Comparing the Cost of Pneumatic and Electro-mechanical Solutions

There are several reasons that customers are changing from pneumatic to electro-mechanical solutions. Requirements for multiple positions, positioning accuracy, and flexibility in changing positions are key elements offered by an electro-mechanical solution that make them preferred to pneumatic solutions.

Comparison of the Operating Costs: Another significant factor behind the change is the high cost of operation of pneumatic products. The use of electro-mechanical actuators is more cost effective even in simple point-to-point applications.

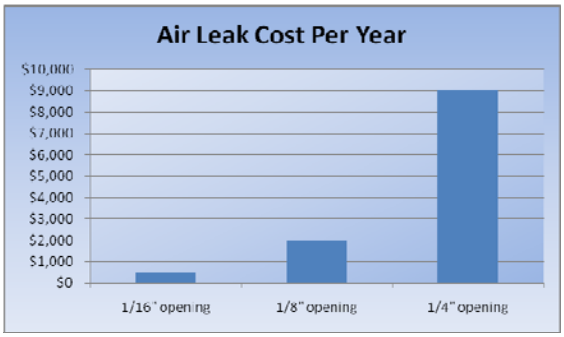
The cost savings offered through using an electro-mechanical actuator system in place of pneumatics becomes very apparent when comparing the direct energy costs. Below is a comparison of a horizontal point-to-point move with 15 inches of stroke and 35 lbs of tooling weight to be cycled 30 times per minute with a duty cycle of 50%.

Electro-mechanical Cylinder: With an electro-mechanical cylinder, the move time of 0.5 seconds can be achieved using a motion profile with 0.1 second acceleration, 0.3 seconds at constant velocity and 0.1 second deceleration. The maximum velocity of this profile is 37.5 inches per second. With the efficiency of an electric system, the power required for the electro-mechanical actuator to perform this application has an energy cost, at $0.07 per kwh, of approximately $165 per year.

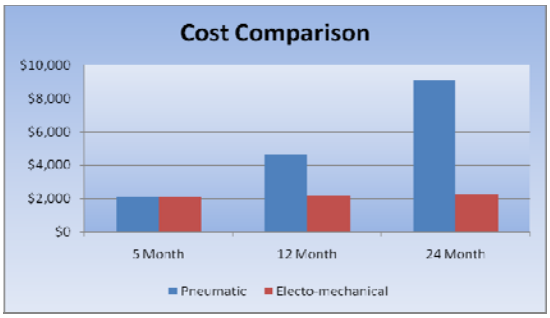
Pneumatic Cylinder: Using a pneumatic cylinder with a load of 35 lbs and the required maximum speed of 37.5 inch/sec, a pneumatic cylinder with a diameter of 2 inches is used with an assumed air pressure of 85 psi. The cylinder volume in combination with the cycle rate, at 85 psi results in air consumption that equates to an annual energy cost of over $1,100! The energy cost to operate the electric cylinder is only %15 of the cost of the pneumatic cylinder.

Studies indicate the energy efficiency of installed pneumatic cylinders can be as low as 10%. The power required soley to supply and prepare compressed air in the European Union is greater than 80TW. This is equal to the the power output of more than seven power plants.

Other Considerations: The Real Cost of Air
In addition to operational costs, another disadvantage of pneumatic cylinders is the energy cost wasted by air leaks. The chart below shows up to $9000 lost per year with a simple air leak of ¼ inch in diameter.



Installed Cost
When comparing installed system cost over time, it can be shown that the component cost differences between a pneumatic and electric system are recovered through energy savings in as little as 5 months in typical systems. The energy cost savings in subsequent months are approximated in the chart below.



Increasing Energy Costs: From 2004 to 2007 the price per kWh for industrial large-scale consumers increased approximately 40% and indicators point to a doubling of energy costs by 2014. This is a major driving force behind machine builders' preferences to move to electro-mechanical solutions.

CO_2 Reduction: 85% of energy production in the United States is accomplished by fossil fuels.

Studies by groups like the Franhofer Institute indicate that the the CO_2 emissions from fossil fuel power plants is 33 times less when powered by an electro-mechanical solution in place of a pneumatic solution.

In addition to directly measureable and significant cost savings, the responsible decision considering this information is to choose an electro-mechanical system over an air powered solution in the interest of the environment.

Exlar Corporation
www.exlar.com
952-368-3434
PN 46835 10-06-10