TechTalk

Simulated intense, fast moving brush wildfire integrity test

Outline

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Flexpipe tested a variety of its products to determine their ability to withstand exposure to an intense, fast moving brush wildfire. The testing was conducted by Southwest Research Institute's (SwRI) Fire Technology Department using a procedure and test parameters jointly developed with SwRI drawing on their prior experience with fire testing.

Test Procedure and Setup

Samples from various product lines including Flexpipe (FP150, FP301, FP601, Flexpipe High Temperature pipe (FP601 HT), and Flexcord (FC801) were tested. They were approximately 8.5 feet long and included two end flange fittings with pipe connected and a coupling fitting in the middle. All test samples were assembled by Flexpipe personnel according to the guidelines for surface line installation Flexpipe's Pipe Installation Guide R3.01. The samples were exposed to a simulated intense, fast moving brush wildfire using a custom gravel/sand filled propane burner box. Samples were laid on top of the burner and completely engulfed by the flames.

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The test procedure was as follows

- The test samples were pressurized to an initial internal pressure of 200 psig with a mixture of water and nitrogen (75% water, 25% nitrogen)
- The test samples were then exposed to a simulated intense, fast moving brush wildfire for three minutes and allowed to self-extinguish (burn until no flame was visible)
- After the wildfire exposure and self-extinguish period, the test samples were pressurized to the maximum allowable operating pressure (MAOP) of the product
- After verification of MAOP capabilities, the samples were subjected to a short-term burst test

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Results

All of the Flexpipe test samples held internal pressure during the three minute simulated wildfire exposure. During the self-extinguish period, the remaining flames were concentrated to the areas where the Petrolatum (i.e., Denso Tape) and Polyken protective tapes were applied and to pools of melted material around the test sample. FP150, FP301 and FC801 held internal pressure during the self-extinguish period for as long as 46 minutes before small holes near one or more of the fittings released the internal pressure. Due to pressure loss during the self-extinguish period, none of these samples were subjected to short-term burst tests. FP601 and FP601 HT successfully held internal pressure until all flames self-extinguished.

The FP601 and FP601 HT products were then pressurized to the 1,500 psi MAOP pressure and successfully passed this test. Finally, the FP601 and FP601 HT samples were burst at as much as 2.5 times MAOP.

Discussion

The ability of Flexpipe products to withstand the effects of an intense fast moving brush wildfire comes from the unbonded, three-layer composite design. The outer jacket's bimodal high density polyethylene (HDPE) material has a low thermal conductivity providing some insulation to the inner layers. In addition, the dry woven glass fiber reinforcement layer, with its extremely low thermal conductivity, provides outstanding insulation. The combination of these two layers provides an exceptional insulation barrier that protects the inner liner from the external heat, while the unbonded nature of the product allows each layer to react independently. Products such as homogeneous polyethylene pipe, steel reinforced polyethylene pipe, or fully bonded composite pipe may behave quite differently, very likely leading to significantly reduced performance and rupture when exposed to a wildfire.

Conclusion

Flexpipe products provide multiple benefits in high risk wildfire areas. Flexpipe Linepipe and Flexpipe High Temp (HT) pipe unbonded products will maintain structural integrity after exposure to an intense fast moving brush wildfire. With demonstrated capability to hold up to 2.5 times MAOP after wildfire exposure, Flexpipe Linepipe helps to prevent pipeline ruptures and subsequent damage to the environment, while maintaining production and public reputation.

Reccomendations

In case a brush wildfire does come into contact with exposed Flexpipe Linepipe, Flexpipe recommends visual inspection of the pipeline for any external damage. All damaged pipe must be replaced using the guidelines found in Flexpipe Installation Guide R3.01.