eNewsletter

May 2018

Fire Engineering Pty Limited

This month we are will be focusing on changing foam concentrates for balanced pressure foam proportioning systems and issues of incorrect installation of the these proportioners.

Please share our newsletters with your colleagues and we welcome any feedback to news@orion-fire.com.au.

Balanced Pressure Proportioning

When changing foam concentrates in a proportioning system it is not as simple as draining the tank and filling it with the new foam concentrate. This can easily result in failure of the foam system. Changing foam concentrates requires a detailed design review by a competent designer.

There are 4 major issues to address when changing foam concentrates.

1. Compatibility of the new concentrate with the materials used (tanks, pipe, valves and pumps). Some concentrates are very corrosive and not compatible with some materials, particularly protein-based foam concentrates.
2. Most balanced pressure proportioners use an orifice plate to meter the concentrate into the water and flow varies depending on the viscosity of the foam used. The foam flow reduction can be as high as 10% for high viscosity products such as fluorine free foams.
3. The minimum usable flow for a balanced pressure proportioner increases with the viscosity of the foam concentrate. The minimum flow can increase by nearly 200% when changing from 3% AFFF to 3% for some fluorine free foams and 100% for some 3/6 or 3x3 ARAFFF's. This is not often well documented.
4. Friction losses in the foam concentrate piping may prevent the foam pump from working correctly.

Correct Installation of Proportioners

It seems to have become quite common to install balanced pressure proportioners without 5 diameters of straight pipe before and after the proportioner. This 5-diameter rule has been around since the invention of this proportioning method over 50 years ago but it now seems to be normal practice to ignore this installation rule even when there is no real difficulty in making space for the pipe. As far as we are aware there is no engineering data to support the use of shorter pipes.

We have received answers like, "it passed a commissioning test" or "we didn't have room for the 5 diameters" when people are questioned about this. These answers don't address the key issue, that there are no design rules to enable shortening the pipes. So, this month we will share some of our experience and address this problem, to some extent at least.

The "it passed commissioning" reply is not a satisfactory response. A commissioning test, in the case of balanced pressure systems, doesn't test even 1% of the system performance envelope. So, it can't be considered a verification that the design rules can be ignored and, in particular, it doesn't normally check the friction losses.

The key problems are:-

1. Device or system approvals will be void. Approval test setups use the 5-diameter rule, as far as we know.
2. The flow range for the device will be incorrect.
3. Friction loss data for the device will be incorrect.

Orion manufactures a wide range of proportioning devices and we carry out extensive testing. From our testing we know that failure to install proportioners with 5 diameters of straight pipe in and out causes the following problems:-

- The minimum flow at which the proportioner will work increases by about 100% if the 5-diameter rule is not followed. This occurs in all configurations where the 5-diameter rule is broken that we have tested.
- The friction loss through the proportioner will be greater than the listed friction loss, in some cases, by more than 100%.

Both these problems can mean that the system will not operate as designed. A 100 kPa (or more) error in the friction loss can have major implications for the operating pressure of foam application devices. Similarly, low flow systems using the proportioning system may not operate correctly.

The common opinion seems to be that it was safer to shorten the outlet pipe. This is actually the worst thing to do. Shortening the outlet pipe produces the largest increase in the friction loss.

The 5-diameter rule should be applied where ever it is possible to do so. If there is no way to comply with the 5-diameter rule (offshore platforms), the designer may be able to justify the design by allowing for the additional friction loss & increased minimum flow. If the inlet pipe is shortened to minimum length, the friction losses will be about 50% higher, provided the outlet pipe is 5 diameters long. The outlet pipe should always be 5 diameters long (min). **Note:** we don't consider our testing to be sufficient to make this a solid design rule, it is just better than current practice. More testing is needed.

There are some specialist wide range proportioners (such as our MPW-150) where the 5-diameter rule does not apply as they are not normal venturi devices.

Next Month

Next month we will look at the design rules for line proportioner systems (in-line educator systems) and high back pressure foam makers and issues that can occur when changing foam concentrates with these systems. These systems are even more sensitive to deviations from the 5-diameter rule.

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