PNEUMATIC AND MANUAL ACTUATORS

Pneumatic Actuators

Pneumatic Actuator converts energy into mechanical motion. The motion can be rotary or linear, depending on the type of Actuators.

Applications

Some types of pneumatic actuators include:

- Tie rod cylinders
- Rotary actuators
- Grippers
- Rodless actuators with magnetic linkage or rotary cylinders
- Rodless actuators with mechanical linkage
- Pneumatic artificial muscles
- Specialty actuators that combine rotary and linear motion—frequently used for clamping operations
- Vacuum generators

Working Principle

A pneumatic actuator mainly consists of a piston, a cylinder, and valves or ports. The piston is covered by a diaphragm, or seal, which keeps the air in the upper portion of the cylinder, allowing air pressure to force the diaphragm downward, moving the piston underneath, which in turn moves the valve stem, which is linked to the internal parts of the actuator. Pneumatic actuators may only have one spot for a signal input, top or bottom, depending on action required. Valves require little pressure to operate and usually double or triple the input force. The larger the size of the piston, the larger the output pressure can be. Having a larger piston can also be good if air supply is low, allowing the same forces with less input. These pressures are large enough to crush object in the pipe. On 100 kPa input, you could lift a small car easily, and this is only a basic, small pneumatic valve. However, the resulting forces required of the stem would be too great and cause the valve stem to fail.

This pressure is transferred to the valve stem, which is hooked up to either the valve plug, butterfly valve etc. Larger forces are required in high pressure or high flow pipelines to allow the valve to overcome these forces, and allow it to move the valves moving parts to control the material flowing inside.

Valves input pressure is the control signal. This can come from a variety of measuring devices, and each different pressure is a different set point for a valve.

A typical standard signal is 20–100 kPa. For example, a valve could be controlling the pressure in a vessel which has a constant out-flow, and a varied in-flow. A pressure transmitter will monitor the pressure in the vessel and transmit a signal from 20–100 kPa. 20 kPa means there is no pressure, 100 kPa means there is full range pressure. As the pressure rises in the vessel, the output of the transmitter rises, this increase in pressure is sent to the valve, which causes the valve to stroke downard, and start closing the valve, decreasing flow into the vessel, reducing the pressure in the vessel as excess pressure is evacuated through the out flow. This is called a direct acting process.

Manual Actuators

Manual Actuators

Manual Actuators are used in applications that require a throttling type of control valve that can be manually operated and set. Capable of giving precise manual throttling control, these actuators can be used on nearly all standard globe-style or angle-style valve body assemblies. A travel indicator on the actuator yoke can provide a visual indication of valve plug position.

Manual actuation is done by a human driving force. While the manual actuation can be made directly on the axis of the valve through a handwheel or other devices, manufacturers refer to manual actuator as incorporating a manual Gearboxes, a mechanism that provides greater torque based on more turns. In fact, it is normal to couple gearboxes in electric or Pneumatic Actuators to increase their features, or at least supplement them with a manual driver in case of failure of the main source.

Manual actuation is usually drove by handwheels. Valves whose access location makes difficult to operate on them can be drove by chain wheels. For security, the driver can be out of the gearbox spigot. And then, only authorized operators who bring the handwheel or wrench nut with them can operate the valve.

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