

Successful Implementation – Energy Conservation Measure

Measure
Optimization of pumping operation by switching of secondary pumping by avoiding secondary circuit
Equipment
Pumping/ air conditioning & Refrigeration
Industry / Sector
Fibre
Year of Implementation
1999
Cost Benefit Analysis
⌚ Type of Measure: Short term
⌚ Annual Energy Savings: 2.86 lakh kWh
⌚ Actual cost savings: Rs. 8.53 lakh
⌚ Actual investment : Rs. 2.25 lakh
⌚ Payback: 3 months
Implementation Highlights
<ul style="list-style-type: none"> 🏠 Implementable in air conditioning and refrigeration circuits wherever hot well and cold well concepts are used. (provided return water has enough pressure to pass through evaporator) 🏠 Very simple measure and can be easily implemented 🏠 Resulted in operation of one pump 🏠 Nowadays, in some of the industries due to high awareness about energy consumption, plant personnel are insisting that the equipment suppliers provide one circuit in chilled water side to avoid secondary circuit

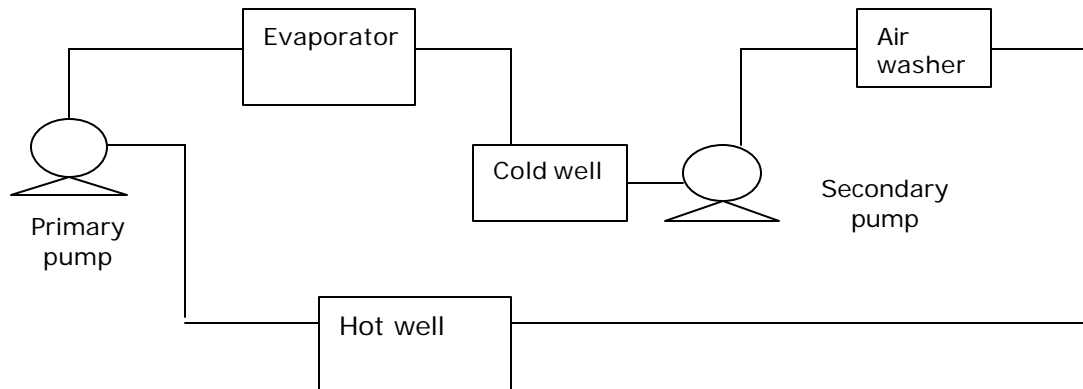
Summary

Avoiding of the secondary circuit has reduced the auxiliary power consumption by 20%. Incorporating design energy efficiency at the project stage will avoid the primary and secondary pumping of chilled water in the air conditioning & refrigeration circuit.

Background

The plant has centralized air conditioning system for the operation of the plant. The system has centrifugal compressor of 360 TR capacity. The chilled water is generated by the system and this is passed through the spray nozzles of air washers for conditioning the air.

The present system was as follows



It can be seen that the primary pumps take water from the hot well and passed through the evaporator. And water from evaporator was collected in cold well. From cold well the water is pumped to air washer spray nozzles. The return water from the air washers is collected in hot well.

Primary and secondary pumps are of same type and same capacity. The brief specifications of the pumps are:

Head: 30 m
 Rated flow: 60 lps
 Motor kW: 30 KW

Operating parameters:

The primary pump was throttled since it required head of 10 m at the inlet. More over the operating TR of the plant was 128 TR. The secondary pump was also throttled to balance the water flow across the system

Actual flow: 26 lps
 Head : 46 m (before the valve)
 Head at evaporator inlet: 10m
 Pressure drop at evaporator: 5 m

Secondary pump delivery head: 35 m
 Required pressure across spray nozzles: 25 m
 Power consumption by secondary pump: 27 kW

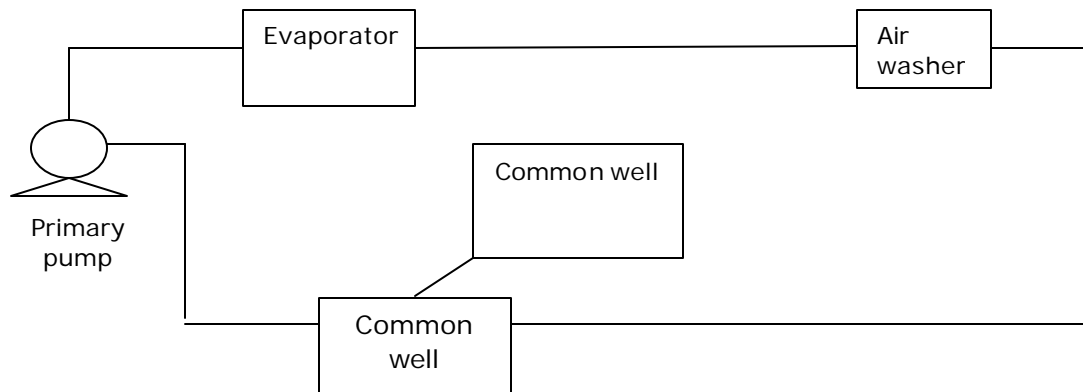
It can be seen that one pump can meet the head requirement of evaporator and spray nozzles.

In view of that the secondary pump was bypassed and only primary pump

is operated. By implementing this measure plant saved about 27 kW of power.

Plant was also replaced the primary pump with suitable pump since the pump was throttled by 50%. The new pump has the rating of 35 lps and 38 m head. This measure also resulted in the saving of about 6 kW.

The present system after the implementation is follows



Details of techno-economics:

Reduction in power consumption by avoiding secondary pump is 27.6 kW and by replacing the primary pump with suitable pump resulted in saving of 6 kW.

Total power savings	: 33.6 kW
Annual operating hours	: 8500 h
Energy cost	: Rs. 3.00 per kWh
Annual Energy savings	: 2.86 Lakh kWh
Annual energy savings	: Rs. 8.53 Lakh
Investment	: Rs. 2.25 lakh
Payback period	: 3 months

Principle

In refrigeration or air conditioning circuit, the concept of hot well and cold well is outdated. Nowadays, in energy efficient system only one circuit is employed.

Implementation issues

- ☞ Initially there was resistance from the plant personnel with regard to head requirement. After the measurement of flows, head and power plant personnel were convinced about the measure.
- ☞ At present plant is operating at full load in future if the production capacity increases then the measure will need to be reviewed.