Mechanical Properties, Behavoir and performance

of Bondstrand® Glassfiber Reinforced Epoxy (GRE) Materials at Sub Zero Temperatures

Introduction

Glassfiber Reinforced Epoxy (GRE) pipes are often referred to as plastic pipes. The behavior and performance of GRE pipe material when subjected to sub zero temperatures is a frequently asked question.

Bondstrand pipe and fittings are manufactured using a thermoset resin (epoxy). Unlike thermoplastic materials (such as HDPE and PVC), thermoset materials do not become brittle at sub zero temperatures.

On the contrary, the stiffnes (E-modulus) and the strength of GRE material increases when the material is exposed to conditions with decreasing (sub-zero) temperatures. This has been verified by determining the flexural modulus and strength according ISO 14125.

Tests have been performed for NOV Fiber Glass Systems by the Belgian Research Center for Pipes and Fittings, BECETEL.

Applicable codes and documents

ISO 14125, Fiber-reinforced plastic composites.
Determination of flexural properties. Becetel report 9401 dated 27 May 2009.

Test results

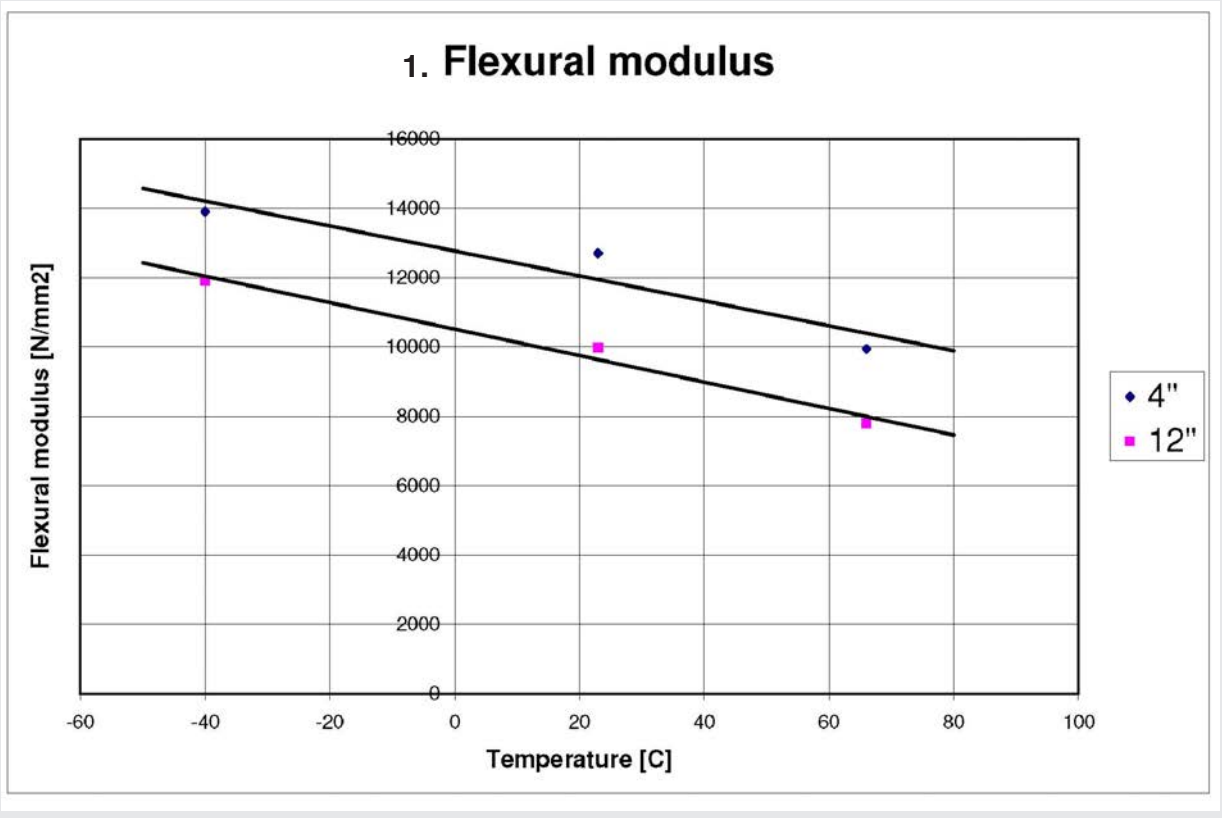
A 4” Bondstrand 3420 series and a 12” Bondstrand 3416FM series pipe sample have been used for above mentioned tests.

