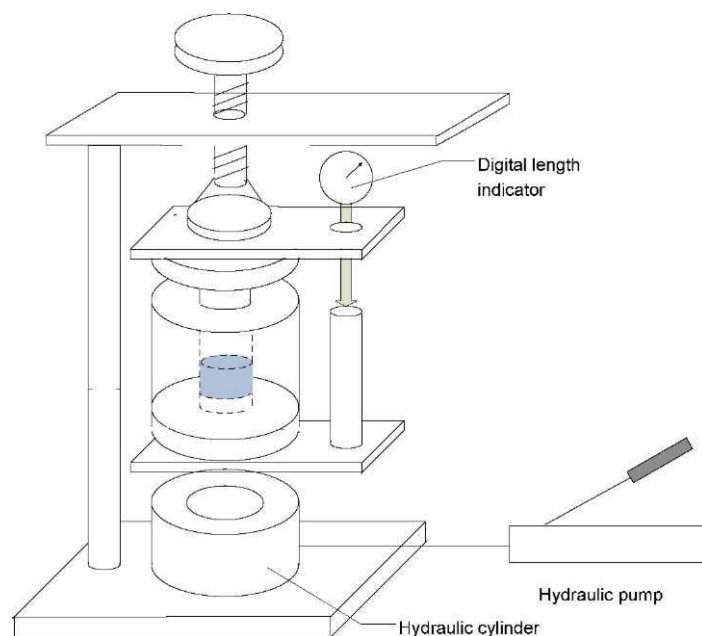




Resiliency Test on Synthetic Graphite WELLSEAL REGULAR 16 | WELLSEAL FINE 72

Instruments and Experimental Setup

A manual, two-column hydraulic laboratory press was used for the test. Our in-house machine shop made a pipe (ID 30 mm) which served as a pellet mold and manufactured the appropriate two head pieces which act as pistons. The alteration in length was determined by digital length indicator with a resolution of 0.01 mm.



Schematic diagram of the testing device. Pictures of the components are given in attachment

1. Procedure

The pellet mold (height 50 mm, inside diameter 30 mm) was filled with graphite (filling level approx. 20 mm) and sealed with the head piece. The assembly was placed into the hydraulic press and stepwise pressurized up to 10,000 psi (689.5 bars) by means of a hydraulic pump. The compressibility of the graphite was traced with a digital length indicator. The pressure of 10,000 psi was held for about a minute and then released to 0 psi. The expansion of the graphite was determined. Pressurizing and de-pressurization was repeated until the length alteration became constant. The observed readings were plotted and the resiliency in % was calculated.

Measured Values

Sample: WELLSEAL REGULAR 16

Pressure cycle	1	2	3	4	5	6	7	8	9	10	11
Initial length, mm	19,7										
Length @ 2900 psi, mm	10,9										
Length @ 5800 psi, mm	9,5										
Length @ 8700 psi, mm	8,9										
Length @ 10000 psi, mm	8,7	8,6	8,86	9,04	9,07	9,11	9,13	9,09	9,11	9,12	9,13
L after pressure release, mm	11,7	11,5	11,18	11,07	11,03	10,99	10,84	10,72	10,72	10,72	10,73
Length alteration, mm	3,0	2,9	2,32	2,03	1,96	1,88	1,71	1,63	1,61	1,60	1,60
% Resiliency	34,5	33,7	26,2	22,5	21,6	20,6	18,7	17,9	17,7	17,5	17,5

