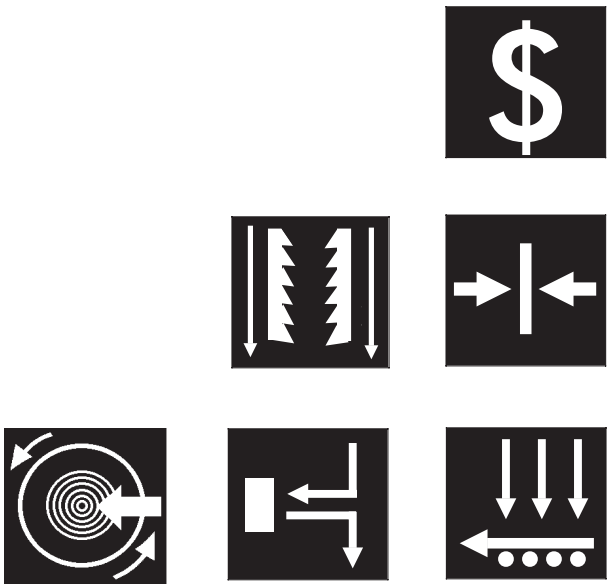
Your Guide to Cost Reduction through Pneumatics Automation



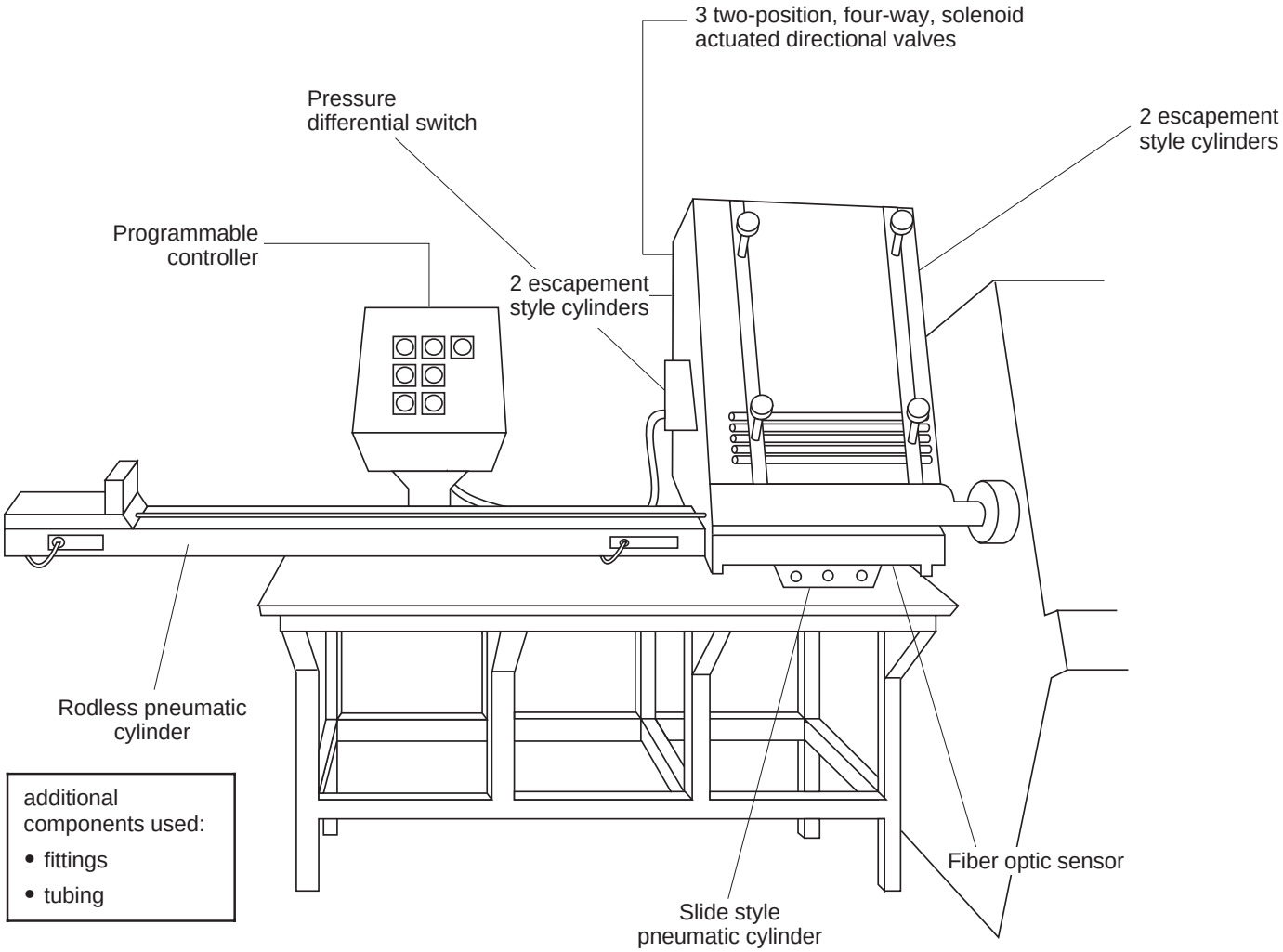
The members of the National Fluid Power Association (NFPA) have prepared this handbook as an introduction to pneumatics automation. It is designed to show you — in straightforward terms — how pneumatics can reduce your manufacturing costs with a minimum of investment and complexity.

