THE EFFECT OF TEMPERATURE ON THE TENSILE STRENGTH AND ELONGATION OF BAL SEAL ENGINEERING MATERIALS

Technical Report
TR-72 (Rev. A; 10-10-01)
(100-47-2)

BAL SEAL ENGINEERING

19650 Pauling
Foothill Ranch, CA 92610-2610
Tel (949) 460-2100
Fax (949) 460-2300
Email: sales@balseal.com
www.balseal.com

Bal Seal Engineering Europe B.V.
Jollemanhof 16, 5th Floor
1019 GW Amsterdam
The Netherlands
Tel +31 20 638 6523
Fax +31 20 625 6018
Email: ordersbv@balseal.nl

TABLE OF CONTENTS

Bal Seal Engineering Co, Inc. ● Foothill Ranch, CA USA 92610-2610 ● Tel: 949 460-2100; Fax: 949 460-2300 ● Email: sales@balseal.com ● Web: www.balseal.com
Bal Seal Engineering Europe, B.V. ● Amsterdam, The Netherlands ● Tel: +31 20 638 6523, Fax: +31 20 625 6018 ● Email: info@balseal.nl ● Web: www.balseal.nl

1.0 PURPOSE

This report describes the effect of temperature on the tensile and elongation of BAL™ Seal PTFE materials.

2.0 DISCUSSION

The following materials were tested.

MATERIAL	DESCRIPTION
T	**Virgin PTFE –** a General-purpose material typically used when chemical compatibility and low friction is necessary. Light duty service. Not suitable in water but it is compatible with most fluids and gases. Color: white.
G	**Graphite-filled PTFE –** Used in general purpose application for a greater degree of extrusion / creep resistance. This material is compatible with most fluids and gases. Not for use in vacuum or dry gas. Color: black.
GC	**Graphite-carbon filled PTFE –** a General-purpose material used where extrusion / creep resistance is important. Resists deformation at high temperatures. Not for general use in vacuum or inert gases. Color: black.
GFPA	**Reinforced-graphite-filled PTFE –** An excellent wear resistant material for use at higher temperatures, pressures, and speeds. Excellent for use in water and other aqueous solutions. Can be used in continuous duty at high pressure with adequate backing. Color: black.
SP 45	**Polymer-filled PTFE –** A general-purpose material, usually used in contact with soft shaft materials like 300 series stainless, aluminum, etc., at various pressures, temperature, speeds and media, including vacuum and inert gases. Color: light green.
SP 50	**Polymer- PTFE Blend –** For general service applications. Excellent wear resistance in gases, air and vacuum. Limited wear resistance in water. Low abrasion to dynamic surfaces. Suitable for high speed low pressure. Color: grayish brown.

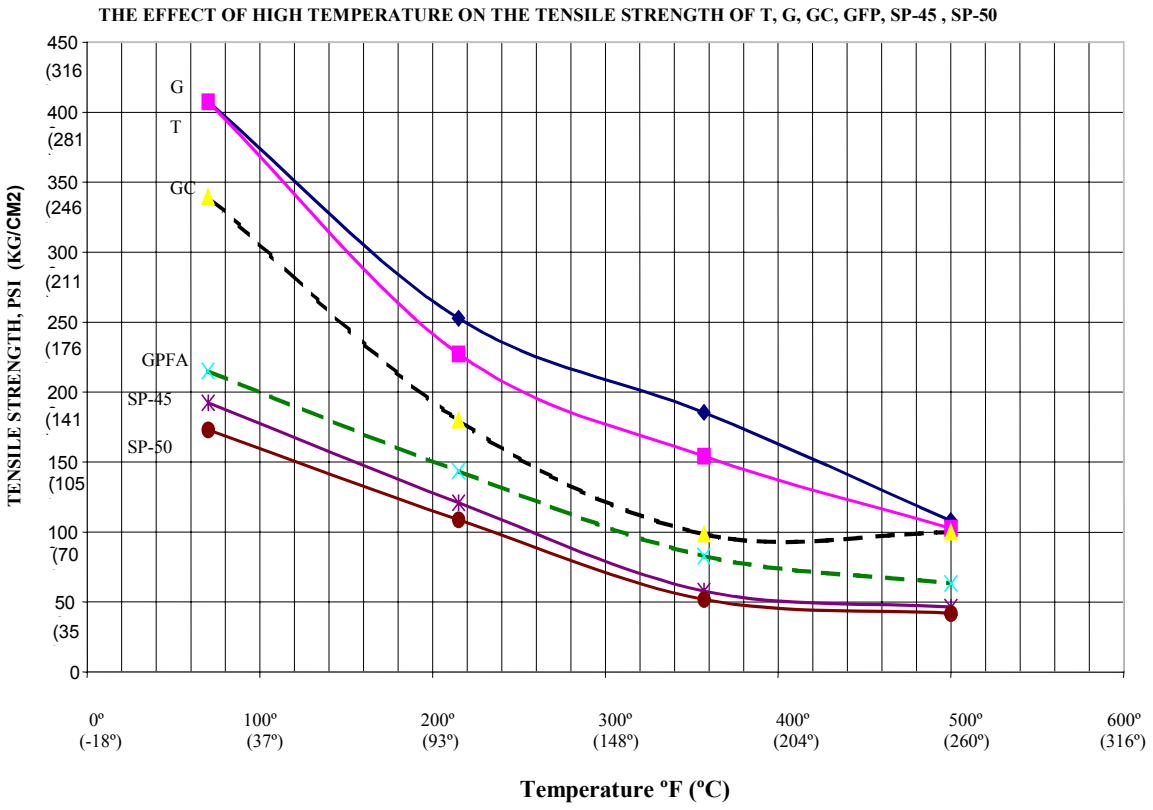
The tensile and elongation properties of PTFE BAL Seal materials decrease as the temperature increases, as indicated in the following charts and graphs.

