By Kim Swinford

Safety matters

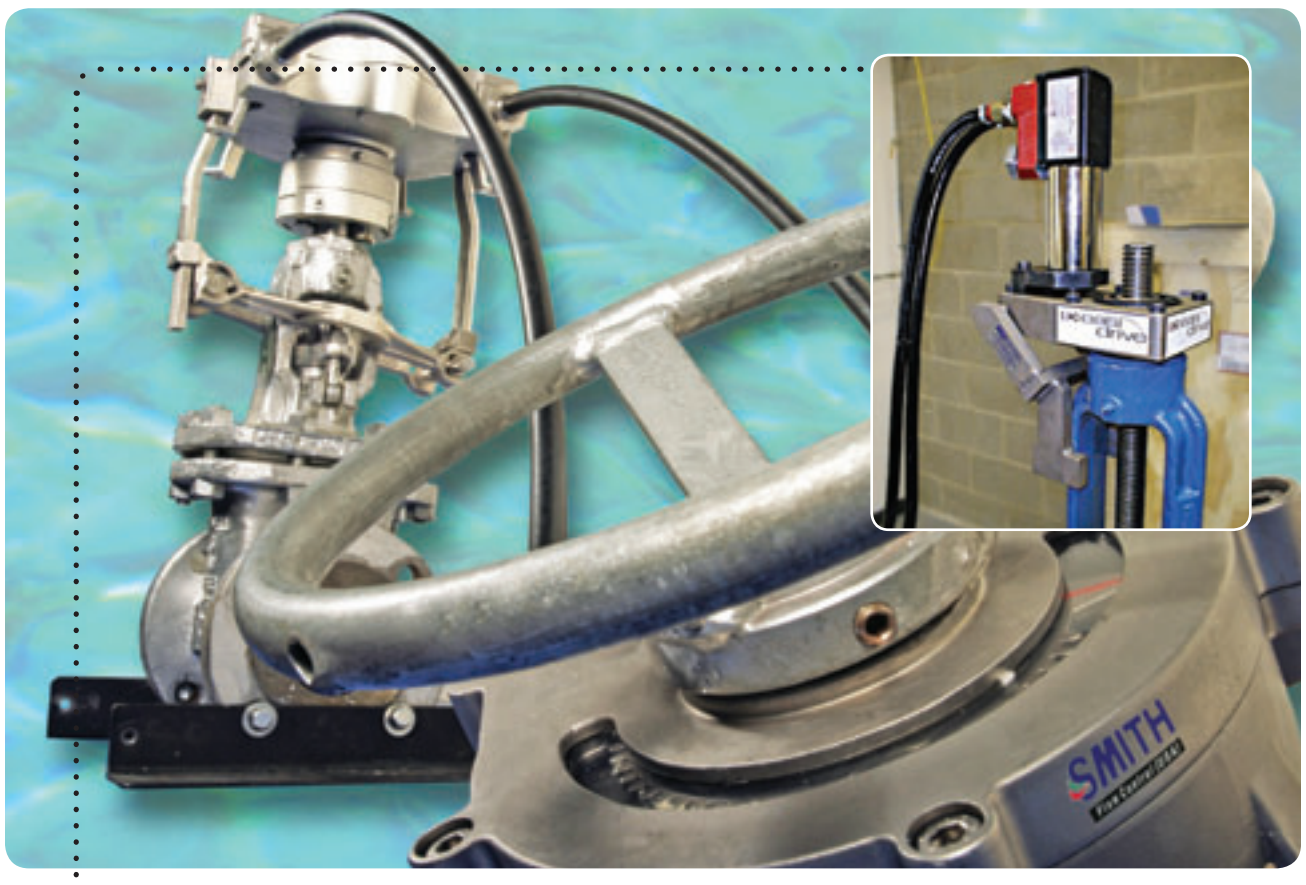
Valve interlock applications in the water and wastewater industry

Safety interlocking of valves and associated equipment is a standard procedure in the oil, gas and chemical processing industries. While many processes in these sectors are automated or semi-automated, there are many situations, such as the changeover of pressure relief valves, where human intervention is essential. As the products being handled are often explosive or highly flammable, the consequences of operator error are potentially devastating. The Piper Alpha oil platform disaster of 1988 is an obvious example. Because of this danger, the use of safety interlocks in these industries has become standard practice.

While the possibilities of such disasters occurring in the water and wastewater industries are less likely, there are still many situations where the interlocking of valves and ancillary equipment is advisable. Even mistakes that do not lead to a large loss of life can result in extensive damage to plant and equipment and expensive downtime. In addition to specific safety and security applications, there are many instances in which valve and actuator operation can be speeded up, simplified or reduced to a one-man operation.

