

Successful Implementation – Energy Conservation Measure

Measure
Installation of VSD on a compressor to avoid the compressed air blow-off in the system
Equipment
VSD
Industry / Sector
Chemical
Year of Implementation
1995
Cost Benefit Analysis
o Type of Measure: Medium term
o Annual Energy Savings: 5.8 lakh kWh
o Actual cost savings: Rs. 15.2 lakh
o Actual investment : Rs. 20 lakh
o Payback: 1.4 years
Implementation Highlights
<ul style="list-style-type: none"> ☞ Very simple measure and can be easily implemented in most of the units ☞ Now-a-days VSD find very good application in pumps, fans, blowers, compressors, reminders, conveyors, etc. where ever load variations present in the process

Summary

Installation of VSD in for compressor avoided and air blow off during lean requirement of the compressed air by the process

Background

The chemical plant has five process fermentors, where the compressed air is used as raw material and as well as for the agitation. Five large compressors, which are reciprocating, single stage, double acting, horizontal, non-lubricated type.

The compressor capacity: 4000m³/h
 Rated pressure : 1.5 kg/cm²
 Rated motor kW : 200 kW

Though all compressors are connected to the common system through valves, one compressor is operated for one fermentor.

The process features are:

- ☞ The air requirement for the process varies with the age of the fermentation.
- ☞ All the fermentors have the flow meters and the supply of air is controlled automatically with respect to the age of fermentation.
- ☞ During the lean requirement of the air for the process the blow off valves opens and bleeds the air since load control were not incorporated in the system. The compressors are large capacity and the generated pressure is low thereby air receivers were not installed.
- ☞ At any given point of the time at least 1320 m³/h of air was bleeding from the complete system, which is equivalent to 73 KW.

Measure:

In view of variations in the load and the energy lost due to bleed off, variable speed drive was installed to adjust the speed based on the requirement. The following was implemented to achieve the energy savings:

- ☞ The existing piping converted in to common system by opening all isolation valves.
- ☞ Operating only four compressors at full load.
- ☞ Install pressure sensor in the common header and installed VSD to fifth compressor.
- ☞ The output of the compressor varied according to the pressure in the system.

Details of techno-economics:

Average bleed air quantity	: 1320 m ³ /h
Equivalent power consumption	: 73 kW
Annual Energy savings	: 5.80 Lakh kWh
Annual energy savings	: Rs. 15.2 Lakh
Investment	: Rs. 20.00 lakh
Payback period	: 16 months

Principle

Pumps, fans, compressors, conveyors, rolling mills, crushers and many other applications are subject to load variations. Load variations may occur

as a result of process variations or changes in capacity utilization rated.

Traditionally dampers, throttle valves, bypasses and venting have been used to adjust the output of the driven equipment. In such cases there exists a potential to save energy by varying the input parameters to change the output delivered to the load. (in case of fan or pump the output varies directly with the pump speed but the required input power varies with cube of the speed).

Thus, if the load requirement drops to 50% of the full load the power input needed would drop to less than 13% of the full load power.