ABRADABLE COATING ON GLAND AREAS OF STEAM TURBINE COMPNENTS

1. SCOPE:

This Standard specifies abradable coating on steam gland areas of steam turbine components.

2. COATING SPECIFICATIONS:

i) **Bond coat** (Primary coat): Metco 450NS (Ni 5Al) or equivalent.

Particle size: 90 +45 microns.
Manufacturing method: Thermal spray coating(flame spraying)
Type of bond: Mechanical
Thickness of coating: 100 – 150 microns
Technical requirements:

- Coating shall manifest good Machinability, oxidation resistant and corrosion-resistance.
- It shall be capable of establishing excellent bond strength with low ferritic alloy steels viz. GS20Mo5, GS17CrMo55, G17CrMoV5-10, 21CrMoNiV47 and Martensitic stainless steel X22CrMov121
- It shall be capable of withstanding service temperature up to 610 °C

ii) **Top coat** (final coat): Metco 301NS (Ni 13Cr 8Fe 3.5Al 6.5BN) or equivalent.

Particle size: 120 +45 microns.
Manufacturing method: Thermal spray coating (flame spraying)
Type of bond: Mechanical
Thickness of coating: as specified in drawing less primary bond coat.

Technical requirements:

- Coating shall manifest good lubricity shall get easily abraded in case of contact with rotor material 30CrMoNiV59, 28CrMoNiV511 & Sealing fin which are made of high alloyed Chromium steel & Austenitic stainless steel.
- Coating shall manifest good Machinability, oxidation resistant and corrosion-resistance.

- It shall be capable of withstanding Service temperature up to 610 °C

Note to Supplier:

1. Location of abradable coating is shown in the applicable specification drawing.
2. Before starting the coating process, the surfaces to be coated shall be cleaned thoroughly and suitable grit type and size shall be selected to achieve required surface roughness to ensure excellent bonding of primary coat. During grit blasting care shall be exercised to protect sealing fins from damage and bending.
3. The surface shall be degreased with suitable solvent
4. Before commencing the thermal spaying process, supplier shall ensure masking of sealing fins with heat resistant tape to prevent damages and inadvertent application of coating on sealing fins.
5. Abradable coating to be applied between the seal strips as shown below

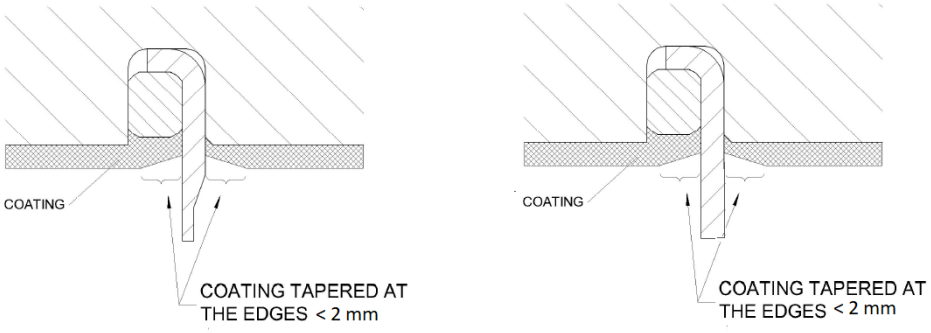

Fig.1

3. PROCESS QUALIFICATION:

Prior to processing final components, the Supplier to establish the thermal spray coating process to accomplish quality requirements through the process Qualification and supplier shall seek BHEL's approval before taking up actual order specific coating work.

3.1 The Process qualification as applicable for first test piece only includes the following as a minimum requirement.

i) Supplier shall provide minimum three coated sample pieces complying order specific coating thickness to BHEL for checking of bond strength, porosity.

ii) One additional sample piece with total coating thickness of 2 mm shall also be provided to BHEL for checking of the hardness of coating.

The number test pieces and testing process is liable to iterate until desirable mechanical properties of the coating (ref. Clause 5.3) are achieved.
BHEL shall provide the interim approval for the process qualification based on compliance of test result in line with clause 5.3 after which supplier shall carry out necessary testing and furnish final test result on mechanical properties of the coating for BHEL's approval, review and record purpose.

3.2 In case of duly qualified process by BHEL, supplier shall coat three sample piece along with order specific component and furnish the test result for mechanical properties on coating (ref. clause 5.3) for BHEL approval, review and record purpose.

4. COATING PROCESS:

The coating is to be applied by flame spraying using the process parameters which have been proven during the manufacturing and testing of the test pieces, and in accordance with the internal specification of the coating manufacturer. The internal specifications contain detailed information on filler materials, such as chemical composition and grain size distribution, coating parameters, such as gases and gas flow rates, distances, spraying equipment, covering, etc.
The supplier shall submit the Manufacturing Process Plan (MPP) to BHEL. The MPP shall define all the necessary steps and the applicable procedures needed to obtain requirements of coated part.

MPP shall include the following:

- List of all materials used directly in the spray coating.
- List of all support materials (masking, grit blast media, etc.).
- List of all equipment used during processing of part.
- Detailed description of the steps used during processing of the part.
- Quality Control Plan describing the methods and frequencies of inspections and tests used to ensure that coated parts meet the requirements of the BHEL drawing.

5. TESTING:

5.1 Visual inspection: Upon completion, the surfaces are to be inspected visually. The following criteria must be fulfilled:

- The coating must be homogeneous and must cover all surfaces as specified in the specification drawing.

5.2 Dimension check

The coated surface thickness shall be within tolerance of ± 0.1mm of specification drawing.

5.3 Mechanical Properties of coating:

Finished coated surface shall be tested for following mechanical properties.

Hardness: HR15Y hardness (Avg.) 45 to 65

Porosity: >50 %

Peel-off strength(psi) as per ASTM C 633: >1100 mean value with Std. deviation less than 10% of mean value. Bond

6. PACKING AND DESPATCH:

The supplier is responsible for packing and transport of finished goods. Special attention shall be paid to the protection of the seal strips and coating in order to prevent damage during transport.

RECORD OF REVISIONS

REV NO.	DATE	REVISION DETAILS	REVISED	APPROVED
00	**19/12/2019**	**NEW**	**KTM**	**GMM**
01	**27/11/2020**	**Mechanical Properties reviewed and modified**	**KTM**	**GMM**