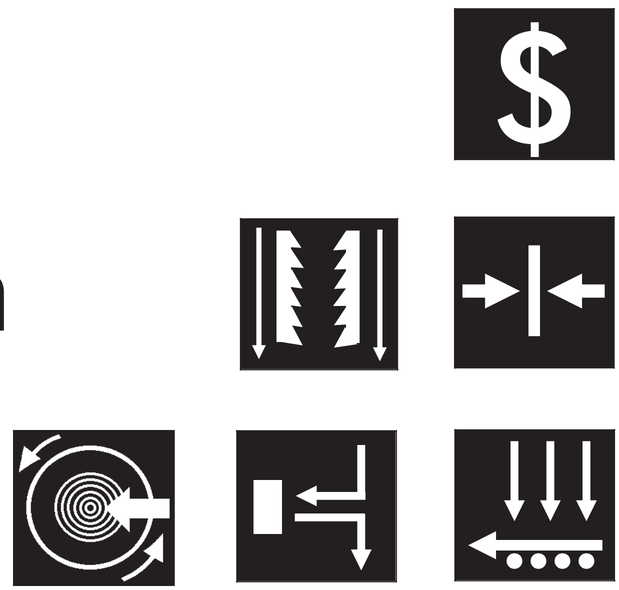
Your Guide to Cost Reduction through Pneumatics Automation



The members of the National Fluid Power Association (NFPA) have prepared this handbook as an introduction to pneumatics automation. It is designed to show you — in straightforward terms — how pneumatics can reduce your manufacturing costs with a minimum of investment and complexity.

The applications and components described here are representative — pneumatics automation can be effectively utilized in countless automation processes, and pneumatic components are available in many different sizes and configurations. NFPA's manufacturers invite you to contact them for additional information as you take the next steps toward automating with pneumatics.

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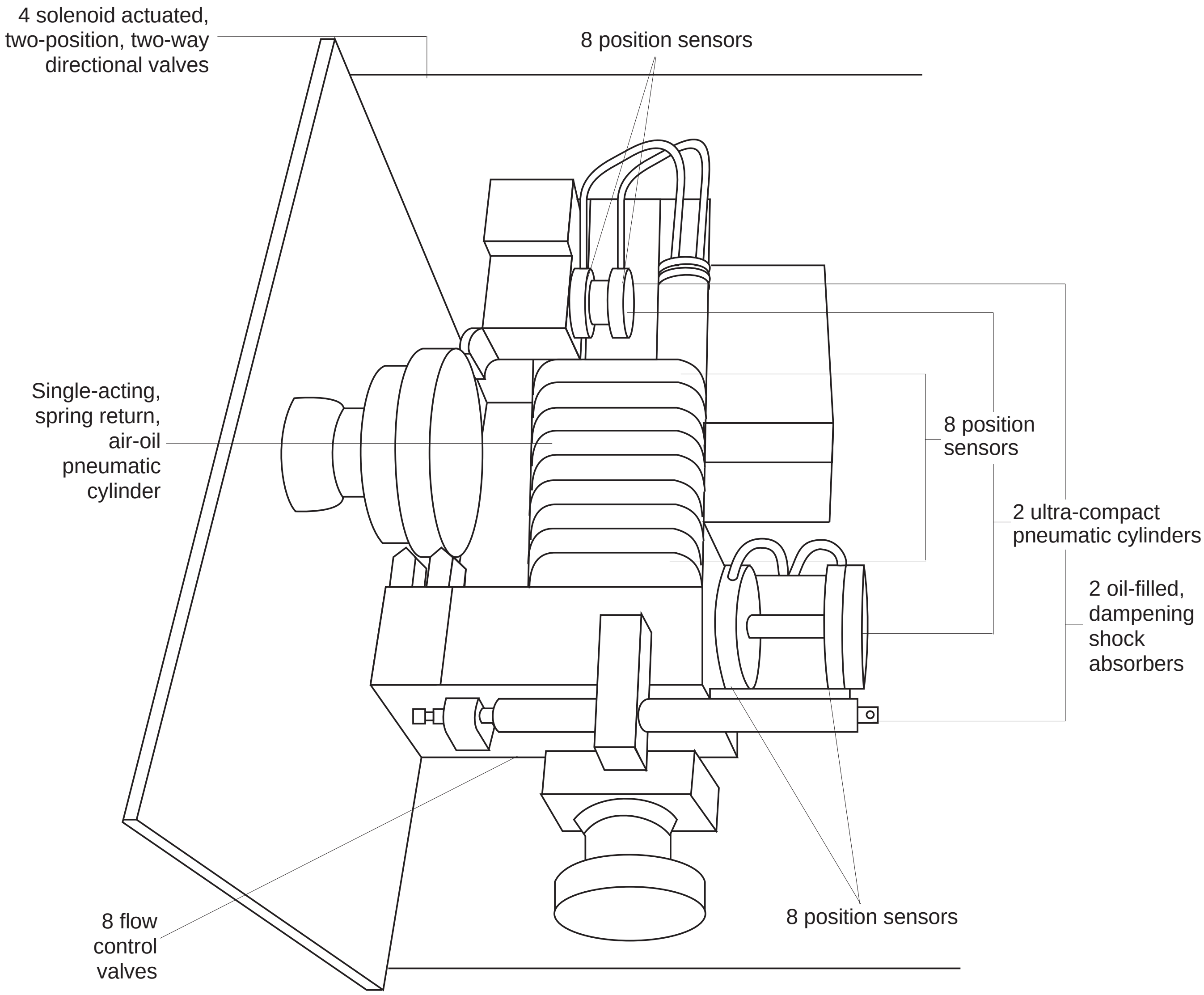
Pneumatics Automation at Work – Facing



