Non Implemented Case Study– Energy Conservation Measure

Measure
Use of Synthetic flat belt in Ventilation fans
Equipment
Air washer units
Industry / Sector
Textile
Year of Implementation
1998 but results were not seen
Cost Benefit Analysis
◊ Type of Measure: Short term measure
◊ Annual Energy Savings: 20000 kWh
◊ Actual cost savings: Rs.64000
◊ Actual investment : Rs. 35000
◊ Payback: 7 months
Implementation Highlights
▱ Plant had implemented the measure on their own with out any external expertise. ▱ The power consumption in that particular application was increased by 5% instead of reducing the power consumption. ▱ In order to reduce the investment, plant has filled the grooves of the pulleys with the resin, but not balanced the pulleys dynamically. ▱ Plant also faced the problem the bearing failure. ▱ The post implementation review of the measure indicated that the failure of the measure is due to: ☾ The original speed of the fan was 900 rpm and after the implementation the speed of the fan is 920 rpm. ☾ Unbalancing and improper filling of the grooves with the resin. The above two factors raised the power consumption of the fan, though there was considerable increase in air quantity, which was unnoticed since air was used for maintaining the required conditions in the shop floor. ▱ The plant personnel related the failure of energy savings to the old conventional flat belts.

Summary

Application of synthetic flat belts in the place of conventional V belts for transmission of the power will results in energy saving to the tune of 5%-8% by improving the transmission efficiency.

Background

One of the textile units has air washer units for air conditioning of the production shop. The air washer unit has one centrifugal fan to supply conditioning air. Fan had V belt transmission for transferring the power.

Fan specifications:

Fan make	: ABB
Type	: Centrifugal
Rated capacity	: 108000 m^3/h
Motor speed	: 1440 rpm
Compressor speed	: 900 rpm
Rated pressure	: 75 mm wc
Motor rating	: 37 kW
Type of transmission	: V belts
No of belts	: 4

Operating parameters

Actual airflow	: 98000 m^3/h
Actual speed	: 890 rpm
Actual power	: 31 kW

Detailed energy audit of the plant suggested that, the V belt transmission could be replaced with modern synthetic flat belt transmission, which can save energy by 5%-8% due to its energy efficiency.

Techno-economics:

Estimated energy savings	: 2.5 kW
Average operating hours	: 8000 per year
Annual energy savings	: 20000 kWh
Annual cost savings	: Rs. 64000
Investment required	: Rs.35000
Payback period	: 7 months

Principle

Industrial belts have been one of the targets for the plant mangers in their mission to save energy. The concept was of replacing flat belts by V belts claiming less slippage and thus favoring energy conservation. Industries are reverting back to flat belts to saving energy. But these are not the old flat belts, but high efficiency nylon sandwich flat belts. The salient features of these modern synthetic flat belts are:

- Conventional V-belts consume more power to wedge in and wedge out in the groove of the pulley.
- Power transmission efficiency of V-belts is 90%.
- Synthetic flat belts have been developed to suit for all transmission application wherever V belts find application.
- In case of synthetic nylon sandwich belts are high efficient (98%) and have extra ordinary tensile and high frictional co-efficient.
- These are of light weight and narrower in width result in reduced shaft loads.
- These belts do not elongate and re-tensioning is not required
- Energy savings of the order of 5-8%.
- Cost of retrofit has payback of 6 months to 2 years.
- Application : Any motor having V-belt drive.

Very high precautions have to be taken while implementing measures to achieve the energy saving. The factors to be considered are:

- Speed / output of the drive before and after implementing.
- Dynamic balancing.
- Filling or replacement of the pulleys.