Applications

Interlocks are available for virtually any type of valve used in the water and wastewater industries, including lever-, gear- and handwheel-operated ball, gate, check, butterfly and diaphragm valves. Applications are wide-ranging and include tanker unloading, control of gear-operated valves in pumping stations and the safe operation of pressure-relief and expansion valves. There are also applications beyond valve interlocking, such as operating electrical switchgear or controlling access to potentially dangerous equipment like ultraviolet or ozone disinfection chambers. Ex-certified interlocks are also available for use in potentially hazardous areas such as sewage treatment plants, where the presence of methane gas can pose an explosion risk.



The Flexi-Drive allows the remote operation of valves in hard to reach or hazardous locations.

INSET: The Easi-Drive is a portable valve actuator ideal for use with manual valves in situations where valve size, pressure rating or work environment would otherwise require a dedicated actuator or work crew.

A simple interlocking system comprises a specially coded key, which must be inserted into a valve for operation to take place. Under normal operating conditions, the valve is either open or closed and inserting the key allows the wheel or lever to be turned. Once the valve is in its new position, the key is locked in place and cannot be removed until the valve is returned to its "normal" working condition. When two valves need to be operated in sequence, two keys are used. The first key is locked in place in the first valve and is only released when a second key is inserted, allowing the valve to be operated. This then frees the first key, which is inserted into the second valve, allowing it to be operated.

Interlocks can also be used with actuated valves. Doing this provides the operator with complete manual control of the actuators, allowing them to be incorporated into a key-exchange interlocking sequence with other valves. For actuated valves, there may be two or more means of operating the valve and all need to be accommodated within the interlock scheme. Due to the high torque applied during valve actuation, mechanical locking is not practical, and interlocking of the actuator control mechanism is preferred.

Versatility of Interlocks

A good example of the versatility of interlocks is with the transfer by road tanker of caustic and alkaline compounds to water treatment plants. Tanker unloading bays normally have a drainage system, and when a tanker is unloading potentially poisonous fluid, the drain has to be diverted so any spillage does not pass into the water supply. This diversion is normally carried out by a two- or three-way interlocked valve. The procedure is simple: Before unloading the tanker, the valve has to be turned to its "divert" position, which frees a key that the tanker driver then uses to activate the unloading mechanism. Once the procedure is completed, the driver removes the key and returns it to the valve, which can then be turned back to its "normal" position. This simple procedure ensures that there is no possibility of accidentally releasing harmful chemicals into the clean water drain.

Another example of interlocking is with pressure-relief valves installed on closed water loops to protect systems from damage caused by pressure buildup. When maintenance needs to be carried out on these valves, it is important to ensure that an open pressure relief path is maintained at all times. For this reason, most modern piping arrangements usually include a standby relief valve, allowing continuous operation of the plant while maintenance procedures are carried out. It is essential, however, to ensure that the standby relief valve is opened before the duty relief valve is closed—fitting a two-key interlocking system to the valve is an effective way of ensuring that the procedure is carried out correctly.

Labor-Saving Devices

A number of new time- and labor-saving devices also have many uses in the water and wastewater industries. The Easi-Drive is a portable valve actuator ideal for use with manual valves in situations where valve size, pressure rating or work environment would otherwise require a dedicated actuator or work crew. Ideal for isolated or minimum-facility installations, it is particularly useful for moving tight or partially seized valves. An example where the Easi-Drive can be used in the water industry is with pumping stations, which often use large gear-operated valves. The Easi-Drive makes operating these valves a simple one-man operation.

Another device is the Flexi-Drive, which allows the remote operation of valves in hard-to-reach or hazardous locations. It is made up of three elements: an operator station, a valve station and a helical drive cable joining the two stations together. Due to the

unique nature of the helically wound steel cable, turning the handwheel of the operator station automatically operates the valve station. It can transmit drive to a valve up to 200 ft away, and can accommodate up to 540-degree bends between the two stations. This allows it to be passed through walls, floors, tunnels and any other obstacles to reach the valve.

Today, water companies have implemented various security means, including surveillance cameras, security guards and secure locks on plant and equipment. In the latter case, there are several options for locking off valves, switches and access covers. There are very secure systems available that ensure access is quick and easy for authorized personnel. One device is the anti-tamper lock, which once fitted, can only be accessed by authorized individuals. It does not require any modifications to the valve and can be fitted or removed as often as required.

While the need for valve interlocking may not be as crucial in the water and wastewater industries, there are applications, such as tanker unloading or the maintenance of pressure-relief valves, where interlocking is desirable. There are also instances in which interlocking can provide operators with a greater degree of control over their plant and equipment. An example is when interlocks are fitted to actuated valves, allowing complete manual control of the actuators. There are also cases where portable valve operating devices such as the Easi-Drive and Flexi-Drive can make it easier to operate valves in isolated, hard-to-reach or hazardous locations. Finally, simple "lock-off" systems are useful as security devices in drinking water installations. WWD

Kim Swinford is U.S. business manager for Smith Flow Control. Swinford can be reached at 859.578.2395 or by e-mail at k.swinford@smithflowcontrol.com.

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