Successful Implementation – Energy Conservation Measure

Measure
Installation of automatic drain traps in compressed air network
Equipment
Compressed Air Systems
Industry / Sector
Engineering
Year of Implementation
1999
Cost Benefit Analysis
‹› Type of Measure: Low investment
‹› Annual Energy Savings: 0.80 lakh kWh
‹› Actual cost savings: Rs. 4.2 lakh
‹› Actual investment : Rs.1.00 lakh
‹› Payback: 3 months
Implementation Highlights
Implementation of the measure has resulted in - Low cost measure - House keeping and maintenance measure - Can be identified by periodic monitoring of the compressor performance - Easy to implement without any external expertise - Now-a-days state of the art drain traps are domestically available - It can fitted without stoppages of comp ressors - Two types of auto drain valves are available (one is timer based auto valve and another is operated based on water sensing). Though the later ones are of high cost, loss of air can be avoided very effectively

Summary

Drain controls instead of continuous air bleeds through the drains valves result in efficient removal water from the compressed air system thereby saves the time as well improves the quality of the air.

Background

Leading engineering company in western India has a large compressed air network, where the approximate hourly consumption of the air is about 2000 cfm. The power consumption in the compressors accounts about 10-12% total plant load.

The compressed air is mainly used for pneumatic tools operation, control valves operation, agitation, etc. Refrigerated dryer is used for condensing the moisture in the line. In addition to these four receivers are connected in parallel to the mainline.

The condensate outlet from all receivers, dryers are connected to common header and the valves of these individual units were kept crack open to drain the condensate as and when collected. It is also observed that most of these units have timer based electronic valves and all these were bypassed due to malfunctioning/non-functioning. Hence, a considerable amount of the air along with water is being vented out.

On a holiday, the leakage from the drain valves was estimated by conducting a leakage test.

Leakage estimation:

For compressors that use start/stop controls, there is an easy way to estimate the amount of leakage in the system. During the test, the valve installed on the mainline after the receivers and dryers was closed. A number of measurements were taken to determine the average time it takes to load and unload the compressor. The compressor was loaded and unloaded because the air leaks trough drain valves. Total leakage (percentage) can be calculated as follows:

Leakage (%) = [(T x 100)(T+t)]

Where: T=on-load time (minutes)
t=off-load time (minutes)

Leakage will be expressed in terms of the percentage of compressor capacity lost.

The test indicated that about 100 cfm of compressed air was lost due to the faulty drain valves.

Average specific power consumption : 6.50 cfm/kW

Power consumption corresponding to leakage: 15.38 kW

Immediately the faulty drain valves and traps were replaced with automatic latest drain traps and again the leakage test was conducted.

The leakage after the installation of valve is about 20 cfm, thereby 80 cfm of air leakage was arrested

Power savings after the rectification 12 kW

Principle

Most compressed air systems have numerous moisture traps located throughout the system. Traps need to be inspected periodically to ensure that they are not stuck in either the open or closed position. An automatic drain trap stuck in the open position will leak compressed air; a drain trap stuck in the closed position will cause condensate to backup and be carried downstream where it can damage other system components. Traps stuck in the open position can be a major source of wasted energy in some plants.

The efficient water removal from the system increases the life of the pipeline, instruments and users due to reduction in condensation of water at usage.

Improper draining of accumulated water in the system will also results in reduction in pipe effective cross sectional areas thereby results in pressure drop. Proper drain valves will avoid this situation.

Details of techno-econmics:

Particulars	Actual energy savings
Power savings	**12 kW**
Annual operating hours	**7200**
Annual Total energy savings, lakh kWh	**0.84**
Annual Cost savings, Rs. lakh	**4.20**
Cost of Implementation, Rs. lakh	**1.00**
Simple payback period, Year	**3 months**

Implementation issues

- Selection of auto drain valves requires expertise, since wide range of capacities are available in the market.
- In timer based units the valve opens certain time in for every interval. In case of timer based units the timer setting require exact time settings, other wise it will lead to either loss of air or accumulation of water within the system.
- Timer based units required periodic setting, based on the relative humidity in the ambient air, since the humidity vary from season to season.