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## **Different Butt Fusion Processes Comparison**

### **Relevant Standards**

The butt fusion procedures and parameters are specified in ISO 21307, *Plastics pipes and Fittings – Butt Fusion Jointing Procedures for Polyethylene (PE) Pipes and Fittings Used in Construction of Gas and Water Distributions Systems*.

ISO 21307 specifies three proven butt fusion jointing procedures for pipes and fittings with a wall thickness up to and including 70 mm, taking into consideration:

- The materials and components used
- The fusion jointing procedure and equipment
- The quality assessment of the completed joint

This standard also covers the weld procedure for activities such as surface preparation, clamping, alignment and cooling procedures.

### **Other relevant standards**

Germany DVS 2207

ASTM D 2657

BS 5955 Part 7

### **Jointing Procedures**

Butt welding involves the heating of two pipe ends to fusion temperature and then subsequently joining the two ends by the application of force. However, a successful butt weld requires the correct combination and sequence of the welding parameters time, temperature and pressure. Various proven butt fusion methods with minor differences have been in use in different countries for many years.

ISO 21307 contains three distinct fusion methods described below for pipe and fittings with a wall thickness up to and including 70 mm.

**It is essential that the parameters specified for a given method are followed. Do not mix and match parameters from each method.**

- **Single pressure – low fusion jointing pressure**

This method has been used by most European countries, Middle East, Asia and in Australia. The single pressure parameters specified are very similar to those specified in DVS 2207

- **Dual pressure – low fusion jointing pressure**

This method is used by the water industry in the UK, and in Europe for pipes with a wall thickness greater than 20 mm.

- **Single pressure – high fusion jointing pressure**

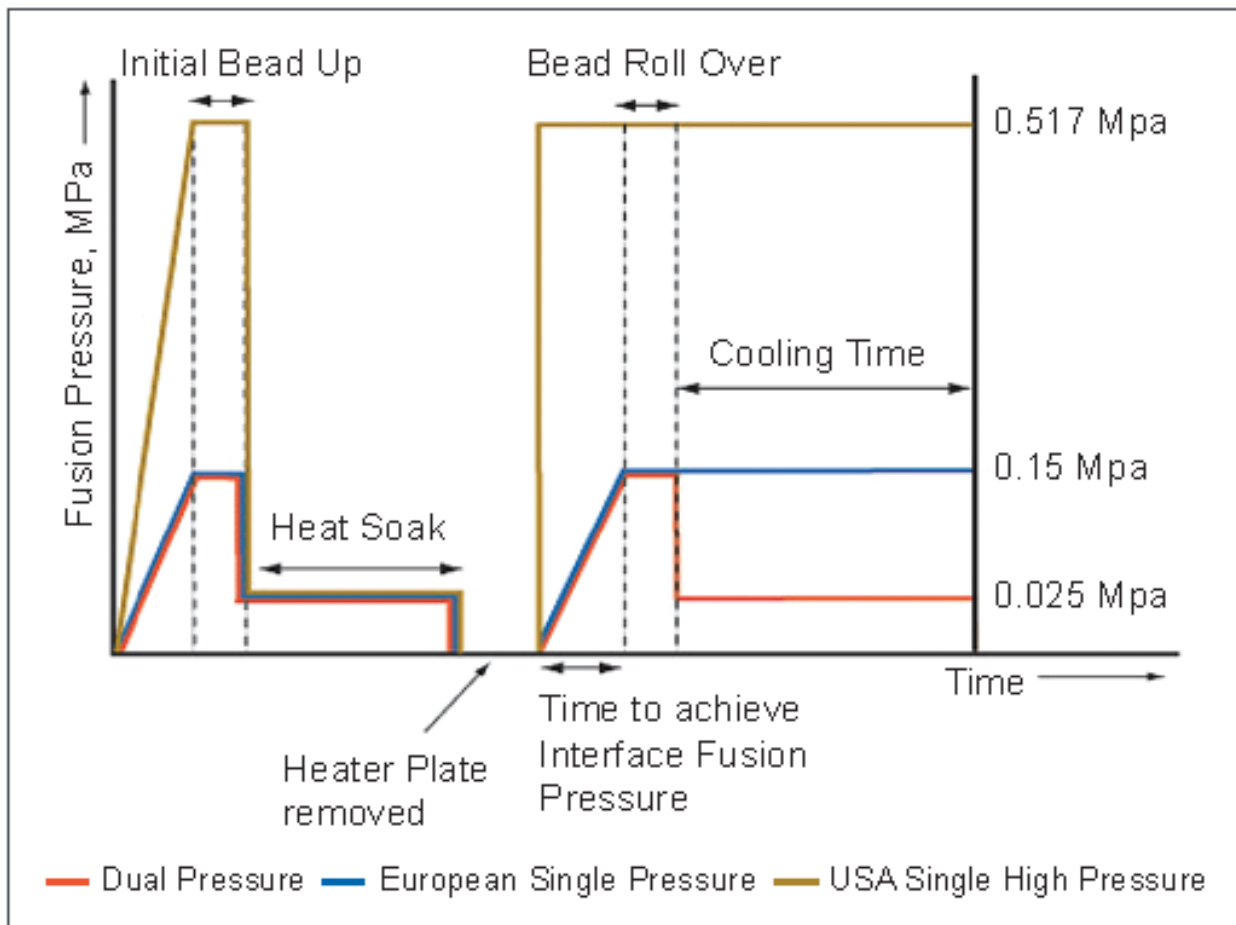
This method has been used extensively in Northern America. The weld interface pressure is approximately three times the low pressure method and, as a consequence, more of the molten material is extruded from the weld zone, thereby enabling a reduced cooling time. Extra attention is required to ensure that:

- Welding machines have sufficient structural strength and hydraulic capacity to achieve the high pressure parameters in a safe manner. Confirmation should be sought from the machinery manufacturer.
- The welding operator is sufficiently experienced and proficient with the parameters.

Where the pipe or fitting wall thickness exceeds 70 mm welding parameters should be agreed between the asset owner and the installer. Under these circumstances the pipe and fitting supplier and the equipment supplier should also be consulted.

Schematically all three welding procedures are outlined in the following Figure which show:

- Procedures are similar in overall approach, i.e. the seven steps of fusion
- Primary differences are in applied pressure and approach to cooling
- When properly performed, all methods result in reliable joints



Schematic Diagram of the Various Stages of the Polymer Butt Welding Process