**AR ${AR}: Reduce Compressor Set Pressure**

**Recommended Action**

Reduce the line pressure from ${CCP} psi to ${RCP} psi, as a considerable amount of energy is wasted compressing the air to a higher pressure than required.

**Summary of Estimated Savings and Implementation Costs**

|  |  |
| --- | --- |
| Annual Cost Savings | ${ACS} |
| Implementation Cost | ${IC} |
| Payback Period | ${PB} |
| Annual Electricity Savings | ${ES} kWh |
| Annual Demand Savings | ${DS} kW |
| ARC Number | 2.4231.2 |

**Current Practice and Observations**

A common source of energy waste is compressing air to a higher pressure than required by air-driven equipment, as is the case with this company. The highest pressure requirement in the facility is ${REQ} psi. It is recommended that the pressure on the ${HP} HP air compressor be reduced from ${CCP} psi to ${RCP} psi.

**Anticipated Savings**

Although the motor size and air temperature affect the energy usage in the plant, the reduction in air pressure will be calculated as a fraction of energy saved as a result of reducing the pressure setting of the compressor. The reduction in the horsepower output of the compressor by reducing the pressure set point from ${CCP} psig to ${RCP} psig is calculated as follows:

POW = 1 - ,

where

POW = Compressor power reduction; %

RCP = Recommended compressor operating pressure; ${RCP} psig

CCP = Current compressor operating pressure; ${CCP} psig

k = Specific heat ratio; 1.4

N = Number of stages; ${N}

AP = Atmospheric pressure; 14.7 psig.

The percent reduction in horsepower output, POW, is:

POW = 1 - ${POWEqn}

= ${POW}%

The power usage is reduced when the pressure set point is lowered from ${CCP} to ${RCP} psig. The energy savings, ES, resulting from lowering the compressor set point is calculated as follows:

ES = HP × OH × LF × RF × C1 × POW / η,

where

HP = Horsepower of compressors; ${HP} HP

OH = Annual operating hours; ${OH} hr/yr (${HR} hours per day, ${DY} days per week, ${WK} weeks per year)

LF = Load factor; ${LF}

RF = Run time as fraction of operating time; assumed ${RF}

C1 = Constant; 0.746 kW/HP

η = Efficiency of compressor; ${ETA}

The energy savings, ES, is:

ES = ${HP} HP × ${OH} hr/yr × ${LF} × ${RF} × 0.746 kW/HP × ${POW}% / ${ETA}

= ${ES} kWh/yr.

The demand savings, DS, is calculated as:

DS = (ES × CF × C2) / OH,

where

CF = Coincidence factor − probability that the equipment contributes to the facility

peak demand; assumed ${CF} per month

C2 = Months during which peak demand can be reduced; 12 months/yr

DS = (${ES} × ${CF} × 12) / ${OH},

= ${DS} kW/yr.

The annual cost savings, ACS, is calculated as:

ACS = ES × Electricity Cost + DS × Demand Cost

= ${ES} kWh/yr × ${EC}/kWh + ${DS} kW/yr × ${DC}/kW

= ${ECS}/yr +${DCS}/yr

= ${ACS}/yr.

**Implementation Cost**

To implement this recommendation, the only cost is the labor required to change the set pressure from ${CCP} psi to ${RCP} psi. The implementation cost for this recommendation is ${IC}.

**The annual electricity savings and demand savings for this AR is ${ES} kWh and ${DS} kW, respectively. The annual cost savings is ${ACS} and, with an implementation cost of about ${IC}, the payback period will be ${PB}.**