM | 25 |
| 3 | GLAND STEAM HEADER RETURN DRAIN LINE -3 VALVE PASSING | 3.6 x 10-5 | MEDIUM | 36 |
| 4 | AST TO GLAND STEAM DRAIN LINE -2 VALVE PASSING | 4.6 x 10-5 | MEDIUM | 46 |
| 5 | CONDENSATE ATTEMPERATION HEADER DRAIN VALVE PASSING | 1.8 x 10-5 | MEDIUM | 18 |
| 6 | LPH-7B/8B NORMAL DRAIN LINE WELDING JOINT (BOTTOM SIDE) | 1.5 x 10-5 | MEDIUM | 15 |
| **7** | **LPH-7B/8B HEATER SURFACE BODY JOINT FLANGE TOWARDS U2 SIDE** | **3.6 x 10-4** | **LARGE** | **360** |
| 8 | LPH-7B/8B VENT MIV DOWN STREAM FLANGELEAK | 1.2 x 10-5 | MEDIUM | 12 |
| 9 | LPH-7B/8B ATMOSPHERE DRAIN WELDING JOINT (U2 SIDE) | 1.3 x 10-5 | MEDIUM | 13 |
| 10 | LPH-7B/8B ATMOSPHERE DRAIN WELDING JOINT (U1 SIDE) | 1.2 x 10-5 | MEDIUM | 12 |
| 11 | LPH 7B/8B NORMAL DRAIN LINE FLANGE JOINT | 2.5 x 10-5 | MEDIUM | 25 |
| 12 | LPH 7B/8B EMERGENCY DRAIN LINE FLANGE JOINT | 1.8 x 10-5 | MEDIUM | 18 |
| 13 | LPH-7B/8B LEVEL GAUGE PIPE WELDING JOINT | 1.7 x 10-5 | MEDIUM | 17 |
| 14 | LPH-7B/8B PRESSURE GAUGE PIPE MIV FLANGE JOINT | 1.1 x 10-5 | MEDIUM | 11 |
| 15 | LPH7B/8B HEATER SURFACE BODY JOINT FLANGE | 4.0 x 10-5 | MEDIUM | 40 |
| 16 | TDBFP-1A REAR GLAND LEAK | 1.1 x 10-5 | MEDIUM | 11 |
| 17 | TDBFP-1A TOP CASING FLANGE LEAK | 1.1 x 10-5 | MEDIUM | 11 |
| 18 | TDBFP 1B REAR PARTING PLANE LEAK | 1.1 x 10-5 | MEDIUM | 11 |
| 19 | TDBFP 1B REAR GLAND LEAK | 1.6 x 10-5 | MEDIUM | 16 |
| 20 | TDBFP 1B TOP CASING FLANGE LEAK | 2.4 x 10-5 | MEDIUM | 24 |
| 21 | LP-1 TURBINE FRONT BELLOW INSPECTION DOOR | 1.3 x 10-5 | MEDIUM | 13 |
| 22 | LP-1 TURBINE FRONT BELLOW CASING JOINT | 6.0 x 10-5 | MEDIUM | 60 |
| 23 | LP-1 TURBINE GLANDLEAK | 1.2 x 10-5 | MEDIUM | 12 |

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| **Sl No.** | **Description** | **Leak Value mbar.lit /sec** | **Leak Size** | **PPM** |
| 24 | LP-1 TURBINE FRONT BOTTOM INSPECTION DOOR LEAK | 1.4 x 10-5 | MEDIUM | 14 |
| 25 | LP-1 TURBINE FRONT PARTING PLANE LEAK | 1.4 x 10-5 | MEDIUM | 14 |
| 26 | LP-1 TURBINE PARTING PLANE LEAK | 1.2 x 10-5 | MEDIUM | 12 |
| 27 | LP-1 TURBINE REAR BELLOW INSPECTION DOOR LEAK | 1.8 x 10-5 | MEDIUM | 18 |
| 28 | LP-1 TURBINE REAR BELLOW LEAK | 1.0 x 10-5 | MEDIUM | 10 |
| 29 | LP-1 TURBINE GLAND LEAK | 1.1 x 10-5 | MEDIUM | 11 |
| 30 | LP-2 TURBINE FRONT BELLOW LEAK | 1.3 x 10-5 | MEDIUM | 13 |
| **31** | **LP-2 TURBINE FRONT GLAND LEAK** | **1.2 x 10-4** | **LARGE** | **120** |
| 32 | LP-2 TURBINE REAR BELLOW CASING JOINT | 3.3 x 10-5 | MEDIUM | 33 |
| 33 | LP-2 TURBINE FRONT BELLOW CASING JOINT | 4.0 x 10-5 | MEDIUM | 40 |
| 34 | LP-2 TURBINE FRONT PARTING PLANE | 1.5 x 10-5 | MEDIUM | 15 |
| 35 | LP-2 TURBINE REAR PARTING PLANE | 3.5 x 10-5 | MEDIUM | 35 |
| 36 | LP-2 TURBINE REAR BELLOW BOLT JOINT LEAK | 1.9 x 10-5 | MEDIUM | 19 |
| 37 | LP-2 TURBINE REAR BELLOW LEAK | 2.7 x 10-5 | MEDIUM | 27 |
| 38 | LP-2 TURBINE REAR GLAND LEAK | 2.4 x 10-5 | MEDIUM | 24 |
| 39 | LP-2 TURBINE REAR SIDE SPARY SIDE DUMMY | 1.1 x 10-5 | MEDIUM | 11 |
| 40 | LP-2 TURBINE REAR BELLOW CASING JOINT | 1.7 x 10-5 | MEDIUM | 17 |
| 41 | LP-2 TURBINE PARTING PLANE FLANGE LEAK | 1.7 x 10-5 | MEDIUM | 17 |
| 42 | LP-2 TURBINE RIGHT SIDE FULL LENGTH HAS HELIUM LEAK | 1.0 x 10-5 | MEDIUM | 10 |
| 43 | LP-1 TURBINE RIGHT SIDE PARTING PLANE | 1.3 x 10-5 | MEDIUM | 13 |
| 44 | LP-1 TURBINE RUPTURE DISC INNER (LP-2) | 3.8 x 10-5 | MEDIUM | 38 |