Successful Implementation – Energy Conservation Measure

Measure
Optimizing Process Cooling water Pumps Operation
Equipment
Pumping system
Industry / Sector
Chemical
Year of Implementation
2001
Cost Benefit Analysis
‹› Type of Measure: Short term
‹› Annual Energy Savings: 2.25 lakh kWh
‹› Actual cost savings: Rs. 10.13 lakh
‹› Actual investment : Rs. 2.00 lakh
‹› Payback: 3 months
Implementation Highlights
⇨ Can be implemented in all types of industrial pumping systems ⇨ Normally scope for reduction in energy consumption will exist in pumping system

Summary

Avoidance of flow of pumped water to idle sections of the plant resulted in reduced energy consumption by 40% in the pumping system. Individual user point requirements was using an additional booster pump instead of wasting energy in the entire system.

Background

A leading chemical company has four pumps to meet the various processes cooling water requirements. All these four pumps are operated simultaneously. Cooling water requirement is in reactor jackets and distillation condensers. All the operations are batch type.

Incase of reactors the water is passed whenever required while in condensers water is passed continuously. The measured flow rate of water to the process from all four pumps was is in the range of 83-85 lps.

All four pumps are operated to meet the head requirement in the top floor of the plant where a user point needs water at the rate of 25 m^3/h.

It was observed that complete water is not circulated through cooling tower and about 50% of water is bypassed. This indicates that though there is no thermal duty on water, the water is circulated for hydraulic requirement. It was learnt that each condenser is operated for 4-6 h per day, but the water is passed through out the day.

In addition, the water is supplied (about 11 lps) to one section continuously, which is not required. During the study the supply of water to dilution plant was stopped (i.,e, flow equivalent to half the capacity of one pump).

Measure:

After considering the load requirement and condensers operation, only two pumps were operated, after implementing the following.

- The water flow requirement to the condensers was controlled as and when necessary like in reactors
- Providing pressure sensor in the header, where additional pumps were be operated based on the pressure requirement
- Providing separate booster pump for the top floor users which require 25 m^3/h. This booster pump is consuming only 2 KW.

The pump details – before implementation

Pump particulars	Unit	Details
No. of pumps	No	4
No. of pumps operated	No	4
Rated flow	lps	27.78
Rated head	m	45
Motor kW	kW	18.5
Total power consumption by all pumps	kW	69

Details of techno-economics:

Present Power consumption by four pumps	: 69 kW
Present consumption by two pumps	: 37kW
Proposed power consumption by booster pump	: 2 kW
Power savings	: 30 kW
Annual Energy savings @ 7500 h	: 2.25 Lakh Kwh
Annual energy savings	: Rs. 10.13 Lakh
Investment	: Rs. 2 lakh
Payback period	: 3 month

Principle

Ensuring flow of pumped water to sections of the plant only when it is required and avoiding this flow when the requirement is not present, considerable pumping energy can be saved. Also an individual user, having high volume or pressure requirements, can be serviced by a separate pump instead of increasing the settings for the entire system.

Implementation issues

- Though significant energy saving potential in water pumping system exists, a detailed systematic study is essential to identify the energy saving measure through measurement and analysis