

Inert gas fire extinguishing systems involve the rapid distribution of relatively large volumes of inert gas into a room, in order to reduce the level of oxygen to a point where combustion of the flammable substance cannot be maintained. Depending upon the specific type of inert gas extinguishant utilized, approximately 50% of the air in the protected space is displaced by the inert gas used to extinguish the fire. The introduction of this gas in a reliable manner and at a controlled rate is a challenge for fire protection engineers.

The inert gas is normally stored in 2,175 or 2,900 psi (150 or 200 bar) cylinders until needed. When system operates, the cylinder outlet valves are opened and the gas is discharge through pipe network to nozzles arranged throughout the protected space. Without proper venting, the pressure in the space would rise to a destructive level. The necessary venting cross sectional area is dependant on the inert gas system's peak flow rate and not the quantity of inert gas flooding into the protected space.

### CONTROLLING THE DISCHARGE

An uncontrolled discharge from high pressure storage cylinders can be hazardous. The traditional method of reducing this pressure is to insert an orifice plate (a disc with a small hole, fitted into the pipe network) at the end of the cylinder manifold. This system layout requires both high-pressure and low-pressure piping to handle the agent as it travels to the discharge nozzle. The system manifold and any piping beyond the manifold is exposed to an operating pressure of 2,175 or 2,900 psi (150 or 200 bar), which in turn requires the system piping to be rated at high pressures. Therefore, non pressure regulating inert gas systems generally employ Schedule 160 piping before the pressure restricting orifice plate.

A system's peak flow rate occurs at 2 to 4 seconds into the discharge and is generally 2-3 times the average flow rate. As the pressure in the cylinder decays during the discharge, the orifice will continue to drop pressure in the same ratio. The use of orifice plates results in a very high initial flow rate and a very slow rate at the end of the discharge when the extinguishing concentration is achieved.

NFPA and ISO standards require that 95% of the extinguishing concentration must be achieved within a 60-second time frame. This requirement is difficult to accomplish for orifice controlled inert gas systems without implementing other design measures, such as increasing the quantity of stored agent. This in turn increases the cost of the system and results in a higher agent concentration within the protected space. In order to comply with the standards, these other inert gas system systems may have to use as much as 10% additional agent (and corresponding agent-storing cylinders).

### PRESSURE REGULATING SYSTEM WITH A CONSTANT FLOW RATE

The Fike UL/FM/LPCB/VDS approved **Prolnert™** System is much more sophisticated than standard decaying pressure inert gas systems. The Prolnert System approach is to use a discharge valve that is designed to regulate the discharge pressure of the system to a constant outlet pressure so the pipe pressure and nozzle flow rate(s) are **consistent for the duration of the discharge**. Regulating the pressure at the valve outlet permits **lower pressure** rated piping (Schedule 40) to be installed in the system manifold, as well as the piping network after the manifold. This translates into easier system installation and a decrease in the overall system installation cost.

Fike's Prolnert constant flow valve assembly also allows the inert agent to discharge within the required 60 seconds, utilizing only the amount required to actually extinguish the fire. That represents an additional savings on agent and cylinder costs.

Other benefits of the ProInert pressure regulated discharge:

- Discharge pipe network typically at least one pipe size smaller in diameter than other systems, reducing costs.
- No orifice plate to install -- saving on design and installation costs.
- Direction or Selector valve systems use low pressure readily available valves.
- Safer installation since the discharge valve can only deliver the regulated pressure.
- Longer pipe runs possible between cylinders and the protected space.

### ROOM VENTING

Market research has shown that the biggest concern with inert gas system end-users, building services contractors, and system Installers is room venting.

Several different types of inert gas systems are available to the market, with various proportions of argon, nitrogen, and even carbon dioxide. Regardless of the system design and inert gas selection, all utilize similar extinguishing concentration levels where approximately 50% of the protected room volume of inert gas is discharged into the protected space. The rate at which the gas discharges into the protected space and the free flow area and flow resistance of the vent or ductwork, determines the developed pressure within the protected space.

When a discharge of most inert gas systems first begins, the pressure in the cylinder is at a maximum, so the pressure restriction in the form of an orifice plate must also be at its maximum. The orifice plate within the piping network must be sized for this initial system condition, which gives the high peak flow rate into the protected space followed by a decaying flow rate throughout the discharge. The initial pressure peak (surge) occurs in the first 2-4 seconds.

The Fike **ProInert** system provides the same reduction in oxygen concentration as other inert gas system suppliers and the agent is stored in similar 2,900 psi (200 bar) cylinders. The difference is that the cylinder pressure is immediately reduced to a constant pressure and flow rate within the cylinder valve(s). Therefore the system has a constant pressure/flow rate for the duration of the discharge. The significantly lower smooth, consistent flow rate from of the ProInert system, results in a significant reduction in necessary vent area. For a standard pressure decaying inert gas system to overcome the initial pressure surge, approximately 2 to 3 times more vent area is required as compared to Fike's constant flow rate ProInert System.

### PROINERT IS BETTER

Because of its unique patented valve assembly, the ProInert agent enters the protected room within the industry required 60 seconds, but at a steady flow rate -- preventing destructive turbulence from occurring. This constant flow rate means you can use small-diameter, low pressure (and less expensive) piping from the inert gas container, all the way to the nozzle. And the necessary venting area is much smaller - reducing installation costs by as much as 60% on venting hardware. ProInert's patented constant flow rate valve translates into a system that is not only safer for your staff and facility, but also saves you money.