Industry Guidelines

POLYETHYLENE (PE) PIPES AND FITTINGS FOR COMPRESSED AIR

ISSUE 6.9

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Disclaimer

In formulating this guideline PIPA has relied upon the advice of its members and, where appropriate, independent testing.

Notwithstanding, users of the guidelines are advised to seek their own independent advice and, where appropriate, to conduct their own testing and assessment of matters contained in the guidelines, and to not rely solely on the guidelines in relation to any matter that may risk loss or damage.

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POLYETHYLENE (PE) PIPES AND FITTINGS FOR COMPRESSED AIR

This document contains guidelines for the use of PE pipes and fittings in compressed air applications and should be read in conjunction with POP001 and POP003. For the use of other plastic pipe systems in these applications, reference should be made to the manufacturer.

ATTRIBUTES
PE has a number of attributes which make it ideally suited to compressed air applications:

Fracture resistance
High resistance to fracture propagation limits the extent of fracture in the event of external damage. This feature means that PE, unlike some other thermoplastics, will present minimal hazard in the event of accidental damage and the pipe system would not normally require additional protection.

Ultraviolet Light Resistance
Black PE materials may be used if exposed to UV radiation, but consideration may need to be given to temperature effects.

For coloured products, PE is specified to contain UV stabiliser. However, UV stabilisers are not as effective as carbon black, and the advice of the manufacturer may be appropriate.

Corrosion resistance
Unlike metallic pipework, PE will not corrode.

Chemical resistance
PE has excellent chemical resistance and is suitable for use in contact with compressor oils, whereas some other thermoplastics have limited or poor resistance to compressor oils. Some synthetic oils, including aromatic, polyester, and di-ester types, may not be suitable. If in doubt, the advice of the manufacturer should be sought.

Impact resistance
PE has high impact strength compared with other thermoplastics, which maximises resistance to external damage.

Colour and identification marking
May be coloured for identification purposes. The manufacturer may be contacted to determine what options may be available.

In the context of compressed air installations there is often reference made to AS 1345 “Identification of the contents of pipes, conduits and ducts”. Whilst this Standard nominates specific base identification colours as part of the identification marking requirements, it must be understood that this does not mean that the entire
pipe is required to be the nominated base colour. The Standard initially states ..."The natural or as-manufactured colour of the pipe need not necessarily comply with this Standard, except where a potentially hazardous conflict might arise, e.g. the use of a green pipe to carry a corrosive substance”. It then goes on to nominate a series of options for marking including applying the base identification colour to the entire pipe length, using base colour identification bands at intervals along the pipe, use a pipe marker identification block in the appropriate base colour or some combinations of the above.

**Low noise/vibration transmission**
Vibrations can cause problems in compressed air systems. PE pipes with their flexibility will not transmit vibrations to other structures.

**Light weight**
The light weight of PE pipe facilitates quick and easy installation. Combined with the benefits of prefabrication, this enables installation costs to be reduced.

Light weight enables the PE compressed air system to be fixed into or onto cable trays, further reducing costs. The pipelines can be secured with pipe clips or cable ties depending on the pipe sizes. Since plastics do not conduct electricity, it is safe to install them in cable trays alongside electrical cables.

**MANUFACTURING STANDARDS**

<table>
<thead>
<tr>
<th>PE – PIPES</th>
<th>AS/NZS 4130</th>
<th>Polyethylene (PE) pipes for pressure applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE – FITTINGS</td>
<td>AS/NZS 4129</td>
<td>Fittings for polyethylene (PE) pipes for pressure applications</td>
</tr>
</tbody>
</table>

PE pipe for compressed air has dimensions to Series 1 pipe requirements of AS/NZS 4130.

**PRECAUTIONS**
Compressed air systems contain substantial stored energy, which, if released suddenly, could cause injury. It is recommended that pipe system design, installation and maintenance be conducted by those with appropriate knowledge and experience. Care is needed to avoid unplanned overheating of the system. Air compressors will produce air which may be considerably above ambient temperature. Connection between a piston compressor and receiver should not be in plastics due to the likelihood of unacceptably high temperatures.

Industry best practice of shielding equipment and pipework from direct heat sources, e.g. sunlight, should be adopted to prevent excessive heat buildup. It is also recommended that oil traps be fitted immediately downstream of the compressor.
JOINTING

It is especially important that installation be carried out by qualified and experienced operators under controlled conditions. All jointing should be conducted in accordance with the manufacturer’s recommendations.

There are two jointing methods

(a) Fusion Joints

(b) Mechanical Joints

ALLOWABLE PIPE SYSTEM WORKING Pressures

The following tables list maximum operating pressures, in kPa. For continuous operating temperature up to 40°C the system life is expected to be in excess of 50 years.

For continuous operation at temperatures above 40°C, life expectancy may be reduced. However, for normal operation, including operation for limited periods at temperatures up to 60°C i.e. variable operating temperatures, the system life would not be reduced. Specific design data may be obtained from PIPA members.

System pressure capabilities have been derived using a design factor of 2. The energy stored in compressed air and the potential for pressure spikes means that the pressure rating is less for compressed air pipes than for water pipes, for which the safety factor is 1.25.

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>Year</th>
<th>SDR</th>
<th>17</th>
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Note: the minimum life periods may be considered to be the minimum potential service lives and represent the maximum extrapolated periods permitted by the ISO 9080 extrapolation rules given the available test data.
### Table 2
#### Maximum Allowable Operating Pressure (kPa)- PE100

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**Calculation of Maximum Allowable Operating Pressure (MAOP)**

\[
\text{MAOP} = 2 \times \frac{\text{MRS}}{(c \times f_1 \times (\text{SDR}-1))}
\]

Where:

- Minimum Required Strength (MRS) is a material property defined in AS/NZS 4130,
- \( c = 2 \) (safety factor for compressed air)
- \( f_1 = \) temperature design rating factor (taken from the tables above).

**PIPE MARKING**

Marking of PE pipes manufactured specifically for compressed air, should show the following details.

1. Manufacturer's name or registered trademark, and pipe series 1 number.
2. Nominal diameter, nominal pressure classification and SDR
3. Operating pressure at 20°C
4. PE material classification i.e. PE100 or PE80
5. The words, ‘Compressed Air’
6. Date of manufacture in the form YR/MN/DY i.e. “140723”.
7. Identification of the manufacturing site
8. The standard number, AS/NZS 4130

Example of marking:

```
TRADEMARK S1 DN32 PN16 SDR11 1000KPa at 20°C PE100
COMPRESSED AIR 140723 F1 AS/NZS4130
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FITTINGS AND VALVES
Reference should be made to PIPA members for recommended pressure limitations, for their range of products, but as a general guide:

- PE moulded fusion fittings are suitable for use at the operating pressures shown in the tables.
- PE mechanical fittings are suitable for use at operating pressures up to PN16 or PN20. Check the operating pressure with the fittings manufacturer.
- Fabricated fittings should not be used.

In order for PE mechanical fittings to comply with the requirements of AS/NZS 4129, it is normally considered necessary to provide reinforcement to female threads larger than 25mm. This reinforcement should also be corrosion resistant and is normally provided in the form of a stainless steel ring. Threaded outlets larger than 50mm should be avoided. The use of PTFE (Teflon) tape only is recommended for all fittings with plastics threads.