

Engineering Report

Test Description:	10% H2S/ 10%CH4/ 80%CO2 and Jet Fuel A per ISO 10423:2009 and ANSI/API Specification 6A Twentieth Edition, Material Class FF/HH,
Report Date:	08/24/2015
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Sample Received date:	NA
Test Start Date:	August 10, 2015
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Engineering Report *continued*

1. SUMMARY

Tensile test pieces and a disk were immersed in a multiphase mixture of Jet Fuel A and 10%H₂S/10%CH₄/80%CO₂ at 121°C, for 160 hours in order to evaluate the material property changes of Freudenberg Gazguard® 728 after exposure. These tests were intended to simulate service conditions using a temperature equal to or higher than the service temperature. The test was performed at Freudenberg Oil & Gas Technologies Materials Development and Products Test Laboratory in Houston, TX, from August 10th through August 24th, 2015.

2. TESTING PROCEDURE

The test procedure was performed in accordance to SOP-00061 rev. 1. Tensile test pieces were punched out using a Din 53504-S2 die which is equivalent to the ISO 37 Type 2. A disk for volume measurement was punched out using ASTM D 395 Type 1A. Measurements following the exposure period were performed using five tensile test pieces and a disk.

The test was carried out in high pressure test vessels that prevented and minimized evaporation of the test liquid and the ingress of air. Decompression of test vessels was at a rate not greater than 40 psi/minute. The tensile tests were performed according to ASTM D412, with a displacement speed of 500 mm/min. The machine used was a tensile tester Instron Model 3367, with a 30kN load cell. The hardness test was performed according to ASTM D2240 (2010). Volume measurements were performed using a Qualitest densimeter. All measurements were taken at standard lab temperature.

3. ACCEPTANCE CRITERIA

Acceptance criteria for the test fluid compatibility of material exposed to immersion testing, taken from NORSOK M-710 Rev. 3 shall be:

Hardness:	+5/ -20 units
Volume:	+25%/ -5%
Tensile:	+/- 50% (tensile modulus, tensile strength, strain at break)
Visual Inspection:	No dissolution, cracking, blistering or physical deformation permitted

4. RESULTS AND CONCLUSIONS

Table 1 below shows the initial results and property changes due to sour gas and Jet Fuel A multiphase mixture exposure. Gazguard 728 displayed a significant drop in hardness and increase in volume. While this corresponds to the decrease in 50% and 100% modulus, the values for 200% modulus, tensile strength and elongation remained notably stable.

Engineering Report *continued*

Table 1: Gazguard 728 121°C Immersion Results

Measurement	Initial Values	Final Values	Difference
Hardness, Shore A	88	72.7	-15.4 units
Volume, cm3	1.560	1.943	24%
Tensile Strength, psi	3353	3003	-10%
Elongation at Break%	261	247	-5%
50% Modulus, psi	670	355	-47%
100% Modulus, psi	1226	807	-34%
200% Modulus, psi	2721	2311	-15%

Visual examination revealed that all samples were intact, without blisters or cracking.



Figure 1: Gazguard 728 samples after 160 hrs immersion in sour gas and Jet Fuel A multiphase mixture

The results for all Freudenberg Gazguard 728 samples, tested in 10% H₂S/ 10%CH₄/ 80%CO₂ and Jet Fuel A per ISO 10423:2009 and ANSI/API Specification 6A Twentieth Edition, Material Class FF/HH, met the acceptance criteria as per NORSOK M-710 Rev. 3. Although the compound passed the standard requirements, in an actual field application there could be additional factors (i.e. harsh chemicals, unexpected spikes in temperature etc.) that can accelerate the aging or degradation of this compound, and therefore caution is advised when concentration of H₂S is close to or above 10%.

Engineering Report *continued*

5. REFERENCES

ISO 10423 F.12.5.2

NORSOK M-710 Rev. 3

SLP-00061/1

WI-00048/1

F-00112/1

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