Final result sample WELLSEAL REGULAR 16 : **Resiliency = 17.5 %**

Sample: WELLSEAL FINE 72

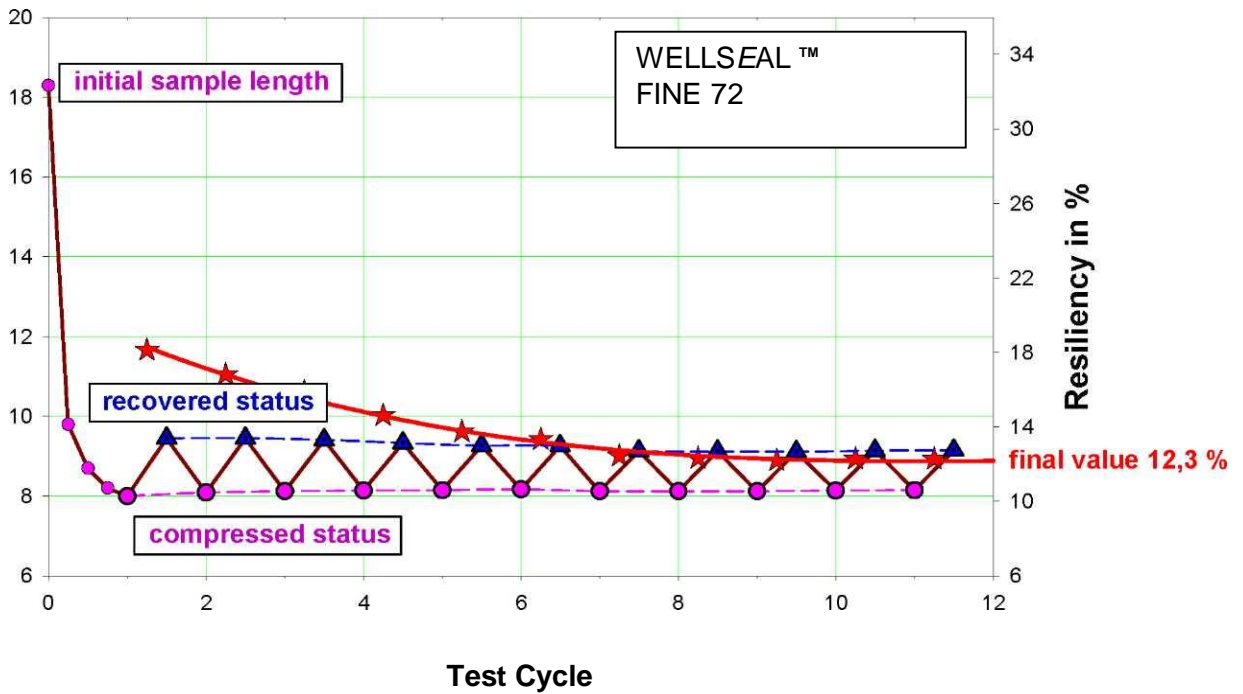
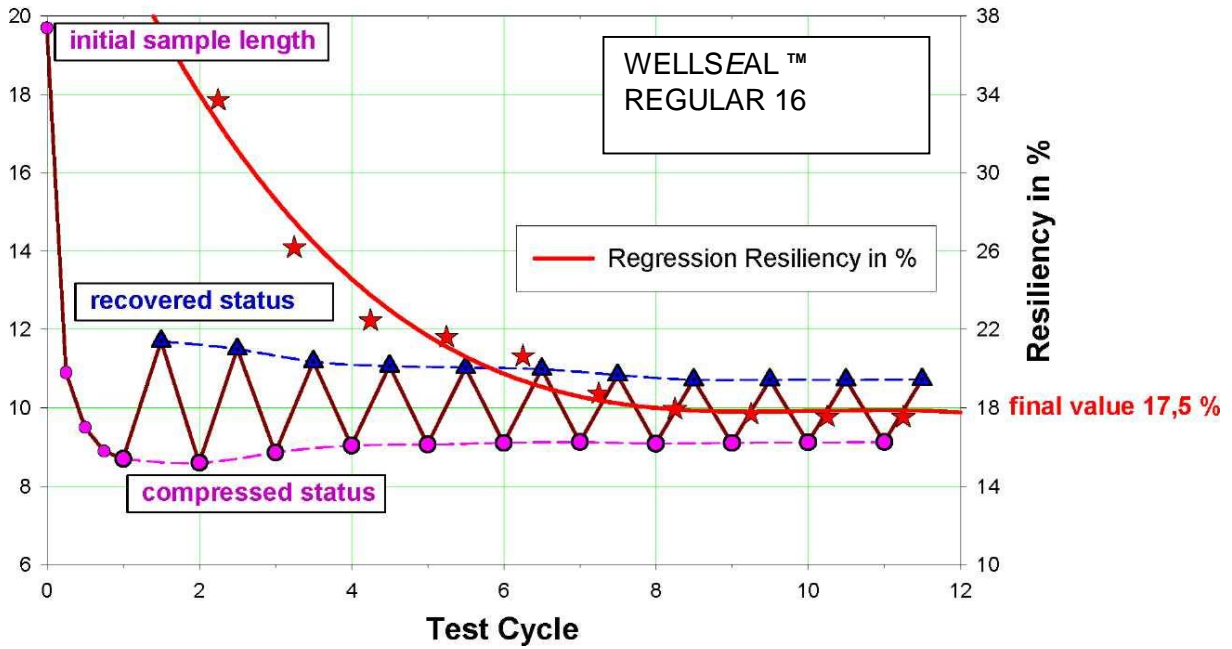
Pressure cycle	1	2	3	4	5	6	7	8	9	10	11
Initial length, mm	18,3										
Length @ 2900 psi, mm	9,8										
Length @ 5800 psi, mm	8,7										
Length @ 8700 psi, mm	8,2										
Length @ 10000 psi, mm	8,0	8,09	8,12	8,14	8,15	8,17	8,12	8,12	8,12	8,14	8,15
L after pressure release, mm	11,0	9,45	9,41	9,33	9,27	9,26	9,13	9,12	9,11	9,14	9,15
Length alteration, mm	3,0	1,36	1,29	1,19	1,12	1,09	1,01	1,00	0,99	1,00	1,00
% Resiliency		16,8	15,9	14,6	13,7	13,3	12,4	12,3	12,2	12,3	12,3

Final result sample WELLSEAL FINE 72 : **Resiliency = 12.3 %**

Plots

Above data were plotted with PC-program Sigma plot and the asymptotic approach to the final resiliency is visualized.

Resiliency Test



Attachments

Attachment 1: pictures of the used components

Modules for Testing Resiliency



Instrumental setup during calibration

Instrumental setup during test



Hydraulic piston and pellet mold with digital length indicator



Pellet mold with digital length indicator