

## Non Implemented Case Study– Energy Conservation Measure

<b>Measure</b>
Use of variable speed drive in pumps to avoid the over flow from the tank
<b>Equipment</b>
Pumping system
<b>Industry / Sector</b>
Copper
<b>Year of Implementation</b>
-
<b>Cost Benefit Analysis</b>
o Type of Measure: Medium investment
o Annual Energy Savings: 0.51 lakh kWh
o Actual cost savings: Rs.2.15 lakh
o Actual investment : Rs. 3.0 lakh
o Payback : 1.5 year
<b>Implementation Highlights</b>
<ul style="list-style-type: none"> <li>☞ Though saving potential exists in the pumping to avoid over flow to pond the measure was not implemented.</li> <li>☞ There is no cooling tower in the plant, the water which is overflowing to pond pass through spray nozzles (located at center of the tank which are acting as cooling tower)</li> <li>☞ The return line of water from all users is connected to common header and the plant is very old. The suggestion of use of return pressure for spray from some of the equipment was not implemented to proceed for installing variable speed drive.</li> <li>☞ The tank is comparatively small and huge fluctuations in demand (in terms of quantity of water required and occurred frequency) made plant not to opt for on and off level controller. Plant had implemented this earlier and found that at times the requirement is very high two pumps were not able takes the load there by tank was emptied particularly when water was at lower level.</li> </ul>

### Summary

Use of variable speed drives in pumps which supply water to the over head tank will results in avoiding of the over flow and also maintain the water level to meet the sudden demand eruptions

**Background**

Secondary copper process unit has a centralized pumping system to cater process water requirement of different equipment. The water is used for cooling application in mills, furnaces, compressors, pretreatment, molding units, hydraulic units, etc.

There are three pumps connected the centralized system and normally only two pumps are operated. The water from the ground water tank is lifted to over head tank by operating two pumps. From the over head tank water is supplied by gravity to the various users. The specifications of the pumps are given in the following table. The return water is sent back to the ground water tank by using gravity force through a common return header

The specifications of the pumps

Make	Kirloskar
Type	Centrifugal
Model	125/150mm
rpm	1450
kW/hp	30/40
Head, m	31.9
Flow, lps	35.5

It was observed that the requirement of water from overhead tank (OHT) is dependent on operating schedule of the users while supply of water to OHT is constant. Hence there was a continuous over flow (the quantity of over flow was varied according to the operation of users) from OHT, which is sprayed through a perforated pipeline (spray nozzles).

**Proposal:**

It was measured that over flow was varied in the range of 5 – 25 lps, while most of the time the over flow was about 15 lps. The overflow can be minimized/avoided by installing a variable speed controller with a level sensor. The speed controller can be installed to pumps to cater the variations in requirement.

It was also observed that about 20 lps was used in the heat exchangers where there is sufficient return pressure. It also suggested that this water could be passed through the spray instead of connecting the common line. This helps the water to get cooled.

**Techno-economics:**

Present average over flow	: 15 lps
Specific power consumption	: 0.59kW/lps
Power consumption for 15 lps	: 8.87 kW
After installing variable speed controller with level sensor	
Proposed maximum over flow	: 5 lps
Proposed power consumption for 5 lps	: 2.95 kW
Power savings	: 5.92 kW
Annual energy savings	: 51100 kWh
Annual cost savings	: Rs. 2.15 lakh
Investment required	: Rs.3 lakh
Payback period	: 1.5 years

**Principle**

- ☰ The largest potential for electricity savings with variable speed drives is generally in variable torque applications. For example centrifugal pumps and fans where the **power requirement changes as the cube of the speed**. Constant torque loads are also suitable for VSD application.
- ☰ The speed of the pumps is varied by varying the frequency to the motor, thereby the output of the pump can be varied.
- ☰ The main parameters required for the application of variable speed drives is variation in flow, variation of pressure, or level of the fluid.