How and Why Butterfly Valves Are Used (888)

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Applications include air, gas, steam and liquid

By Kevin Peterson Salina Vortex Corp. ‘They are an excellent, economical positive shut-off valve for handling materials that are easily displaced by the valve disc as it closes.’ A butterfly valve is used to control the flow of material through a circular pipe or tube. Typically the material is air, gas, steam or liquid. Certain dry materials may also be handled through a butterfly valve. Simply, a butterfly valve consists of a circular disc with its pivot axis at right angles to the direction material is flowing. The valve is made up of a body, seat, disc, stem, and actuator. Each component part is available in a variety of materials called “trim features.” Properly combining trim features to address material handled and environment is important in selecting the correct model valve for its intended service. A butterfly valve body can be made of cast iron, ductile iron, aluminum, carbon steel, stainless steel and exotic metals.

Butterfly valves are available in wafer and lug style. Wafer style valves are installed “sandwiched” between pipe flanges. This style of valve is easier to replace or

install. However, replacing a wafer valve requires the conveying line to be drained. Once the valve is removed, there is nothing to seal material either upstream or downstream from the removal point. Lug style valves contain tapped holes that allow them to be bolted directly to a mating flange. In the closed position, the valve independently seals material to the upstream and downstream side. Because of this independent sealing, lug valves may be used to isolate downstream equipment that may require replacement or maintenance. Resilient seated valves are the most commonly used types. The interior of the valve body is lined with an elastomer seat. Seats may be made of EPDM, buna, viton, Teflon, natural rubber, carbox, chlorbutyl, white buna or white neoprene as well as other materials. Choice of seat material depends on temperatures, pressures and material handled. The seats of some inexpensive butterfly valves are typically molded into the body and cannot be repaired or replaced. Precision butterfly valves typically contain removable seats that are repairable or replaceable.

The valve disc (controlled by the actuator) regulates the flow of material within the conveying line. Disc materials are available to meet a variety of application demands: stainless steel, aluminum/bronze, ductile iron, ductile/epoxy coated, ductile/nickel plated,

ductile/nylon II coated and others. As the disc is directly in the material flow stream, care must be taken in specifying the proper material of construction and disc shape. Some discs are designed to allow increased flow patterns through the piping. The stem passes through the center of the valve, attaches to the actuator and positions the disc for material flow control and shut off. Depending on the application and valve size, stems may be one- or two-piece construction. Typical materials of construction include carbon steel and different grades of stainless steel. A variety of actuators are available for butterfly valves: manual handle, gear, pneumatic, electric and electro-hydraulic. Also, actuators that may be enclosed in special housings and buried are available for certain underground applications. Depending on the application, additional valve features may need to be considered. Some of these features include the manner in which the stem and disc are attached, the way the stem and disc assembly mount inside the valve body, undercutting of disc, type of material used in stem bushings and packing, and availability of a ring seal between the seat and valve body. Working with a company that can offer and properly apply a variety of trim features will enhance the success of the butterfly valve in a specific application.

Applications

As stated earlier, butterfly valves are generally specified for most air, gas, steam and liquid applications. They offer an excellent, economical positive shut-off valve for handling materials (e.g. gases and liquids) that are easily displaced by the valve disc as it closes. When handling this type of material, butterfly valves provide a reliable, bubble-tight, bi-directional shut off. Care must be taken when applying a butterfly valve in semi-abrasive or abrasive dry material applications (this includes slurry applications that contain suspended particles because: 1) A valve disc closing on dry bulk material will create premature wear to the rubber seat; 2) The obstructed orifice created by the disc may cause bridging of material on the inlet side of the valve; 3) A disc opening or closing on a standing column of dry material may cause the material to jam/pack. 4) Particles of dry material or suspended particles in slurries may become trapped between the disc and seat, causing conveying line inefficiencies.

Other Types of Butterfly Valves

As a person becomes familiar with butterfly valves, he will undoubtedly discover other types of butterfly valves on the market. Listed below is a brief introduction to some of these other types.*Inflatable Seated Butterfly ValvesInflatable seated butterfly valves utilize an inflatable seat or bladder to create a seal around the disc. Once the disc is brought to the closed position, the bladder is inflated pneumatically.Pros:1. Since*

the seal is created after the disc closes, less torque is required to move the disc into the closed position. A smaller sized actuator costing less money is can be used.2. Again, because the seal is created after the disc closes, minimal abrasion exists between the disc and the seat.Cons:1. In addition to the controls needed to verify the position of the disc, additional controls are needed to identify whether the bladder is inflated or not. These controls add cost to the valve.2. The bladder may be damaged and not creating a seal, even though controls identify that a seal has been established.3. The valve must be located near an air supply to pneumatically inflate the bladder. 4. The inflatable bladder is subject to damage and abrasion, requiring periodic replacement.High Performance Double Offset Butterfly ValveThis type of butterfly valve is ideal for applications involving higher temperatures (up to 1,200F) and higher pressures (up to 1,440 psig). The disc and stem are double offset, causing the disc to "cam" into place upon closure.Pros:1. A reliable butterfly valve for handling higher temperature and pressure applications.Cons:1. Cost - considerably more expensive than standard butterfly valves.High Performance -- Triple Offset Butterfly ValveThis type of butterfly valve is often used in refinery and off shore applications where more extreme conditions exist. Most triple offsets utilize a metal on metal seat and disc closure, are rated up to 600# class and are fire safe.Pros:1. A reliable valve for extreme

applications.Cons:1. Cost - more expensive than the double-offset butterfly valve. The double and triple offset butterfly valves are specialized valves for extreme applications. Kevin Peterson is Director of Marketing for Salina Vortex Corp., 3024 Arnold Ave., Salina, KS 67401, which specializes in valves for handling dry bulk solids in pneumatic conveying or gravity flow systems. More information is available at www.vortexvalves.com or by calling 888-829-7821ftien local controls. An example is an automated welding machine that needs to have a central control system, which integrates with other parts of the manufacturing process, as well as a remote system that can control specific operations. Welding machine control often is the domain of PLCs. When adjusting and manipulating data necessary to control feed rates, as well as control the I/O of the system, a PLC easily integrates, through the use of CANopen, with the controller's digital positioning system. Multiple axes of control are instantly attainable.

Another example of how the controller can be incorporated into a CANopen communications system is when a packaging device requires a precise ratio between two axes. The PLC can maintain overall system operation without affecting the axes directly. A controller with CANopen communications interface capability is

ideal for such an operation. CANopen can easily be engaged to communicate directly with the controller. This allows the controller to handle the precise ratio requirements of the system, while the PLC maintains communications contact with the other devices in the system.

Structure and Protocol

Transferring data is done using a system that reads and writes to the controller's object dictionary. Service Data Object (SDO) transport protocol is the entry used to transmit these objects, regardless of size. The SDO communication is used to configure the object of the controller. Although larger entries are split into segments, segmenting isn't necessary for objects of four bytes or fewer; as a result, transfer can be expedited. Nearly all objects in the controller's object dictionary are designed to be non-segmented transfers to ensure speed. Higher priority transfers are also possible when dealing with the need for real-time data. This is done using Process Data Objects (PDOs), which are unconfirmed services containing no protocol overhead. Consequently, they represent an extremely fast and flexible method of transmitting data from one node to any number of other nodes. PDOs can be specifically compiled and confirmed b

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