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TEST CERTIFICATE

This document certifies that

Z95X

from

Precision Polymer Engineering Limited (PPE)

meets the requirements of

NORSOK M-710 Rev. 2 in respect of Sour fluid resistance (Sour Ageing)

Test fluid: 2% Hydrogen sulphide/hydrocarbon oil/water

Test pressure: 100 bar (10 MPa)

Passed by: Dr Keyur Somani

Date: 19th November 2014

Element verify that tensile specimens of PPE elastomer compound Z95X (batch number 28170/03/01) have been exposed in a multi-phase sour fluid at 100-155°C for up to 8 weeks. The oil phase was aromatic and the test gas mixture contained 2_{mol}% H_2S. Material performance was assessed by tracking changes in volume, hardness and tensile property levels, all measured at room temperature.

Test Conditions

Exposure fluid composition and distribution

Volume (%)	Composition
30	2/3/95 mol% $H_2S/CO_2/CH_4$
10	Distilled water (de-ionised)
60	70% heptane, 20% cyclohexane, 10% toluene

Test temperatures and sampling intervals used in the NORSOK M-710[1] programme are shown in the table below; test pressure was 100 bar.

Exposure test conditions

Temperature (°C)	Intervals (days)
100	7, 14, 28, 42, 56
121	7, 14, 21, 35, 49
155	7, 14, 21, 28, 42

Summary for Z95X

Material	Temperature (°C)	End of exposure period (NORSOK acceptance range)					ACCEPTANCE TO NORSOK M-710
		Volume swell	Hardness change	Modulus at 50%	Tensile Strength	Elongation at Break	
		+25/ -5%	+10/ -20 units	±50%			YES/NO
Z95X	100	14.2	-8	-14	-32	-36	YES
	121	15.3	-3	0	-22	-38	
	155	16.1	-7	-24	-30	-28	

Z95X behaves as expected when immersed in a liquid hydrocarbon oil phase with H_2S gas present. The tensile test results do not discriminate sufficiently between the influence of exposure time and temperature, excluding their use in life estimation calculations. The changes in room temperature tensile property levels are well within the allowable range after exposure periods at 100-155 °C of up to 8 weeks.

[1] NORSOK M-710, "Qualification of non-metallic sealing materials and manufacturers", Rev. 2, October 2001