

What's New - SURPASS® RMs245-U/UG

Third-Generation Tank Grade

ARM Fall Conference 2015, Denver CO

Henry Hay and Céline Bellehumeur, NOVA Chemicals
November 2015

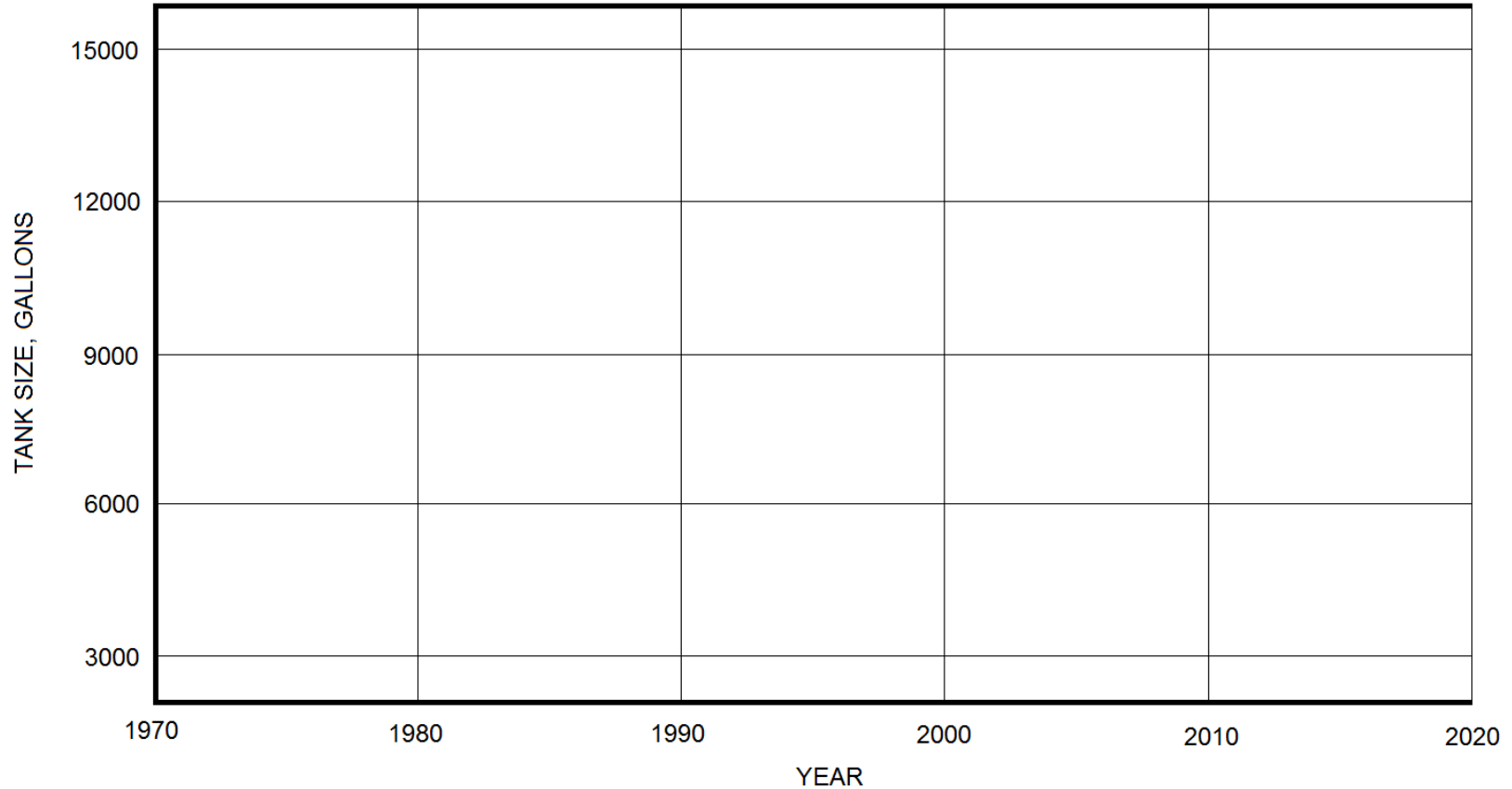
What's New - SURPASS® RMs245-U/UG

