SUPPLYING WORLD LEADING VALVES TO INDUSTRY FOR OVER 25 YEARS

NEWS FEATURE

November 2008

Attention to Detail and Communication is the Key to Successful Valve Actuation

Peter Everett, CEO of H.S. Pipequipment comments on actuation valves:

H.S. Pipequipment (HSP) leading supplier of valves and services to the oil, gas and petrochemical industry has been operating for over 30 years from three offices in the UK. Over the last four years HSP has significantly grown its valve actuation service with over £20m sales of actuated valves to customers in the UK and overseas. The company provides a diverse range of actuated valves that vary both in design and dimensions ranging in sizes from 1 to 48 inch diameter and in pressure ratings up to Class 2500.

Actuators provide automatic control by physically opening and closing valves in response to a signal from an independent power source. The actuator is mounted upon the valve to provide remote operations. The actuator can be moved into position by air, gas, electric or liquid energy, depending on the power source available at the site and the control systems that are required. Most actuators are used to move valves to either a fully opened or fully closed position. However, in the case of control or position regulating valves, the valves are given a positioning signal to move to a specific position.

The need for valve actuators to provide the interface between the control intelligence and the physical movement of a valve has grown significantly in recent years. Remote operation of valves in large plants is often essential but there is an added need for increased working safety and the environmental protection that valve actuators can provide.

There are several basic types of valve actuators: electric, pneumatic and hydraulic. Electric actuators are dependent on an electrical power source for their rotary or linear operation. These valves respond to a signal and automatically move to a desired position using single-phase or three-phase AC / DC motors, which drive a combination of gears to generate the desired torque level.

Rotary electric actuators use ball, plug and butterfly valves that rotate a quarter-turn from open to close. Linear electric actuators are used on gate, globe and diaphragm valves.

Pneumatic and Hydraulic actuators can either be classified as single acting (e.g. Emergency Shut Down or ESD valves) where the air or hydraulics operates the valves in one direction and a spring in the opposite direction. Alternatively, these actuators can be double acting, where the air or hydraulic fluid operates the valve in both directions.

Pneumatic actuators adjust valve position by converting air pressure into linear or rotary motion. Similarly, electro hydraulic valve actuators and hydraulic valve actuators convert fluid pressure into motion. When large valves are being actuated it is often necessary to mount the actuators on mechanical gearboxes in order to provide increased torque outputs,

Given the various choices of actuator available and their individual design features, the selection of the correct actuator is as critical as selecting the correct valve. The design of the actuation package has also to take account of critical site information such as the power supply available and air and hydraulic fluid pressure.

In addition to this information, it is necessary to establish the action required from the actuator should there be a failure. In the case of the fail action of an electric actuator this is described as “Stay Put” in the event of power failure.

In the case of pneumatic and hydraulic actuators, these spring return actuators are either fail open or fail close. In the case of a double acting actuator, it will need to be established if the actuator is fail “stay put” (and maintained by air pressure) or fail “stay put drift”. If its “fail stay put” then it will be necessary to advise the stroke operations required from the air or hydraulic fluid tank.

Other critical information required for the design of the actuated package is the valve torque figures. These are the physical forces that are required for various positions of the actuator. The manufacturer of the valve normally provides these torque figures.

Depending on the valve type the following information is required:

- The maximum torque required to break (unseat) the valve element from its fully closed (seated) position, against the maximum pressure differential in the valve.
- The maximum running torque required to operate the valve against the applicable flow rate and the differential pressure in the valve.
- The maximum torque required to seat the valve in its fully open position.
- The maximum torque required to unseat the valve from its fully open position to start closing.
- The maximum torque required to close (seat) the valve in its fully closed position.
- The direction of operation required to close the valve - clockwise or anticlockwise.

The most contentious matter in actuator sizing, are the Safety Factors. Safety Factors are defined as the difference between the torque requirements of the valve and the torque generated by the actuator. These are often empirical factors developed by end users that provide some comfort in sizing calculations and as such there can be significant variation in the industry.

Generally the Safety Factor should be a minimum of 1.25 (i.e. the actuator torque is 1.25 higher than the minimum valve torque) It is important not to apply a higher than required Safety Factor, especially for pneumatic actuators. The result of this can be mechanical breakage of valve stems and adaptation kits (the connection between the valve and actuator).

The stroke time of the valve (i.e. the speed of movement) is another fundamental consideration. Typically for electric actuation the stroke times are three - five seconds per inch of valve bore size. The gearing in the actuator and the valve gearbox restricts faster acting electric actuation.

For hydraulic spring return actuation stroke time requirements are often one-two seconds per inch of valve bore size for the fail stroke, For pneumatic actuators the air stroke it is likely to be two-four seconds per inch of valve bore size.

The air/hydraulic stroke times of both double acting and spring return actuators are determined by the supply media (air or hydraulic fluid)and the flow / exhaust rates through the control components.

The actuation package is completed by a control system including control panels and ancillary equipment, like solenoid valves and pressure regulators.

Clearly the design considerations of the actuation system must also include client preferences in terms of design, materials of constructions and the hazardous area classification. This will include such issues as the orientation of the valves and control panels

Gordon McNair, Engineering Manager at H.S. Pipequipment comments, “Understanding and choosing the ideal actuator for your valve is essential. HSP’s approach to providing world class actuation is our attention to the detail of all the design elements and initiating detailed discussions with customers. It is fundamental that HSP monitor all engineering aspects of the design thoroughly. This can be achieved by ensuring that all parties are aware of the design elements and any potential interface complications. The essence of providing a world class package is attention to detail and keeping all key people (e.g. valve engineers, actuator manufacturers) involved. The key to providing successful actuation packages is selecting an economical solution that meets the customer’s specifications and provides a lasting solution for site

Gordon continues, “As an independent supplier of actuators, H.S. Pipequipment offers a flexible approach to clients, making sure that scheduled deliveries are achieved. This is supported up by a professional project and documentation management team and 24/7 site support. We currently sustain many actuation clients in many different parts of the world, including as far away as Kazakhstan”.

ENDS