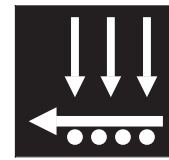
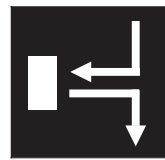
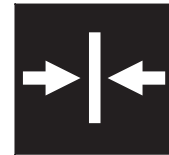
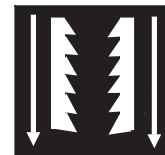


Your Guide to Cost Reduction through Pneumatics Automation



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.

The applications and components described or pictured here are illustrative only. Depiction or description of any product or component does not constitute, indicate or imply a recommendation or endorsement of any sort with respect to any system, products or components. Information and illustrations contained in this booklet do not constitute or indicate a warranty, express or implied, including but not limited to a warranty or representation as to quality, merchantability, or fitness for a particular use or purpose of any system, product or component.

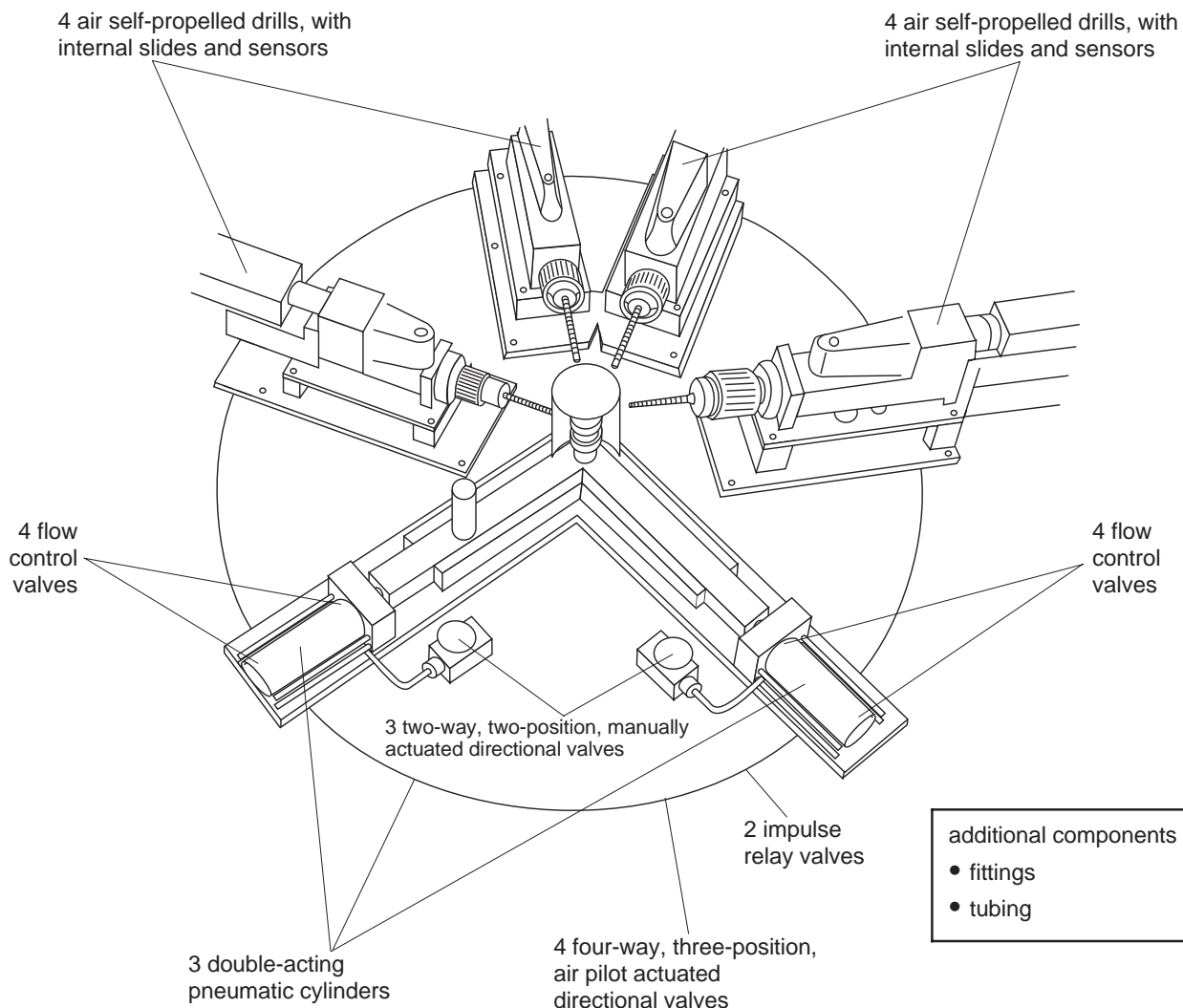


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Pneumatics Automation at Work – Drilling

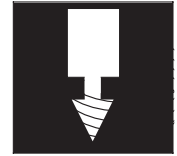


The Problem and Its Solution

A valve manufacturer was drilling four holes in a cylindrical-shaped aluminum sleeve, and then manually deburring those holes with a wire wheel. The holes were drilled one at a time using a standard drill press and a fixture. The holes were drilled at approximately every 90 degrees around the perimeter of the sleeve, with two holes being drilled in one plane, while the other two holes were drilled in another plane.

The manufacturer decided to design a dedicated station for this operation which utilized four self-propelled air drills placed horizontally on a bench in a circular pattern, with the drill's chucks pointing toward the center. The process started when an operator depressed a manual valve. One of two powered sliding pegs carried a sleeve

toward the center. Once in the center, a pneumatic cylinder then pushed the sleeve upward, wedging it against an overhead plate. Two of the drills would then simultaneously enter in a different plane, boring through the wall of the sleeve. These drills would then retract, and the second set of drills would enter, performing the same operation from different angles. While this drilling operation was proceeding, the operator would load the second peg with a sleeve. As soon as the drilling operation was completed on the first sleeve, its holding peg would retract and the operator would depress a second manual valve, sending the second peg and sleeve to the center. The drilling operation would repeat while the operator manually deburred the first peg. The entire cycle was then repeated.



The Design and Construction Process

- 1) A basic layout was devised indicating a horizontal drilling operation with tandem feeding pegs to hold the sleeves. Approximate cycle time requirements and number of operations per year were established.
- 2) Major components were selected including suitable air drills featuring self-contained feeding mechanisms which allowed them to be automatically extended or retracted. It was determined to use pneumatic-based switching, or logic devices, to provide the sequencing and timing for the various operations instead of electrical relays or programmable controllers. This meant directional valves switched by air. These directional valves, in turn, controlled the drills and valve sleeve peg motion as well as the under bench pneumatic cylinder motion. Pneumatic valves were also used for timing and speed control.
- 3) The valve sequencing and timing pattern was diagrammed. Outputs from pneumatic sensors indicating end of stroke positions in the pneumatic cylinders and air drills were used to switch the position of the pilots in the directional control valves. Impulse valves were added allowing a pilot valve to change positions.
- 4) Machining of the bench and peg slides was done next, with mountings provided for the air drills and the under bench pneumatic cylinder which locked the sleeve in place. A safety cut-off valve was added. Air lines were connected to all valves and timing was calibrated.

Payback: Manual vs. Automated Processes*

Time Savings Per Unit

114 seconds (manual) - 32 seconds (automated)
= 82 seconds

Labor Savings Per Month

.023 hour (82 seconds) x \$10 per hour (average hourly rate) x 4,642 units per month = \$1,068

Number of Months to Payback Investment

\$4,700 component cost / \$1,068 monthly labor savings = 4.4

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

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