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- Tank Resin Requirements
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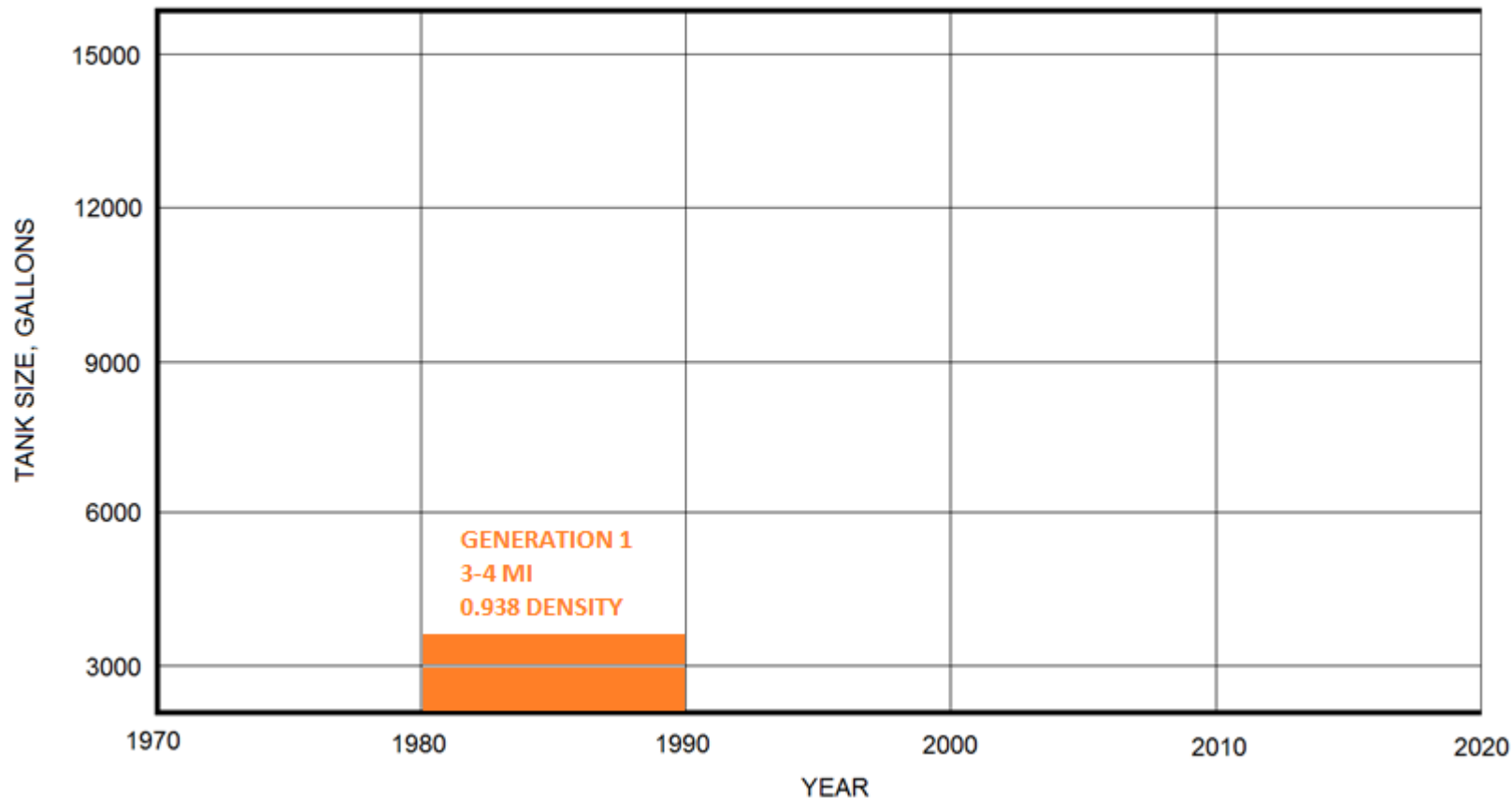
What's New - SURPASS® RMs245-U/UG PE Tanks - History

