

W.O. 71862A/17100
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P.I. 140661293

ANNEXURE - K

Nitrogen Injection Type Fire Prevention & Extinguishing System

- 1.1 Nitrogen Injection Type Fire Protection System (NIFPS) shall be designed to prevent explosion of transformer tank and the fire during internal faults resulting from arc and also to extinguish the external oil fires on transformer/ reactor due to tank explosion and/or external failures like bushing fires, OLTC fires and fire from surrounding equipments, etc.

The system shall work on the principle of Drain & stir. On activation, it shall drain a pre-determined quantity of oil from the tank top through drain valve to reduce the tank pressure, isolate conservator tank oil and inject nitrogen gas at high pressure from the bottom side of the tank through inlet valves to create stirring action and reduce the temperature of oil below flash point to extinguish the fire. On operation, the quantity of oil removed from the tank shall be such that adequate amount of oil shall remain to cover active part (i.e. core coil assembly).

Electrical isolation of transformer shall be an essential pre-condition for activating the system.

1.2 Operational Controls

The system operation shall be fully automatic and activate from the required fire and other trip signals. In addition to automatic operation, remote operation from control room/ remote centre and local manual control in the fire extinguishing cubicle shall also be provided. System shall operate on following situations:

1.2.1 Prevention of transformer from explosion and fire

To prevent transformer from explosion and fire in case of an internal fault, signals given by operation of Electrical protection relays and tripping of circuit breaker of transformer and operation of either Buchholz relay or pressure relief valve (PRV) shall be used to activate the system. The exact logic for system activation shall be finalized during detailed engineering.

1.2.2 Prevention of transformer from fire

In case of fire, sensed by fire detectors, the system shall be activated only after electrical isolation of the transformer, confirmed by breaker trip. If the fire detection is not associated with any other fault, the system activation shall be only manual. Manual operation switch shall be provided in the control room with a cover to avoid accidental operation of it.

1.3 Operation of System

On receiving activation signal, the following shall take place:

- i) Open the quick opening drain valve to drain the top layer oil
- ii) Shut off the conservator isolation valve to prevent flow of oil from the Conservator tank to the main tank
- iii) Open the Nitrogen regulator valve to inject Nitrogen into the transformer tank to create stirring of oil.

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There shall be interlock to prevent activation of the system if the transformer is not electrically isolated.

There shall also be provision for isolating the system during maintenance and/or testing of the transformer.

1.4 Technical Particulars

The contractor shall be responsible for the design of the complete system and shall submit the drawings and design calculations for the number of fire detectors, pipe sizing of drain pipe and Nitrogen injection pipe, Nitrogen cylinder capacity, number of injection points, etc. and get approval from POWERGRID.

Facility shall be provided to test the system when the transformer is in service, without actually draining the oil and injecting Nitrogen.

The Nitrogen regulator valve shall be designed in such a way that the Nitrogen shall not enter the transformer tank even in case of passing/ leakage of valve.

Owner shall provide two distinct station auxiliary DC feeders for control purposes. The system shall work on station DC supply with voltage variation defined in GTR. The control box of fire protection system shall have facility to receive these feeders for auto changeover of supply. It shall be the contractor's responsibility to further distribute power to the required locations. In case auxiliary DC power supply requirement is different than station auxiliary DC supply, then all necessary DC-DC converters shall be provided by the Contractor.

Following minimum indications and alarms shall be provided in the local cubicle as well as in the control box:-

- Nitrogen cylinder pressure indication - manometer with sufficient number of adjustable NO contacts
- Nitrogen cylinder pressure low
- Fire in Transformer/ Reactor
- Oil drain started
- Conservator oil isolation valve closed
- Nitrogen injection started
- DC supply fail
- Oil drain valve closed
- Gas inlet valve closed

1.5 Details of Supply of System Equipments and Other Related Activities:

The scope of supply shall include the following items and any other items required for safe and trouble free operation of the system.

- i) Fire extinguishing cubicle with base frame and containing at least the following:
 - Nitrogen gas cylinder of sufficient capacity with pressure regulator and manometer with sufficient number of adjustable NO contacts.

