

TECHNICAL NOTE



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PVC PIPES AND FITTINGS FOR COMPRESSED GAS LINES

This technical note addresses only technical matters related to the application of our products. It does not address issues of health and safety practices, nor any regulatory limitations that may apply, and does not constitute a recommendation of suitability for any purpose

Introduction

PVC is not a preferred material for use in conveyance of compressed gas. There are specific reasons for this as discussed below.

This technical note covers the use of PVC pipe materials, including unplasticised PVC (PVC-U), oriented PVC (PVC-O) and modified PVC (PVC-M), with compressed gas, including compressed air. It does not apply to the low-pressure distribution of fuel gas.

Temperature Considerations

The first problem that arises is temperature. When a gas is compressed rapidly, there is a large increase in temperature. The pressure capability of PVC pipes reduces as the temperature increases. Hence, the pressure rating of PVC pipes must be reduced, in accordance with AS 2032, for operating temperatures over 20°C. Expert advice from an appropriate consultant should be sought in determining temperatures likely to be encountered for a particular installation.

At the other end of the scale, a rapid expansion results in a decrease in temperature which leads to other problems. Since PVC is a good insulator of heat, rapid changes in temperature can set up significant internal stresses through localised expansion and contraction. This can be a problem in particular with fittings, where the complex shape involves complex stress patterns.

In addition, at high velocities, localised high or low pressure regions can occur in the gas flow where quite large temperature differentials can be set up. Again this is particularly so at fittings.

Chemical Resistance

For compressed gasses other than compressed air, the chemical resistance of PVC should also be carefully evaluated. A detailed discussion of this is outside the scope of this technical note. However, it should be noted that chemical resistance charts provide only a first order assessment of suitability. It may be necessary to conduct testing to ensure that the combined effects of the chemical environment, the operating pressure and any temperature variations do not have a deleterious effect on the pipe.

Fracture modes

The nature of a failure in a line containing compressed fluid is significantly different from that involved in an incompressible liquid such as water. Compare the bursting of a balloon filled with air to one filled with water. Rapid decompression of the gas is explosive by nature. In particular, in a pipeline, if the material fails in a brittle manner, fragments may be projected at quite high velocities by expanding gases.

PVC has two modes of failure, ductile and brittle. There are many factors controlling the type of failure that occurs in practice, and it is somewhat difficult to predict. Temperature is a major factor and PVC pipes are more prone to brittle failure at lower temperatures. Chemical effects may also contribute.

PVC-O pipes to AS 4441(int) and modified forms of PVC such as PVC-M pressure pipes to AS/NZS 4765 (Int) and gas pipes to AS 1464 are available with a reduced tendency toward brittle type failure. Standard PVC-U pressure pipes to AS/NZS 1477 are not modified in this way. Also, it should be borne in mind that PVC fittings currently on the market are not modified.

Alternative

Vinidex offer a range of polyethylene pipes and fittings intended specifically for compressed air applications under the trade name Vinidexair.

Vinidexair pipes and fittings are manufactured from PE100 material and are available in the size range DN20 to DN110mm.

In Summary:

- PVC should only be considered for compressed air applications where the consequences of a brittle type failure are not severe, eg underground installations, or above ground where protection is provided.
- When selecting PVC pipes for use in compressed gas applications, large factors of

safety should be adopted, ie its uses should be limited to low pressure. No specific figures can be given since the final judgement on factors of safety must be made by the designer in accordance with his particular circumstances and consequences of failure.

- PVC Fittings are not modified and where significant risk exists, ductile metallic fittings should be used.

Finally, Clause 4.1.7 of Australian Standard 2032-1977, "Installation of UPVC Pipe Systems", should be heeded.

"The use of UPVC pipe for compressed air is not recommended unless special precautions are taken following consultation with the manufacturer and the relevant statutory authority".

For further information about our products and applications, see our web site at

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