LARGE POLYETHYLENE TANK HISTORY



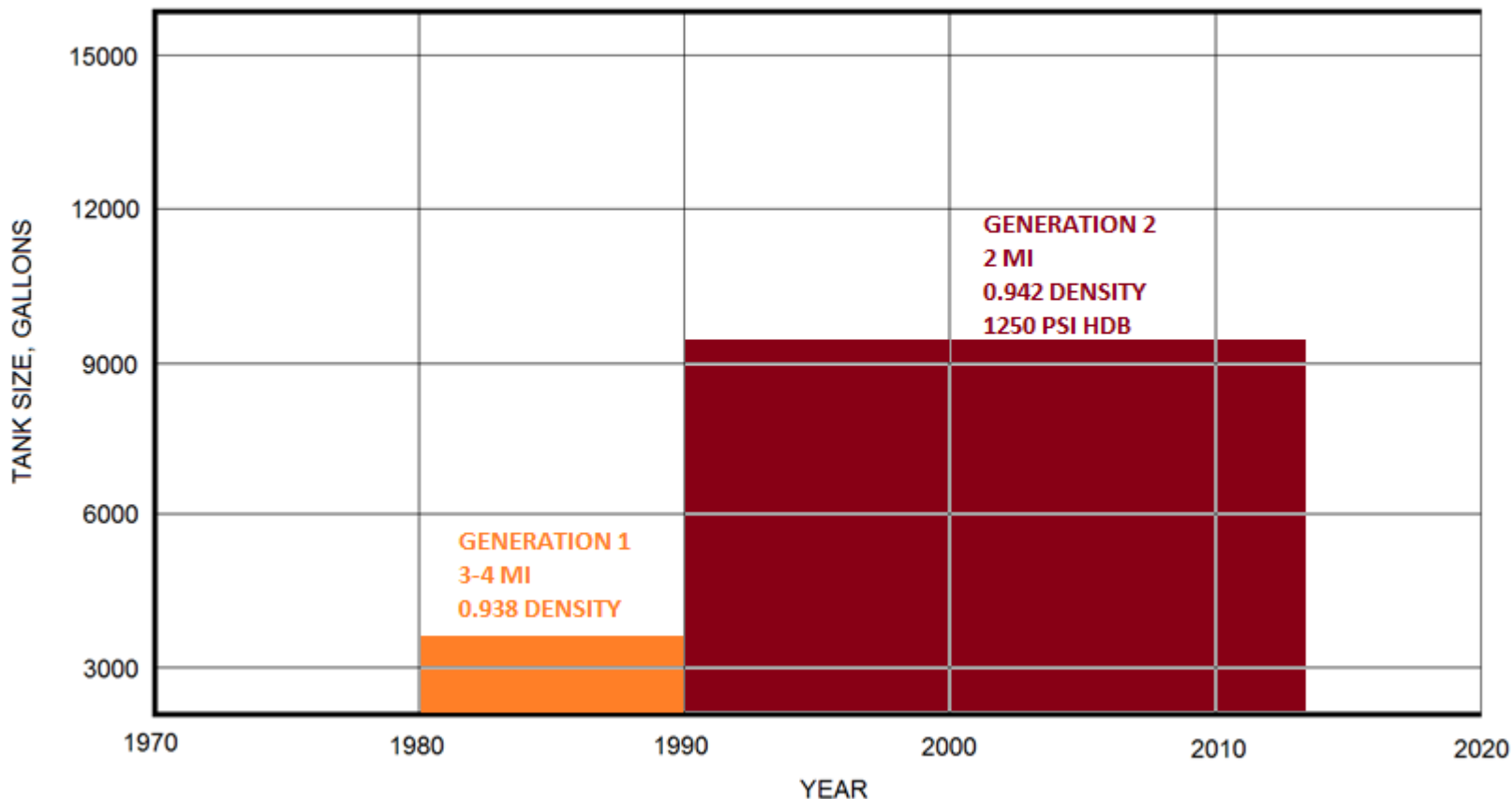
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