GUJARAT TECHNOLOGICAL UNIVERSITY

स्वर्णिम गुजरात
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INDUSTRY DEFINED PROBLEM/PROJECT (IDP) STATEMENT FORM

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INDUSTRY DEFINED PROBLEM STATEMENT FORM

TITLE OF PROBLEM/PROJECT

To increase the efficiency of condenser by removing the scaling formation in condenser tubes.

DISCIPLINARY | INTERDISCIPLINARY	DISCIPLINE	

PROBLEM DEFINATION:

During our industrial training in GESCL wanakbori, when we are working for our final report preparation in unit no 7 we noticed that some problem had been arise in condenser of unit no 7. The technical problem in condenser was that, due to scaling in condenser tubes proper heat transfer from steam to cooling water was not occurring due to which condenser vacuum remains low. They have noticed that vacuum was 648 mm of Hg against design value 675 mm of Hg.

PROBLEM DISCRIPTION:

We can say that power plant is the heart of large scale industries. Power plant is usually established for purpose of generation of electricity mainly but some large scale industries also establish their own power plant so that they can generate electricity at their own industry and can use it in their own different section of plant. Mainly private industries like NIRMA, ADANI etc. establish power plant, the main primary factor behind that is they require process steam in their own purpose.

During our industrial training we have visited GUJRAT STATE ELECTRICITY CORPORATION LIMITED (GSECL), WANAKBORI which is the biggest power plant of Gujarat. For generation of this huge amount of electricity GSECL has established 7 units, that mean set of 7 boiler ,7 turbine,7 cooling tower and 7 generator mainly, each unit has capacity of 210 MW .power.

The condenser condenses the steam from the exhaust of the turbine into liquid to allow it to be pumped. If the condenser can be made cooler, the pressure of the exhaust steam is reduced and efficiency of the cycle increases. The condenser tubes are made of brass or stainless steel to resist corrosion from either side. Nevertheless they may become internally fouled during operation by bacteria or algae in the cooling water or by mineral scaling, all of which inhibit heat transfer and reduce thermodynamic efficiency. Many plants include an automatic cleaning system that circulates sponge rubber balls through the tubes to scrub them clean without the need to take the system off-line.

For best efficiency, the temperature in the condenser must be kept as low as practical in order to achieve the lowest possible pressure in the condensing steam. Since the condenser

temperature can almost always be kept significantly below 100 °C where the vapor pressure of water is much less than atmospheric pressure, the condenser generally works under vacuum. Thus leaks of non-condensable air into the closed loop must be prevented.

In modern fissile fuel plant approximately 1200 KCAL heat are rejected in to the circulating water per each KW-HR of energy produce i.e. more than 10% of heat from fuel burned in modern fossil fuel plant is reject to CW system. On account of above reason, the desirable feature of condensing plant such as minimum quantity of CW water, minimum cooling surface area per Kw capacity, minimum auxiliary power & minimum steam condensed per sq.meter of surface area are to be ensured. The efficient condenser plant must be capable of processing & maintaining a high vacuum with the available quantity of cooling water & should be designed to operate for prolonged period.

Experience reveals that the efficiency of condenser tube depends upon the maintenance of heat transfer surface cleanliness. The success of heat transfer with minimum power consumption for long time mostly depends upon the cleanness of tubes. The corrosion and scale formation are the common phenomenon in condenser tube during operation due to the action of chemical compound and deposits collected on the tube surface carried with water. The fouling of tube occurs because of micro organism such as algae, organic material or other foreign material, which in turn adversely, heat transfer result in low vacuum & there by reduction in thermal efficiency of power plant in our unit #7 condensers, condenser DP reached to 1.02Kg/CM^2 in both condensers, which shows that process of chocking /fouling, has begun. Keeping in view of above mentioned facts, it is desirable to clean the condenser tube chemically or by any other method so that predicted performance can be ensured.

EXPECTED OUTCOME:

As discussed above, it is desirable to improve condenser efficiency so that overall efficiency of plant can be increased. So if want to improve performance of condenser it is require that the heat transfer rate of condenser tube increases. So we have to remove the scaling or fouling that have taken place inside the condense tubes. So if we remove this fouling than the desirable value of vacuum inside the condense tube can be maintain. The primary goal is to achieve vacuum at 675 mm of Hg which is the design value so that proper heat transfer occurs between steam and CW water and flow rate can be achieved around 27688.94 kg/s / m^3/h.