INTER PLANT STANDARD – STEEL INDUSTRY		
IPSS	**CODE OF PRACTICE FOR CLEANING OF WINDING OF ROTATING ELECTRICAL MACHINES**	**IPSS: 1-03-038-09**
	Corresponding IS does not exist	

0. FOREWORD :

0.1 This Inter Plant Standard has been prepared by the Standards Committee on Rotating Electrical Machinery, IPSS 1:3 with the active participation of the representatives of the steel plants and reputed consultancy organizations; and was adopted in September 2009.

0.2 This standard has been made to lay-down practices for cleaning of winding of rotating electrical machines in steel plants.

1. SCOPE: This Code of Practice is applicable for dc, LT, HT motors. I.R. (preferably R10/R1) should be measured before and after cleaning of winding of all rotating electrical machines.

2. REASONS FOR CLEANING OF MOTOR WINDING :

1. Schedule maintenance of overhauling of motor.
2. Heavy ingress of oil and dust in the winding.
3. Low Insulation Resistance of motor.
4. Winding temperature of motor showing an upward trend.
5. Fault in motor winding.

3. METHODS OF WINDING CLEANING :

A. In-situ cleaning of winding during short duration of maintenance.

1. Cleaning is done with dry compressed air.
2. Cotton cloth without fibre is used for wiping the dust in exposed & overhang portions.

B. In-situ cleaning of winding during capital repairs without removal of Rotor/Armature for pedestal mounted large machines.

1. Initial cleaning is done with dry compressed air.
2. Mopping of winding is done on exposed over hang portion of the winding and parts with a carbon cleaning solvent and fibreless cotton.
3. Spraying of carbon cleaning solvent is avoided as dissolved carbon may get deposited in the bottom part. Special care is taken to ensure that any dust or sticky particles are not deposited in the bottom part of winding while mopping, usually a plastic sheet is placed between rotor & stator.

C. In-situ cleaning of winding after dismantling of machine.

1. Initial cleaning is done with dry compressed air.
2. Carbon cleaning solvent is sprayed along with air to thoroughly clean the windings.
3. Greasy and sticky dust/dirt is removed by mopping with suitable solvent.
4. After mopping with diesel / suitable solvent, Carbon cleaning solvent is thoroughly sprayed to remove traces of diesel or suitable solvent.
5. Final cleaning is done by dry compressed air only.

D. Cleaning of machines removed for overhauling and to be kept as spares:

1 Initial cleaning is done with dry compressed air.

2 In case the winding is normal (not any sticky dirt/dust) carbon solvent compound is sprayed.

3 In case winding having greasy /sticky dust/dirt, Diesel or suitable solvent is sprayed to soften dust/dirt. Then both Rotor and Stator winding i.e all the winding parts, overhangs, air passage ducts, slot mouths etc is cleaned with nylon wire brush/ bottle brush/wooden sticks/cotton cloth etc. Compressed air is blown. Carbon cleaning solvent is sprayed with sprayer or with compressed air. If still dirt/dust is remaining above process is repeated. Final cleaning is done with dry compressed air. Stator and Rotor is varnished with air drying varnish.

4. CLEANING OF MACHINE IN ELECTRICAL REPAIR SHOP.

4.1 Machines are sent to ERS for following reasons *:*

4.1.1 Normal medium repair of machine.
4.1.2 Mechanical damage of machine
4.1.3 Electrical fault in machine.
4.1.4 Low/zero insulation resistance in the machine.

4.2 Method of cleaning adopted on a particular machine at ERS is subject to the following conditions :

4.2.1 Overall condition of winding in terms of accumulated dust / conducting particles.
4.2.2 Type of repair to be carried out
4.2.3 Delivery schedule of machine
4.2.4 Previous history of machine in terms of its IR value
4.2.5 Results of in situ cleaning methods attempted earlier

4.3 Before cleaning al the machines are dismantled and individual components are cleaned separately at ERS. Based on the types of cleaning agents used, the following methods are adopted at ERS for cleaning of windings :

4.4 Cleaning with cleaning agent :

4.4.1 Winding is covered with traces of dry dust and no sticky deposits.
4.4.2 Time availability is less like in case of C.R. jobs and other exigencies
4.4.3 Winding is dry
4.4.4 Winding is healthy and no winding repair is required

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4.5 The steps involved in this method of cleaning are –

4.5.1 Measure IR value of winding before cleaning.

4.5.2 Use compressed air for blowing out dry dust from the winding.

4.5.3 Spray carbon cleaning solvent thoroughly over the windings and other relevant areas like all air passages, supporting rings, front cone of commutator etc.

4.5.4 Use dry compressed air for final cleaning of winding.

4.5.5 Measure IR value of the winding and perform 4.6.1 unless a healthy value is achieved

4.5.6 If IR value of winding does not improve, cleaning with hot water as per step 4.6.1 is recommended.

4.6 Cleaning with hot water and caustic soda solution :

4.6.1 This method is usually adopted under the following conditions :

- Winding is covered with a thick layer of dust / muck of any kind.
- Time availability is abundant.
- Winding is wet due to ingress of water.
- Winding is defective and partial winding repair is anticipated.
- Non availability of cleaning agent.
- No improvement in IR value after cleaning with cleaning agent

4.7 The steps involved in this method of cleaning are :

4.7.1 Measure IR value of winding before cleaning.

4.7.2 Use compressed air for blowing out dry dust from the winding.

4.7.3 Inject a high pressure jet of hot water mixed with caustic soda (1KG/100L of water) all over the winding & its adjoining affected areas like air passage ducts, slot mouths, overhangs, supporting rings, front cone of commutator etc.

4.7.4 Sprinkle dry caustic soda all over the vulnerable parts of the winding including the slot mouths at both ends, supporting rings, front cone of commutator etc.

4.7.5 Spray water over the areas where caustic soda is sprinkled so as to facilitate free flow of caustic soda to the remote part of windings which is not accessible.

4.7.6 In case the winding is having oily stuff, use of bottle cleaning brush, nylon brush, cotton may be used to clean all air passage ducts, slot mouths, overhangs etc.

4.7.7 Allow some time for the caustic soda water to soften the stubborn dust/dirt in case of the winding having greasy / sticky dust/dirt.

4.7.8 Inject a high pressure jet of hot water all over the winding & its adjoining areas like air passage ducts, slot mouths, overhangs, supporting rings, front cone of commutator etc. to remove remaining traces of entrapped caustic soda / carbon dust from inside the winding.

4.7.9 Use dry compressed air for blowing out extra droplets of water and to facilitate quick drying of winding.

4.7.10 Keep the machine component inside drying oven for 40-48 hrs at a temperature of 120^{o}C increased gradually from 80^{o}C.

4.7.11 Measure IR value of the winding after the end of the drying cycle and repeat the extent of the drying cycle by another 30-36 hrs.

4.7.12 If IR value has shown signs of improvement but still not healthy, a second cycle of cleaning followed by a corresponding drying cycle may be attempted.

4.7.13 Monitor the IR value for a period of 3-4 days.

4.7.14 If IR value is stabilized at a healthy level, impregnate the winding after preheating and its curing thereafter.

4.7.15 If IR value does not improve after cleaning, replacement of deteriorated insulation followed by winding repair is to be attempted.

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