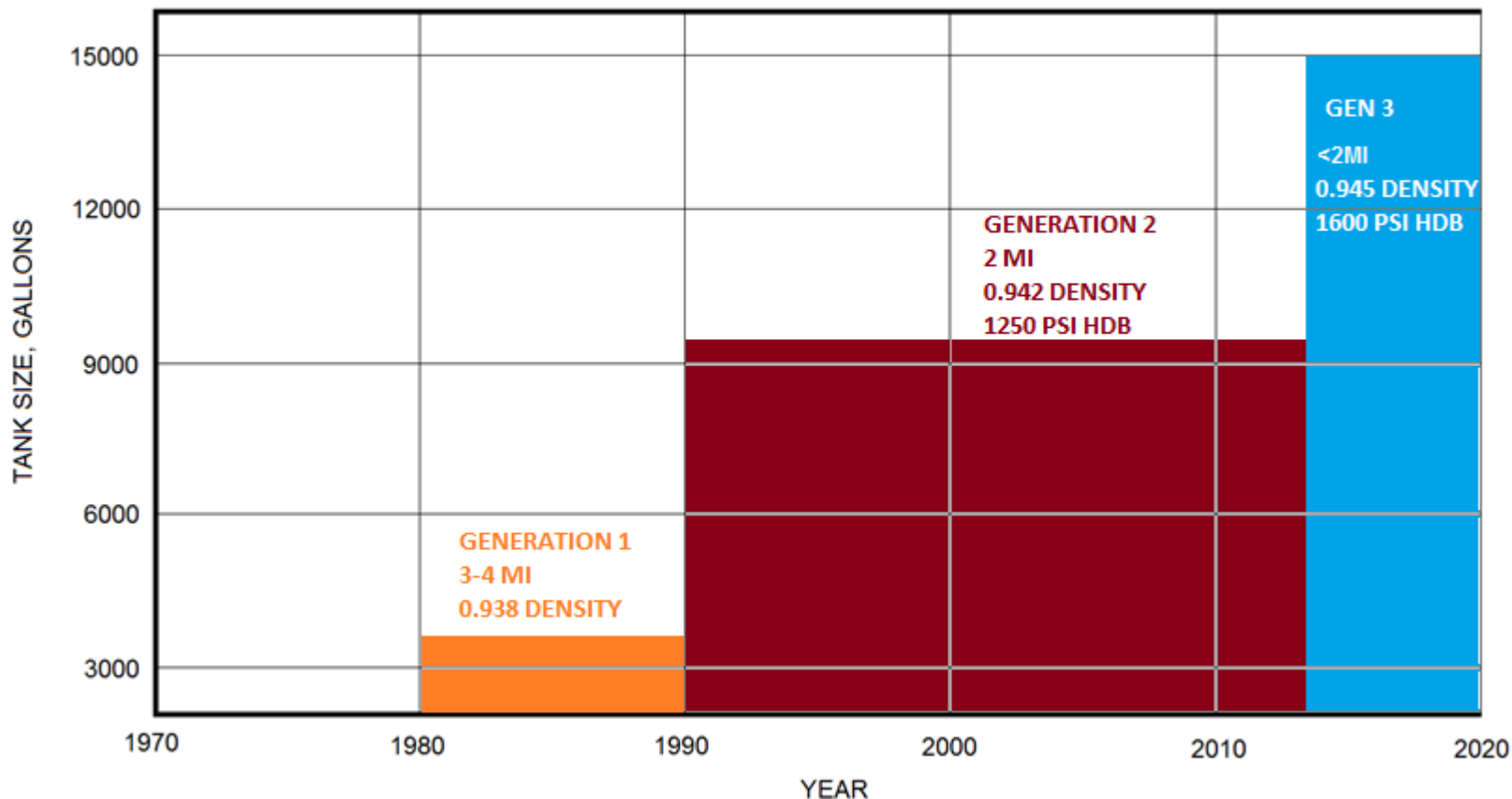
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LARGE POLYETHYLENE TANK HISTORY



