

## **INTRODUCTION**

Saving money is in everyone's best interest, particularly in a very competitive fire protection industry. The Fike Prolnert Fire Extinguishing System design includes a distinct pressure regulating valve assembly different than standard inert gas systems on the market. This distinct design offers pipe and installation advantages resulting in overall system costs savings.

## **FIKE'S PROINERT FIRE EXTINGUISHING SYSTEM – CONSTANT FLOW RATE**

The Fike Inert Gas System is much more sophisticated than standard decaying pressure inert gas systems. The Fike system approach is to use a discharge valve that is designed to regulate the discharge pressure of the system to a constant 650 psi (44 bar) so the pipe pressure and nozzle flow rate(s) will be consistent for the duration of the discharge. Regulating the pressure at the valve outlet permits both low pressure rated piping to be installed in the entire system piping network. Smaller bore piping can also be used compared to standard inert gas systems. Both features present easier system installation and decreases the overall cost of the system installation.

## **STANDARD INERT GAS SYSTEMS - DECAYING FLOW RATE**

Most inert gas systems discharge from the containers at high pressure, and then use a pressure restriction in the form of an orifice plate further down the pipe network. This system layout requires both high-pressure and low-pressure piping to handle the high-pressure extinguishant as it travels to the discharge nozzle. Inert gas systems currently available to the market place store the gas at either 2,900 or 4,350 psi (200 or 300) bar pressure. The system manifold and any piping beyond the manifold and up to the orifice plate are exposed to an operating pressure of 2,900 or 4,350 psi (200-300 bar), which in turn requires the system piping to be rated at high pressures. Standard inert gas systems generally employ Schedule 160 piping before the pressure restricting orifice plate.

To enable the agent discharge to be controlled and to avoid having to use high-pressure discharge piping throughout the protected space, standard inert gas systems rely on the simple flow restricting orifice plate to reduce the pressure from the cylinder. Restricting orifice plates are sized to limit the discharge pipe network exposure to approximately 870 psi (60 bar) and nozzle pressures are typically 290 psi (20 bar). Restricting orifice plates are simple devices, which are sized at the system peak flow rate. According to a leading inert gas manufacture, a systems 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, thus at approximately half the cylinder pressure the pipework pressure has dropped to 435 psi (30 bar) and the nozzle pressure to 145 psi (10 bar). The use of orifice plates results in a very fast discharge rate initially and a very slow rate at the end of the discharge which at that point 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. One method of achieving this regulatory requirement is to increase the quantity of stored extinguishant which increases the cost of the system and results in a higher concentration within the protected space which could potentially approach the NOEL level of concentrations. Another industry known method to achieve this regulatory requirement is to implement a discharge time from 60 down to 45 seconds which results in higher discharge flow rates. Increasing a system flow rate results in a higher-pressure drop for a given size of pipe. To achieve a comparable pressure drop along the pipe the size needs to be larger in diameter.

Using the 2-3 free vent area multiplier from a leading inert gas manufacturer's general guidelines, the pressure loss through schedule 40 pipe from Crane 'Flow of Fluids' warrants Fike's Prolnert system enabling lower diameter piping compared to standard inert gas systems as shown in Figure 1.

System Pipe Size	
Prolnert	Other Inert Gas Systems
½" (15mm)	1" (25mm)
¾" (20mm)	1 ¼" (32mm)
1" (25mm)	1 ½" (40mm)
1 ¼" (32mm)	2" (50mm)
1 ½" (40mm)	2 ½" (65mm)

Figure 1