

# Thermosets

Polyester BMC Styrene-Free Polyester Phenolic Melamine/Phenolic

## Oil and Gas

Plenco Thermoset materials have been providing the oil and gas industry with dependable alternatives to metal and thermoplastic for more than 30 years. Their proven property retention under extreme heat and chemical exposure makes them ideal for a wide range of severe duty applications.

### Applications

<b>Frac Balls</b>	02300, 02535, 04100, 06406, 06445, 06448, 06080
<b>Frac Plug Components</b>	06406
<b>Cementing Wiper Plugs</b>	04100, 06401, 06404
<b>Casing Centralizers</b>	08680, 08218, 06406
<b>Valve Components</b>	04100, 04311, 06401, 06406, 08122
<b>Gauge and Meter Housings</b>	02370, 06401



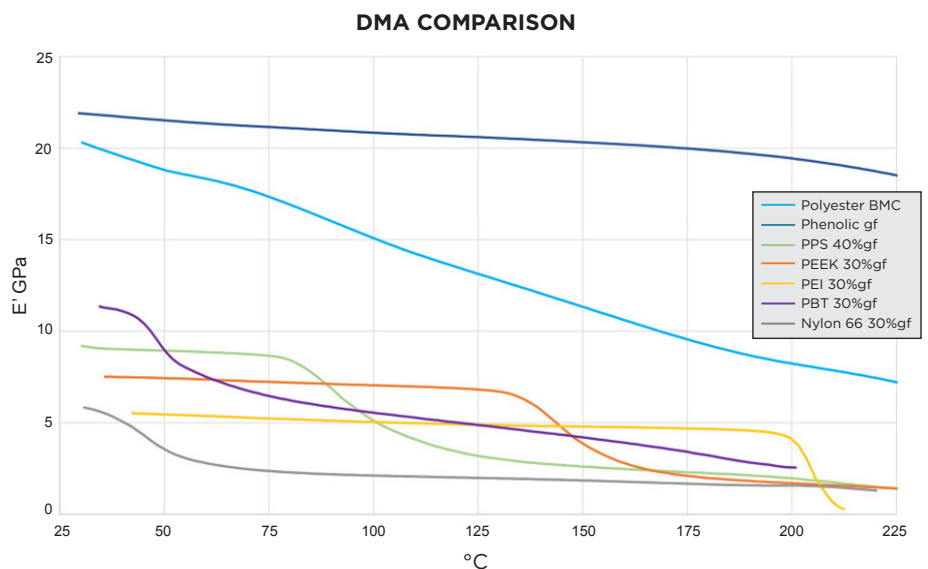
### Thermal Stability

The cross-linked chemical structure of Plenco Thermosets gives them a wider operating temperature range and better chemical resistance than many, more-costly thermoplastics. From  $-40^{\circ}\text{F}$  to  $+400^{\circ}\text{F}$ , Plenco thermosets provide solid, predictable performance for completion, production and delivery in both oil and natural gas systems.

### $^{\circ}\text{C}$ Scanning DMA T<sub>g</sub> vs. Modulus

The Glass Transition Temperature (T<sub>g</sub>) is where molecular mobility increases dramatically. The physical properties of thermoplastics can decline rapidly when forced to operate above their T<sub>g</sub>.

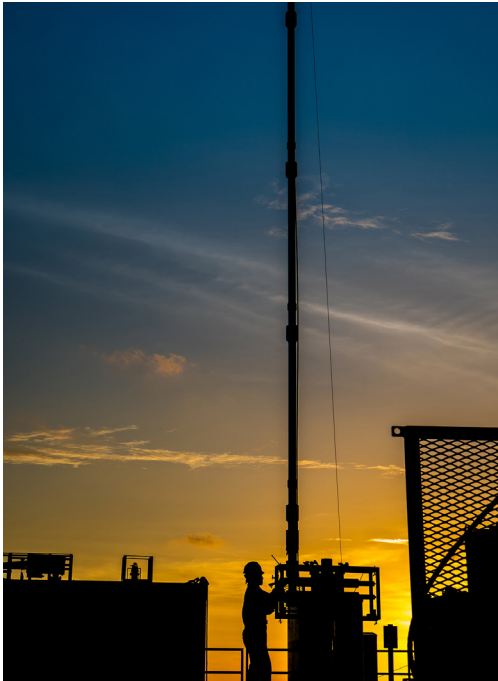
Properly prepared Plenco Thermosets offer significantly higher T<sub>g</sub>, providing better property retention at elevated temperatures.



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## Compressive Strength and Modulus



The compressive strength and modulus of Plenco Thermosets approach those of aluminum and zinc die castings.

This provides exceptional creep resistance, bolt torque retention and molded-in thread strength.

**Compressive Strengths to 56,500 psi**  
**Compressive Modulus 1.8MM psi**

## Thread Strength Comparisons

#10 - 5/8" coarse thread self tapping screw

06310 - glass/mineral reinforced phenolic	126.0 in·lbs torque
06401 - glass/mineral reinforced phenolic	114.0 in·lbs torque
03356 - mineral reinforced phenolic	76.8 in·lbs torque
08218 - glass fiber reinforced polyester	53.0 in·lbs torque

## Surface Hardness and Wear

The high surface hardness and smooth finish provided by Plenco Thermosets produce excellent cosmetic and wear surfaces.

Internal testing of small engine cam lobes molded from Plenco 06401 showed no measurable wear after running against a steel cam follower under a 5# spring load for 2000 hours in 300°F motor oil.



## Gasoline and Oil Resistance - Plenco 06401

Gasoline at 22°C	Hours	Dimensional Stability %	Barcol Hardness	Flexural Strength MPa	Flexural Modulus MPa	Charpy Impact Strength J/m
	0	0	54	130.5	12245	31.1
	168	-0.013	59	146.5	12743	30.9
	1000	0	68	130.3	12839	28.1
Motor oil at 150°C	Hours	Dimensional Stability %	Barcol Hardness	Flexural Strength MPa	Flexural Modulus MPa	Charpy Impact Strength J/m
	0	0	54	130.5	12245	31.1
	168	-0.11	71	157.8	14158	27.6
	1000	-0.22	70	113.7	13398	27.6