3.0 TENSILE STRENGTH VERSUS TEMPERATURE

There is a rapid decrease in tensile strength for T, G, and GC materials, while the decrease in tensile for GFPA, SP-45 and SP-50 is gradual. GFPA and SP-45 maintain their properties substantially better at elevated temperatures.

MATERIAL – TENSILE STRENGTH AT TEMPERATURE (PSI)						
TEMPERATURE (°F)	**T**	**G**	**GC**	**GFPA**	**SP-45**	**SP-50**
70	4075	4075	3396	2151	1924	1731
215	2527	2275	1798	1434	1209	1088
357	1856	1543	984	829	578	520
500	1082	1027	998	633	464	418

*Reference Report #27-7 **TABLE 1**



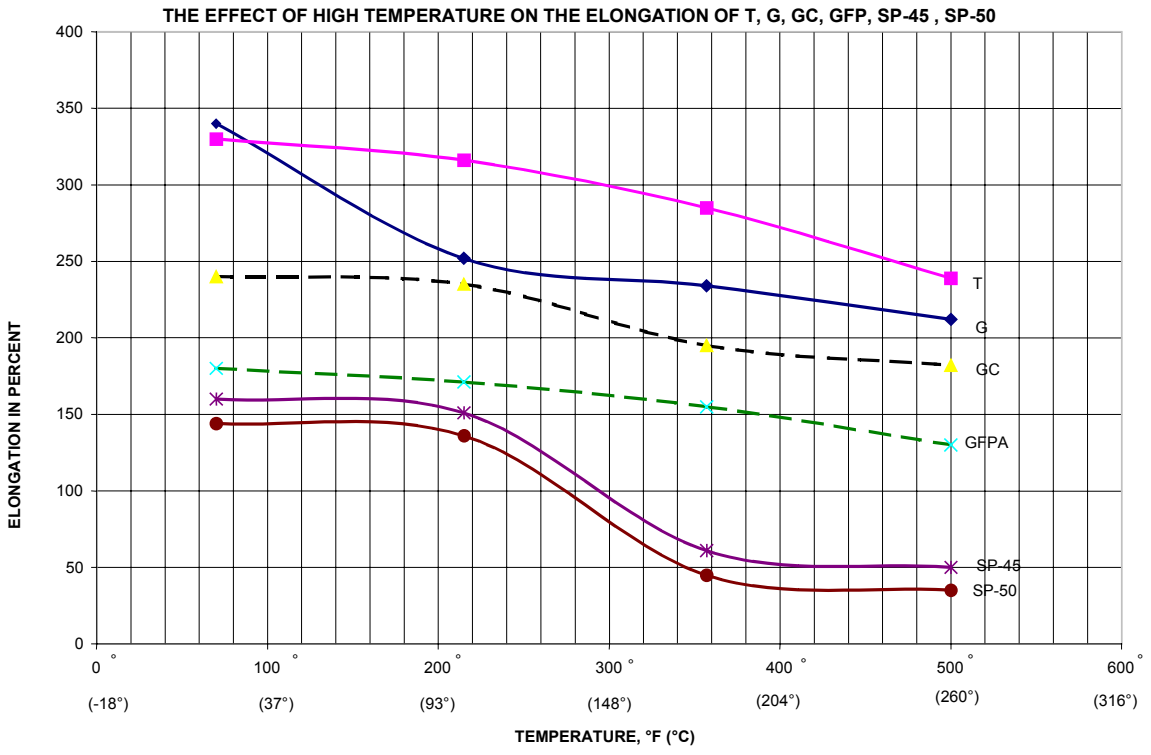
GRAPH 1

4.0 ELONGATION VERSUS TEMPERATURE

As the temperature increases, the elongation of T, G, GC, GFPA, SP-45 and SP-50 decreases because the materials soften. The elongation of virgin PTFE decreases much more sharply than other materials. GFPA, SP-45 and SP-50 have lower elongation properties then the other materials. See Table 2 and Graph 2.

MATERIAL – ELONGATION AT TEMPERATURE (PSI)						
TEMPERATURE (°F)	**T**	**G**	**GC**	**GFPA**	**SP-45**	**SP-50**
70	340	330	240	180	160	144
215	252	316	235	171	151	136
357	234	285	195	154	61	45
500	212	239	182	130	50	35

*Reference Report #27-7 **TABLE 2**



GRAPH 2

5.0 RESULTS

The results indicate that G is most stable in conditions where the seal is to be used at elevated temperatures.

6.0 REFERENCES

Bal Seal Engineering Reference Report #27-7 and #100-47.
"Properties of BAL™ Seal PTFE Seal Materials." Technical Report TR-8A.
Bal Seal Engineering DM-5 "Rotary Seal Catalog."