

# Technology Brief

## Butt Fusion Repair Sleeve (BFRS) for PE Pipe

**Description:** An electrofusion fitting to reinforce defective PE pipe joints  
**Status:** The BFRS fitting is commercially available in a 4" size.  
The 6" BFRS is under development.

### BENEFITS

NYSEARCH is designing, developing and testing a repair fitting for PE butt fusion joints with a manufacturer, NUPI-GECO Systems of Italy. The split-type repair sleeve, also known as BFRS (Butt Fusion Repair Sleeve), provides a 360° electrofusion repair around the entire circumference of the pipe. Although statistics show that butt fusion joint failures occur infrequently in the field, questionable joints are encountered during routine work that do not meet existing visual examination guidelines. The only repair that can be made, other than using mechanical fittings, is to physically remove the butt fusion joint(s) in question. To accomplish this, a pipeline shutdown is typically required (flow interruption) to remove the joint. This is a costly and time consuming process that requires additional excavations, specialized equipment and, at times, disruption of gas service to customers. The BFRS fittings provide a permanent lower-cost repair option and improve overall safety to gas company operators and the general public (Figure 1).



Figure 1: BFRS Installed on PE80 Pipe

### BACKGROUND

PE pipes are widely used by natural gas companies and account for more than 95% of all new main and service installations. In most cases, butt fusion is the preferred pipe joining method, which equates to millions of joints being fused annually. Presently, if a pipeline is encountered that has butt fusion joints that don't pass a visual examination and/or do not meet company standards, the joints need to be removed and the pipe section replaced. Currently, there is no non-destructive means to examine these joints in the field to determine structural integrity and long-term performance.

The BFRS fitting allows for a joint repair to be made without interrupting gas service. The fitting is comprised of PE100 material that can be electrofused to all PE pipe materials. The special design has an internal channel to accommodate the external bead of the butt fusion joint. This eliminates the need to physically remove the bead during the repair process (Figure 2).



Figure 2: BFRS Void Area

## TECHNICAL APPROACH

The objective of this effort was to design, develop and test a PE electrofusion fitting to repair poorly fused, suspect or weak butt fusion joints. Based on the funders needs, it was decided that the initial pipe size to be developed would be for 4" PE pipe. The split-sleeve fitting is designed to fully encapsulate the fusion bead and PE pipe, thereby making a full encirclement repair. A specially designed cavity or void in the middle of the fitting is placed over the bead area (Figure 3). Therefore, the joint bead does not need to be disturbed or removed to apply the BFRS fitting, which is an important safety feature for gas operators. In addition, during the installation process the fitting does not require the pipe ends to be retained with clamps/anchors; unlike the typical installation for standard electrofusion couplings.



Figure 3: Graphic — BFRS

The BFRS installation requires the pipe surface to be cleaned using a pipe scraper tool in accordance with standard electrofusion procedures. The fitting halves are positioned over the joint and its flanges are clamped together to secure the fitting to the pipe prior to electrofusion. The fitting is fused in three steps: 1) top-half of circumference, 2) bottom-half of circumference and 3) both flange ends. The entire electrofusion process is a little over (5) minutes, followed by a (30) minute cooling period prior to removing the clamps. The BFRS fitting is equipped with a universal code label and uses standard electrofusion equipment.

The BFRS fitting can be applied to systems operating at pressures up to (124) psi. The fitting has undergone extensive testing by various

companies and meets all applicable ASTM requirements. In addition to joints, BFRS can be applied to pipe damages up to 2 inches in length that exceeds the 10% pipe wall thickness (maximum allowed by the gas industry). The BFRS repair system is not recommended for situations where the butt fusion joint or the pipe has failed and gas is blowing.

## PROGRAM STATUS

GECO and NYSEARCH have completed all tests required for the fitting and it meets ASTM and ISO requirements. The BFRS fitting is commercially available in 4" sizes and is being distributed by NUPI Americas and Mulcare in the Northeast. A 6" BFRS fitting is being developed by GECO and is funded by NYSEARCH member companies (Figure 4).

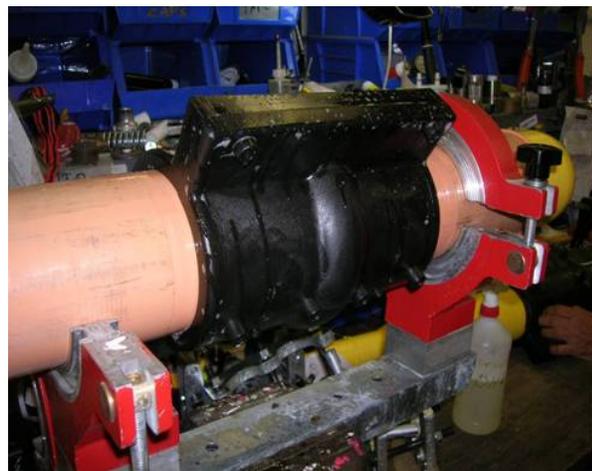


Figure 4: BFRS Under Pressure Test in Lab

### Highlights

- Repair butt fusion joints
- Repair small damages up to 4"
- 360° electrofusion fitting
- Rated for 124 psi
- Reduce repair costs
- Not for blowing gas situations
- Electrofuse with standard equipment

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