What's New - SURPASS® RMs245-U/UG Gen 3 Resin Requirements

Ability to Mold Big Tanks

- Thermal Stability
- Consistent, Easy Mold Release
- Resistance to Warping
- Resistance to Sagging and Dripping

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High ESCR

- 1000+ hours (Bent Strip A100)

Very High Stiffness

- 1000+ MPa Flexural Modulus

High Toughness

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- 1600 psi Cell Class

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- UV 15 +

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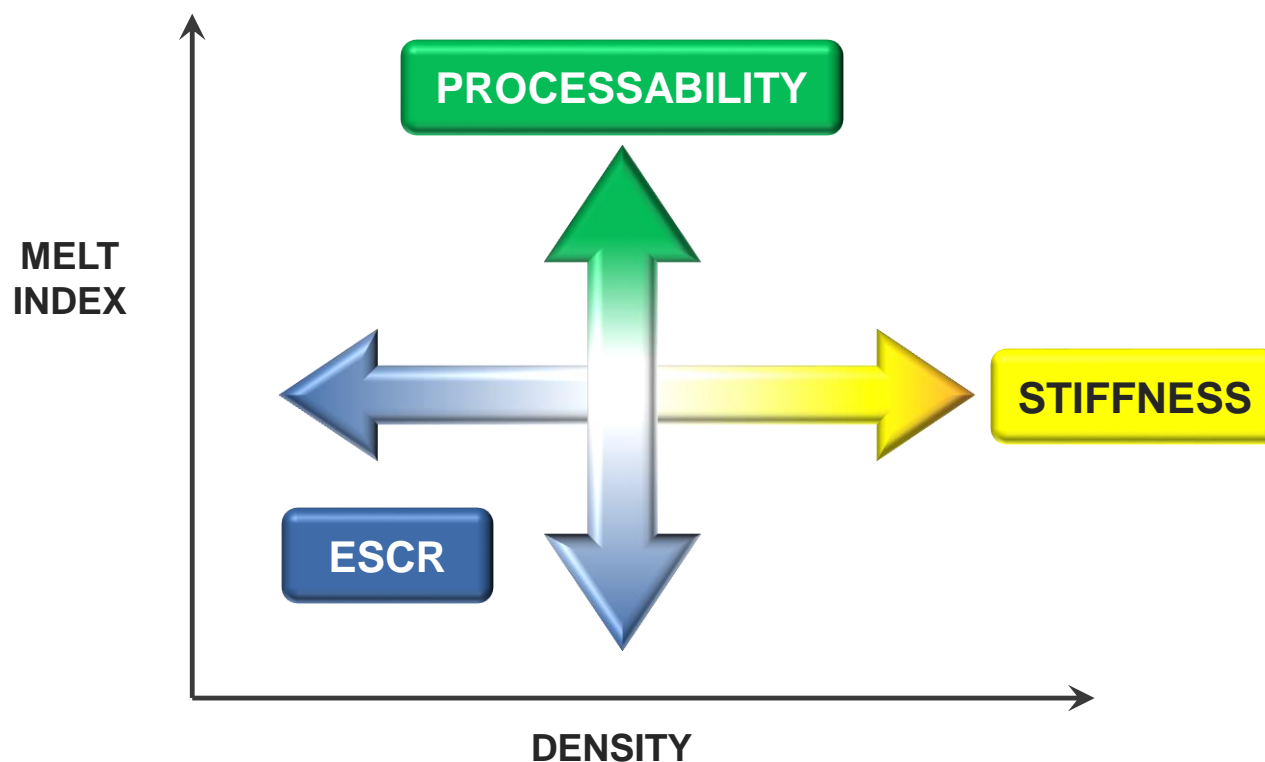
- UV 15 +

