

Prolnert™ – Piping Benefits

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 cost savings.

Fike's Prolnert 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 42 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, 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 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 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 gas discharge to be controlled and to avoid having to use high-pressure discharge pipework 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 pipework exposure to approximately 60 bar and nozzle pressures are typically 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 30 bar and the nozzle pressure to 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 ProInert system enabling lower diameter piping compared to standard inert gas systems as shown in Figure 1.

Figure 1

System Pipe Size	
 PROINERT	Other Inert Gas Systems
15 mm	25 mm
20 mm	32 mm
25 mm	40 mm
32 mm	50 mm
40 mm	65 mm



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