(As seen from above.)

additional components used:

- fittings
- tubing

The Problem and Its Solution

A manufacturer made end caps in a multi-operation, single station process. Starting with sections which had been sawed from 5" diameter bar stock, a recessed area was turned into one side of the end cap with a lathe. One of the outside diameters of the end cap was chamfered. The end cap was then reversed and a chamfer was cut along the other diameter. Next, a finishing cut was made along the entire outside diameter from front to back. Tooling was changed, and a finishing cut was made along the face of the end cap.

The lathe operator stood idle during many of these operations. In an effort to increase throughput, a second lathe was installed to execute the chamfering and finish facing cuts. It utilized an automated cross slide which, once started, completed all operations without being attended. This allowed the operator to return to the original lathe to perform the recessing operation which was the most time-consuming phase of the process.

Facing

The Design and Construction Process

1) The cross slide from the original lathe was removed from its saddle, and tooling for a new cross slide was prepared which would accommodate a pneumatic cylinder to provide the forward and backward movement.

2) The appropriate pneumatic cylinder was selected (see clamping application for selection process). A combination air-oil pneumatic cylinder was chosen to ensure smooth action along the cylinder's entire stroke. The pneumatic cylinder was configured to allow four positive stopping positions and featured center rods protruding from both ends.

3) Two sliding tool rests, which moved perpendicularly to the cross slide, were attached to the end of each of the pneumatic cylinder's center rods. Because of space restrictions, ultra-compact pneumatic cylinders were attached to these sliding tool rests to provide the needed motion, which was parallel to the lathe bed.

4) On the forward tool rest, a cutting tool was mounted to provide chamfering and facing of the end cap's outside diameter. On the rear tool rest, a cutting tool was mounted to provide the finishing cut for the face of the end cap.

5) Each pneumatic cylinder used included a position sensor to mark when the cylinder reached its end position, indicating that particular operation had been completed. Using the on/off signals provided by this sensor, a series of solenoid-operated directional valves and relay switches were constructed to start, stop and reverse the direction of each of these pneumatic cylinders as they performed their tool movement functions. The series of operations was started by closing a manual switch. Rates for pneumatic cylinder movement were metered by a series of flow controls between the directional valves and the cylinders.

6) Hose, fittings, wiring connections and control mounting were added. A quick release chuck was attached to the lathe's spindle to facilitate the loading and unloading of the end caps. The control system was connected to the lathe's motor to start and stop the spindle rotation at the appropriate time.

Payback: Manual vs. Automated Processes*

Time Savings Per Unit
3 minutes (manual) - 2 minutes, 15 seconds (automated) = 45 seconds

Labor Savings Per Month
.0125 hour (45 seconds) x $10 per hour (average hourly rate) x 2,940 units per month = $368

Number of Months to Payback Investment
$4500 component cost / $368 monthly labor savings = 12.2

***NOTE:** Supplied figures for all applications in this guide are based upon 21 work days per month with one 7-hour shift operating and an average hourly rate including benefits but not including operating overhead. The component costs listed do not include the tooling or labor required to build the application. For an estimate of total application costs, double the total component cost. Final application costs will vary based upon individual labor costs, skill levels and final application design.

Components Used in Pneumatic Applications*:

- Actuators
- After Coolers
- Air Compressors
- Air Dryers
- Air Line Lubricators
- Controls (electronic) and Software
- Cylinders
- Filters
- Filters/Regulators
- FRLs
- Fittings
- Gauges
- Grippers
- Hose
- Manifolds
- Motors
- Mufflers
- Regulators
- Rotary Actuators
- Seals
- Shock Absorbers
- Slides
- Switches
- Tubing
- Vacuum Products
- Valves

***Click here to access the NFPA Fluid Power Product Locator, which includes information about and links to NFPA member companies.**