INTER PLANT STANDARD IN STEEL INDUSTRY		
IPSS	**RECLAMATION OF ROLL TABLE ROLLERS**	**IPSS:3-02-018-18**
	Corresponding IS does not exist	Formally : IPSS:3-02-018-07

(FOR INTERNAL USE OF MEMBER PLANTS)

0. FOREWORD

0.1 Interplant standardization in steel industry was initiated under the aegis of the Indian Standards Institution (ISI) and the Steel Authority of India Limited (SAIL). This IPSS was prepared by the standard committee on Operation and Maintenance, IPSS 3:2 and firstly published in 2007. Lastly, this has been revised by the standard committee in July 2018 with the active participation of the representatives from major Indian steel plants and leading consultants.

0.2 This standard for steel industry primarily aims at achieving increased life of Roll Table Rollers by in-house developed technology of roller reclamation.

0.3 This standard is intended to provide guidelines for reclamation of Roll Table Rollers which can not be used because of damage in bearing journal or wear in barrel of roller. Wear in barrel of roller causes stain in the metal during its movement. Further increase in the wear results in retarded, interrupted movement or sometimes no movement. Wear beyond a limit makes roller beyond reclamation and roller is to be discarded.

1. SCOPE

1.1 This Inter Plant Standard covers the reclamation of the Roll Table Rollers of all sizes of Primary and Finishing Mills. Size of roller varies in length and diameter.

2. COMPOSITION OF ROLLER

2.1 Material composition varies from roller to roller but reclamation process does not change much.

2.2 The typical material composition of some of the rollers reclaimed are as follows:

i) **Plate Mill Roller**

Material : 45 C 8 as per IS:2004:91.

Chemical Composition:

C - 0.40 - 0.50

Si - 0.10 - 0.35

Mn - 0.60 – 0.90

S - 0.035 max

P - 0.035 max

ii) **Rail & Structural Mill Roller**

Material : C m 5 (USSR)

Chemical composition:

C - 0.2 - 0.37

Si - 0.10 - 0.35

Mn - 0.50 – 0.80

S - 0.055 max

P - 0.045 max

Note : Equivalent Indian Standards to be followed.

3. SELECTION OF ROLLERS FOR RECLAMATION

3.1 **Physical Inspection**: Only rollers which have defects in bearing journal, side hole and wear in the barrel are selected for reclamation. For this, physical inspection is carried out. Total wear is measured in barrel and journal. Cracks are marked and dye penetration (DP) test is carried out to assess the cracks.

3.2 **Bearing Seat Repair** – It is done by using 30/10 type Cr-Ni SS electrode. Preheating of roller is done at 150 deg C after welding area is covered with asbestos cloth and job is allowed to cool slowly. Super therm (Ni) special or any equivalent can be used.

3.3 **Barrel Wear Repair** – In case of fine cracks on the barrel, full crack shall be removed by machining. Maximum allowable roller diameter reduction is 20 mm. DP test shall be done in order to ensure the crack free roller. Subsequently, roller reclamation technology shall be adopted.

4. ROLLER RECLAMATION TECHNOLOGY

Repair of barrel is carried out by following processes:

i) Semi automatic welding

ii) Submerged arc welding

It is preferred to use submerged arc welding for build up. Following electrodes in general shall be used for build up.

a) With CITORAIL-1

Electrode or equivalent	After 1st layer hardness	- 200 BHN
	2nd layer gives	-220 BHN
	3rd layer gives	-220/250 BHN

b) With L&T 2B electrode	After 1st layer hardness	-200 BHN
or equivalent	2nd layer gives	-260 BHN

3rd layer gives -270/280 BHN

4.1 **SEMI-AUTOMATIC WELDING**

E 71T-1 rutile type, all position flux cored wire, is most popular electrode in use. Common wire used are Advani-CITOFIL 31 or 12 and ESAB-OK TURBOD 15-14A or equivalent. Hardness achieved by these flux cored wires is 170 BHN.

Mechanical properties of weld metal depend on type of wire and shielding gas. Basic flux cored wire has lower level of oxygen, nitrogen impurities in the weld. Shielding gas has great influence on impact properties of weld metal.

4.2 SUBMERGED ARC WELDING

Thickness of deposited metal in this process is 12mm maximum. Various layers of metal deposited are as follows:

1st buffer layer	3mm approx
2nd hard layer	3mm approx
3rd hard layer	3mm approx
4th hard layer	3mm approx (if required)

To achieve above, submerged arc welding process is to be adopted.

4.3 ELECTRODE WIRE

Mostly, two types of wires are used.

i) CCMS (Copper Coated Mild Steel) or equivalent : SA-1

ii) Alloy Steel Wire (ASW) or equivalent : 30.CA or SA-12

4.4 **FLUXES**

4.4.1. Flux is one of the important elements of the welding process, which to a large extent, determines the quality of the weld metal and of the welded seam. The flux serves the following functions:

i) To protect the molten metal from atmospheric gases

ii) To ensure good formation of welded bead and the stability of the arc

iii) To prevent splashing of the molten metal

iv) To ensure easy separation of the slag encrustation from the weld

v) To slow down the crystallization of the molten metal and to given better conditions for escape of gases from the molten metal

4.4.2. The fluxes are divided into two main types – the fused fluxes and the ceramic fluxes (agglomerated fluxes)

Fused Fluxes – These are prepared by melting the charge in the furnace, followed by granulation through water pouring process. It is then dried at 350-400 deg C and sieved to required grain size. Commonly fused flux used are AH 348 A or TPD-40.

Agglomerated Fluxes – These fluxes are mechanical mixtures of Ferro alloys with natural minerals. These are prepared by mechanical mixtures of the powders with liquid glass. Commonly used agglomerated flux AH

340 A is HF 101. The chemical composition of AH 340A fused flux is given below:

Silicon	-	41to43.5%
CaO	-	5.5%
MnO	-	34.5 to 37.5%
MgO	-	5.5 to 7.5%
Clay	-	3%
$CaPH_2$	-	3.5%, S<0.15%, P<0.12%

Welding with neutral flux & HF 101 wire givens BHN 220. By mixing the flux hardness can be increased to BHN 300. SA 12 wire neutral flux gives BHN 270.

5.0 PRE-HEATING & POST HEAT TREATMENT

Preheating of roller is done from 180 deg C to 200 deg C. Post heating / stress relieving can be done in annealing furnace to achieve required hardness.

6.0 WELDING DEFECTS

Crack develops in the weld metal due to diffusible hydrogen content caused by moisture absorption by flux. Flux core wire can not be retried effectively, hence should be stored in hermetically sealed packing.

7.0 MACHINING OF ROLLERS

Built up heat treated rollers are machined to correct diameter.

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