MODIFICATION OF STG AUXILIARY STEAM LINE TCV SYSTEM FOR MAINTAINING AUX. STEAM TEMPERATURE IN AUTO MODE AND RECOVERING CONDENSATE AND HEAT ENERGY.

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Confidentiality Statement

The information in the document mentioned is not confidential and have been taken references from various sources as specified.

Abstract

About the Author

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Description

An Ejector system is used to extract the non condensable gases from the condenser for creating and maintaining vacuum in a steam turbine, which plays an important role in the rated output and efficiency of a steam turbine. NINL STG is provided with a two stage ejector (one working and one standby) for producing the desired vacuum of - 0.88 kg/cm^2.

Vacuum is created in the condenser of a turbine when steam is passed through the nozzles of the ejector. The pressure and temperature of steam used in ejector (called auxiliary steam / motive stem) is to be maintained at a pressure 11 kg/cm^2 and temperature 350 ^{0}C for the ejector to function effectively. Auxiliary steam parameters are maintained using a PRDS (Pressure reducing and desuper heating station). PRDS consists of a PCV (Pressure control valve) for reducing and controlling the steam

pressure from 62 kg/cm^2 to 11 kg/cm^2 and a TCV (Temperature control valve) which reduces and controls the steam temperature from 480 ^{0} C to 350 ^{0} C by spraying water. PRDS works in auto mode and is controlled by DCS. (Distributed control system)

TCV reduces steam temperature by spraying water .This spray water is DM water (Feed water to boilers) provided from the discharge of BFP (Boiler feed pump) at a pressure 85 kg/cm^2. TCV consists of a pneumatic valve in the main line which can be controlled from control room, in auto or manual mode. Main valve is provided with a bypass valve which can be controlled from field in case main valve fails.

At present all the valves of the TCV system are passing, resulting in auxiliary steam temperature not getting maintained at 350 ^{0} C and is going to the saturation temperature of aux. steam.(190 ^{0} C at 11 kg/cm^2) . Now temperature of aux. steam is maintained manually from field by opening the drain valve in TCV system to drain the excess spray water to the atmosphere. This results in huge loss of DM water and heat energy which affects the overall plant efficiency, in addition to financial losses. Also the valves flange gaskets are failing frequently due to saturated steam, which increases maintenance cost.

MODIFICATION FOR MAINTAINING AUX. STEAM TEMPERATURE IN AUTO MODE.

The drain line of aux. steam line TCV should be provided with a pneumatic control valve. (It can be taken from the PRDS of steam dumping line of STG or Boiler desuper heating valve SD-5) The pneumatic valve shall be controlled in auto mode, to maintain aux. steam temperature at 350 ^{0} C. (see fig. 1) .

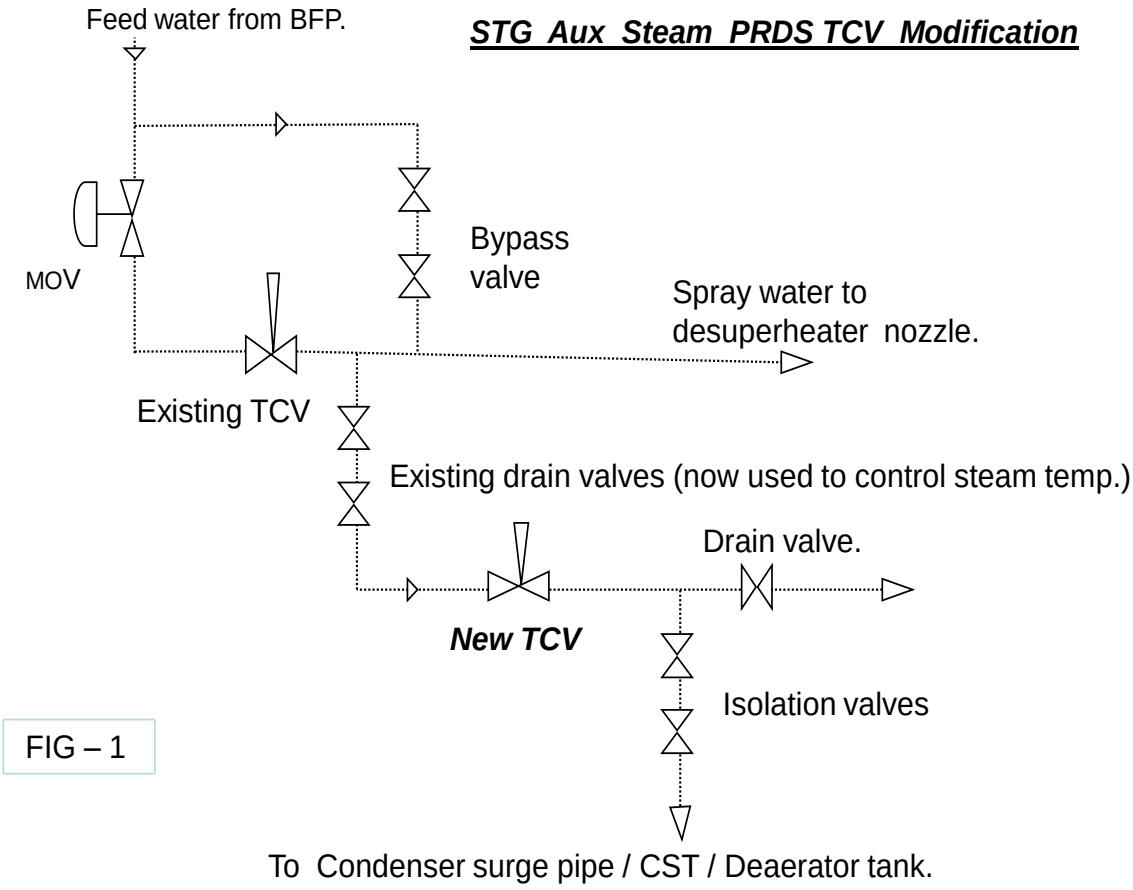

FIG – 1

MODIFICATION FOR RECOVERING CONDENSATE AND HEAT ENERGY.

At present the condensate is drained to the atmosphere. To recover the condensate and heat energy either of the following two modifications can be adopted.

a) By a little modification the drain line can be connected to the surge pipe of STG condenser thereby the condensate can be recovered 100 % and heat energy partially.(Because the flash steam gets condensed in the condenser).
b) To recover heat energy of the condensate completely, the drain line should be connected to the deaerator or condensate storage tank (CST) directly and the line should be insulated properly.

Temperature control valve (TCV) installed in drain line to control auxiliary steam temperature in auto mode

Drain line connected to condensate storage tank (CST) for recovering condensate

TANGIBLE BENEFITS

1) **Aux. steam temperature will be maintained as per the process requirement in auto mode. (350 ^{0} C)**
2) **Recovery of 22 M^3 condensate per day which is now drained to atmosphere.**
3) **Recovery of 3.5 tons flash steam per day which can be used as condensate.**
4) **Recovery of heat energy from the condensate which is now unutilised.**
5) **Steam leakages due to flange gasket failure of ejector valves and gland steam valves prevented. (Due to saturated steam)**
6) **Ejector efficiency and life increased as required steam parameters are maintained.**
7) **Maintenance cost and downtime are reduced as gasket failures are minimised.**

   (Total shutdown of STG is required to replace gaskets of ejector and gland steam line valves and total plant shutdown required to replace valves of PRDS which are passing)

COST BENEFIT

- **Modification successfully implemented with effect from *01/01/2017* and now DM water and heat energy is recovered resulting in increased power plant efficiency and annual savings of Rs 13 lakhs.**

References

Not applicable