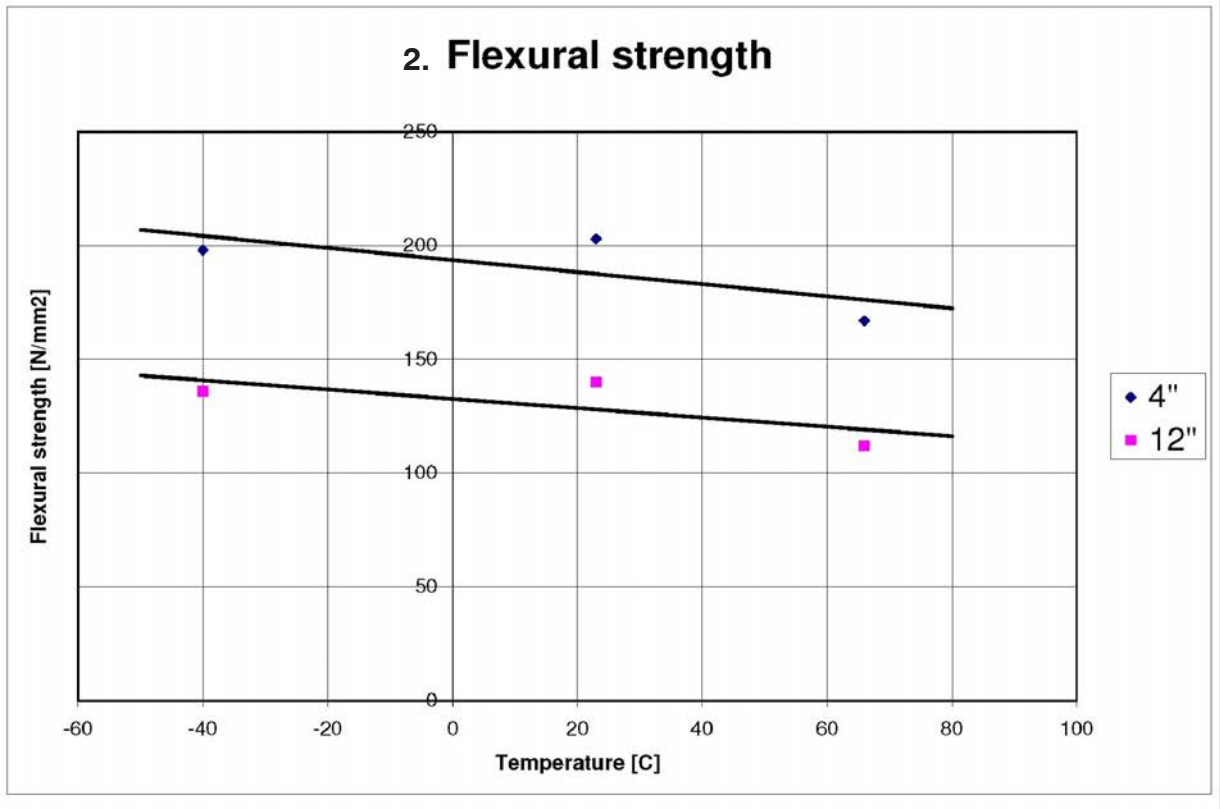
Sample preparations were done by BECETEL.

1. Flexural modulus
The flexural modulus has been determined for a 4”and 12” pipe section at three temperatures (66 °, 23 ° and -40 °C).
The flexural modulus increases in value with a decreasing temperature.

2. Flexural strength
The flexural strength has been determined for a 4”and 12” pipe section at three temperatures (66 °, 23 ° and -40 °C).
The flexural strength increases in value with a decreasing temperature.

The tests performed at sub-zero temperatures show that Bondstrand composite





Conclusion

The tests performed at sub-zero temperatures show that Bondstrand composite materials will maintain its high flexural strength and modulus at sub zero temperatures. This implies that Bondstrand pipes and fittings can be used for sub zero applications in extreme cold environments without reducing the performance. This provided that system designs are made to prevent freezing of the fluids in the pipe and that they allow for thermal expansion and contraction through the range of service temperatures.

Please contact NOV Fiber Glass Systems for an Arctic Conditions Installation Manual and for further advice of NOV Fiber Glass Systems Engineering on installation issues related to sub zero environments.

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