The Application of Polyurethane Grouts for Rapidly Filling of PVC Pipes

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Abstract

In this study, methods to fill or seal the pipelines internally for repairing operations, safe removal or permanently replacing the pipe was studied. As one option, expansive grouts such as polyurethane grouts were injected into the pipe to fill and seal the pipe. Grout filled pipes were tested for water leakage up to 100 psi. Grouts had varying effect on the characterization of the grout filled pipes

1) Introduction

Polyurethane grouts have been widely used in different industries. Because of its expansive properties it could be used to minimize leak. Because of its low density and low permeability it has been used also as insulators. Since Polyurethane (PU) grouts are fast reacting and expand within minutes, they have the advantage of being used in filling pipes.

2) Objectives

The overall objective was to investigate the effectiveness of selected grouts to fill and seal PVC pipes from inside.

3) Methods and Materials

For this study 4 types of polyurethane grouts were selected. The differences between these are expansion ratio, expansion pace and suitability for different environments. The selected pipe was PVC with a diameter of 1.25 inches. Two different lengths of 5 and 10 feet were chosen to screen the effect of the length on the sealing performance of the grout. Also some preliminary tests were done to quantify the physical and mechanical properties of the grout. After grouting the pipes the permeability test with pressure up to 100 psi (over 200 ft of water) were performed on the grout-filled pipes to see how much water leaks out the pipe and quantify the sealing quality. The mechanical and physical properties are summarized in (Table 1).

Table 1. Typical properties of Polyurethane grouts selected for the study

Grout / Property	Type-1	Type-2	Type-3	Type-4
Unit Weight (Kg/m3)	86.9	38.2	56.0	99.3
Free Expansion (%)	1174	2119	1542	952
Water Absorption (%)	401	444	385	72
Shrinkage (%)	3	28	15	5

4) Results and Discussions

4.1) 5 Feet long pipe

As shown in Fig.1 grout-2 had no leak up to pressure of 40 psi. In all other cases there were leaks which varied with applied pressure.

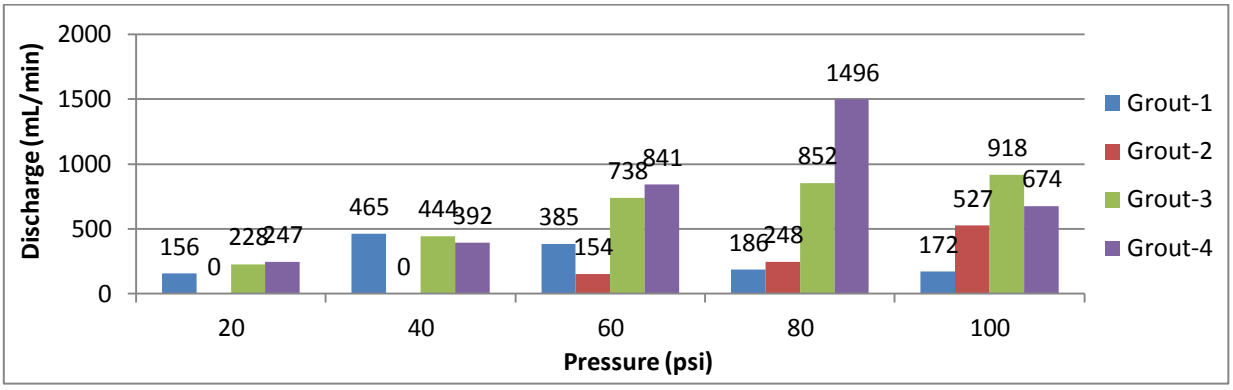

Figure 1. Leakage Tests on various grouted 5 feet long pipe

4.2) 10 feet long Pipe

As it is shown in Fig.2, Grout-1 performed the best and sealed the pipe up to 100 psi. With Grout-2 complete sealing up to 40 psi was achieved. Also, with Grout-3 we could have complete sealing of the pipe up to 40 psi and gradually the water permeation started and increased. For grout Type-4 we had completely sealed pipe up to 60 psi and suddenly the bond between grout and pipe failed and the flow started. Hence grouting length is an important parameter in sealing the pieps.

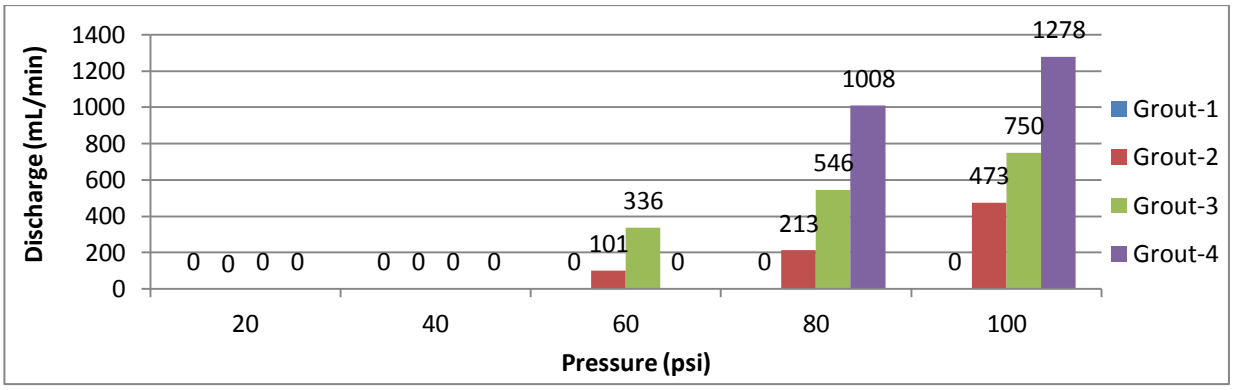

Figure 2. . Leakage Tests on various grouted 10 feet long pipe

5) Conclusion

Variuos types of expansive grouts were evaluated for sealing the plastic pipes. Based on the leak permeability results, grouting length is an important parameter.

6) Acknowledgment

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7) References

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