

101A PNEUMATIC CYLINDER POSSIBILITIES

There is little doubt that double acting pneumatic cylinders with two ports and a four way valve to drive it back and forth does the lions' share of applications. Two under used possibilities that might improve some applications are the "Air Spring" and three way valve.

Veneer Stackers present one particular application that might benefit from a "different way." The sequence of operation is similar to many asynchronous operation requirements. Any series of items that is sorted or gauged and directed to a specific address (bin, hopper, pile etc.) may be a candidate. The same applies to asynchronous conveyor assembly as well.

The general requirements are a rapid action when an item arrives at the destination previously specified. The pneumatic cylinder should act fast and retract rapidly to perform the function at that station and get out of the way. Whether sorting mail, packages or sheets of veneer. In the majority of these applications the pneumatic cylinder speed limits the conveyor rate.

For example a four by eight sheet of veneer may travel at 400 feet per minute. Then $400\text{fpm}/4\text{ft} = 100$ sheets per minute or 1.67 sheets per second.

A cylinder, actuator assembly, would have .6 seconds per cycle and .3 second per stroke. With 12" wide pieces of veneer the cycle rate might be 6.7 cycles per second. Even with multiple duplicate addresses (or parallel bins) the feed rate of the conveyor might have to be reduced.

Some things to make the valve and cylinder operate slightly faster:

Reduce opposing pressure to break inertia and accelerate faster.

Improve cushions to decelerate with less impact shock.

Use hollow oversize rod low mass and high performance.

Close couple three way valves to the cylinder to reduce line loss.

Use "Air Spring" return and adjust the pressure to optimize.

Reduce friction with optimum lubrication.

Saving a considerable amount of compressed air is a bonus.

A technique like the following may offer many of the advantages above. See Figure 1.

For example, choose 90 psig to extend and 10 psig (air spring) to retract.

Shift a three way valve to start.

Initial acceleration is maximized with 80 psig differential to start.

Pressure trapped on rod end increases from 10 to 90+psig.

Maximum thrust is reduced without shock to the cylinder.

Trapped air exceeds inlet pressure to stop without slamming.

Release the valve with PLC or position switch.

Exhausting air causes differential pressure with the trapped air.

Related to rod diameter, initial return pressure is 100 psig.

Trapped pressure decreases and impact on return is reduced.

In addition to probable improved functions listed above, a regulator on the 10 psig air spring will provide make up air for leaking rod glands or fittings. The clean, lubricated power air may be exhausted into a reservoir to use for the air spring or other lower pressure functions including lubricating chains, bearings etc.

Savings per cylinder include: Three way valves are less expensive than four way valves.

Approximately half of the compressed air is saved.

Fast action without trauma extends cylinder life.

Fine tuning plus trial and error optimize production rate.