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.

National FLUID POWER Association®

ISBN 0-942220-23-4

Pneumatics Automation at Work – Loading

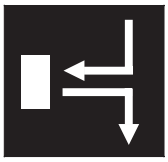


The Problem and Its Solution

A manufacturer wanted to be able to utilize the remnant bar stock left over from larger lathes which had a 15" minimum usable bar stock length. However, the set up and feed time required to utilize these shorter stock lengths was prohibitive since it required an operator to hand load, register and feed the stock in a different machine after each finished part was cut off.

In order to solve this problem, the manufacturer decided to add an automated magazine to one of its smaller, rear spindle-fed lathes. This would allow an operator to fill the magazine with up to 30 pieces of approximately the same size remnant bar stock. The magazine would then present one piece of remnant stock at a time, while a pneumatic cylinder would load and register the remnant into the air collet on the lathe. Sensors in the automated magazine would then signal the lathe to start the machining process, and advance the remnant as needed. The lathe automatically expelled the finished parts.

Loading



The Design and Construction Process

1) An adjustable bar stock loading magazine was designed and built which could accommodate round bar stock from 1/4 to 1-1/4 inches in diameter, and from 7 to 15 inches in length. The design called for the bar stock to be within plus or minus 1 inch of the same length. The magazine was fitted with two devices known as escapements. These contain twin pneumatic cylinders which alternately extend and retract to allow only one object at a time to pass.

2) A vertically adjustable V-block bed was made to accept each piece of remnant stock. The vertical adjustment allowed the V-block to accept varying diameters of stock, while always staying level with the center line of the lathe's spindle. A rodless pneumatic cylinder was attached to the V-block to push the stock into the lathe's spindle.

3) A pressure sensor, attached to the rodless pneumatic cylinder, signaled when the bar stock had reached a stop block on the lathe's turret. The system was designed so that when this stopping action occurred, the lathe's collet closed and the cylinder retracted. In addition, a fiber optic-based sensor installed near the V-block indicated whether a part was present or not.

4) A pneumatic cylinder, made into a slide, was mounted to the bed of the assembly in order to move the entire loading mechanism out of the way should manual access to the lathe be necessary.

5) Three solenoid actuated directional valves were added to control the escapements, the rodless pneumatic cylinder and the slide style pneumatic cylinder. Wired to the valves, the sensors and the lathe, the programmable controller started the remnant loading process upon the receipt of a "chuck open" signal from the lathe. The controller was programmed to accept a signal from the lathe indicating the machining process was complete, whereupon it advanced the existing remnant further into the collet or loaded a new one. The process was then repeated.

Payback: Manual vs. Automated Processes*

Time Savings Per Unit
240 seconds (manual) - 9 seconds (automated) = 231 seconds

Labor Savings Per Month
.064 hour (231 seconds) x $10 per hour (average hourly rate) x 2,205 units per month = $1,411

Number of Months to Payback Investment
$6000 component cost / $1,411 monthly labor savings = 4.3

***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.**