- Oil Drain Assembly including oil drain pipe extension of suitable size for connecting pipes to oil pit
- Mechanical release device for oil drain and nitrogen release
- Limit switches for monitoring of the systems
- Panel lighting
- Flanges on top of the panel for connecting oil drain and nitrogen injection pipes for transformer
- Back up pressure switch to operate nitrogen gas valve
- Pressure indicators for Nitrogen pressure of the cylinder and actual injection through Nitrogen regulator

ii) Control box to be installed in the control room of the station for monitoring system operation, automatic control and remote operation, with alarms, indications, switches, push buttons, audio signal, suitable for tripping and signalling.

iii) Required number of fire detectors to be located in strategic locations to be finalized during detailed engineering.

iv) All controls, alarms, panels, cables, cable trays (if required), junction boxes etc.

1.6 Under Ground Oil Storage Tank

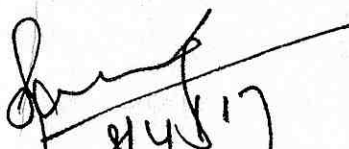
Each transformer unit shall be provided with an underground oil storage tank. The oil storage tank shall have Non Corrosive, water proof, epoxy coated (from Inside) mild steel (minimum thickness 6 mm) to store drained out oil on operation of NIFPS. The tank shall be painted from outside as per **Annexure – F**. The total capacity of storage tank shall be atleast 10% of transformer tank oil to avoid overflowing of oil considering that drained oil volume shall be around 10% of transformer tank oil. Necessary arrangement shall be made on underground storage tank so as to take out the drained oil from the tank for further processing and use. All the pipe and physical connection from transformer to oil pit shall be in the scope of contractor.

This storage tank shall be placed in the pit made of brick walls with PCC (1:2:4) flooring with suitable cover plates to avoid ingress of rain water. The design of tank and pit shall be finalised during detailed engineering.

1.7 Installation and pre-commissioning test

After installation the system pre-commissioning tests shall be carried out jointly with the Owner's representative before the system is put in service.

Note- Supplier to furnish clause-wise compliance to above cl. 1.1-1.7 incl. sub clauses.


8/4/17

Painting Procedure

PAINTING	Surface preparation	Primer coat	Intermediate undercoat	Finish coat	Total dry film thickness (DFT)	Colour shade
Main tank, pipes, conservator tank, oil storage tank & DM Box etc. (external surfaces)	Shot Blast cleaning Sa 2 ½*	Epoxy base Zinc primer (30-40µm)	Epoxy high build Micaceous iron oxide (HB MIO) (75µm)	Aliphatic polyurethane (PU) (Minimum 50µm)	Minimum 155µm	RAL 7035
Main tank, pipes (above 80 NB), conservator tank, oil storage tank & DM Box etc. (Internal surfaces)	Shot Blast cleaning Sa 2 ½*	Hot oil proof, low viscosity varnish or Hot oil resistant, non-corrosive Paint	--	--	Minimum 30µm	Glossy white for paint
Radiator (external surfaces)	Chemical / Shot Blast cleaning Sa 2 ½*	Epoxy base Zinc primer (30-40µm)	Epoxy base Zinc primer (30-40µm)	PU paint (Minimum 50µm)	Minimum 100µm	Matching shade of tank/ different shade aesthetically matching to tank
contractor may also offer Radiators with hot dip galvanised in place of painting with minimum thickness of 40µm (min)						
Radiator and pipes up to 80 NB (Internal surfaces)	Chemical cleaning, if required	Hot oil proof, low viscosity varnish or Hot oil resistant, non-corrosive Paint	--	--	--	--
Digital RTCC Panel	Seven tank process as per IS:3618 & IS:6005	Zinc chromate primer (two coats)	--	EPOXY paint with PU top coat or POWDER coated	Minimum 80µm / for powder coated minimum 100µm	RAL 7035 shade for exterior and Glossy white for interior
Control cabinet / Marshalling Box - No painting is required.						

Note: (*) indicates Sa 2 ½ as per Swedish Standard SIS 055900 of ISO 8501 Part-1.