Process Flexibility

- Ability to Mold Smaller Tanks → Resin Consolidation

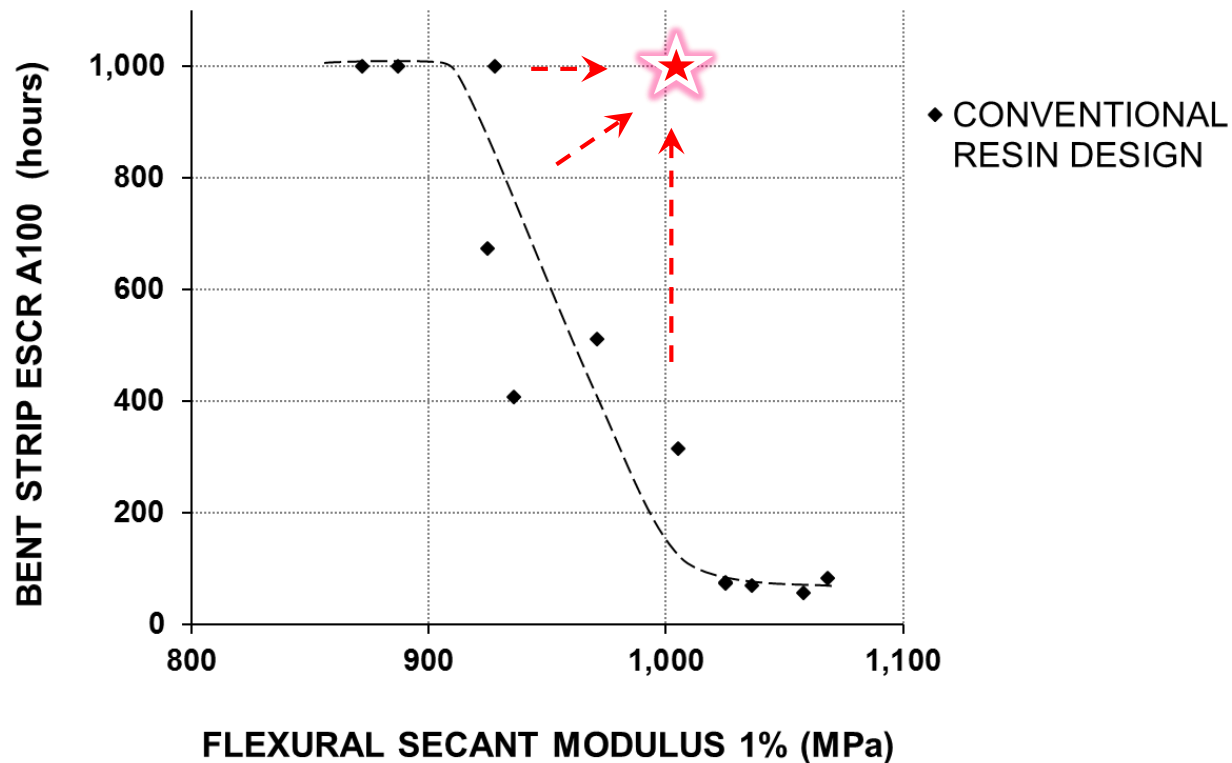
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The Challenge:
Combining High Stiffness with ESCR, Toughness, and Processability



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- **Target Values**

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- **Strategy**

Manipulate molecular weight & co-monomer distribution to achieve high stiffness combined with high ESCR

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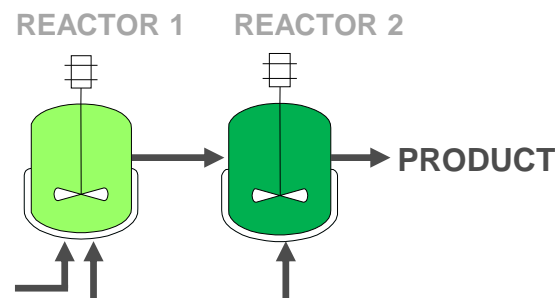
Manipulate molecular weight & co-monomer distribution to achieve high stiffness combined with high ESCR

THE FIX: SURPASS® RMs245-U/UG

- **Specifications**

1.7 MI

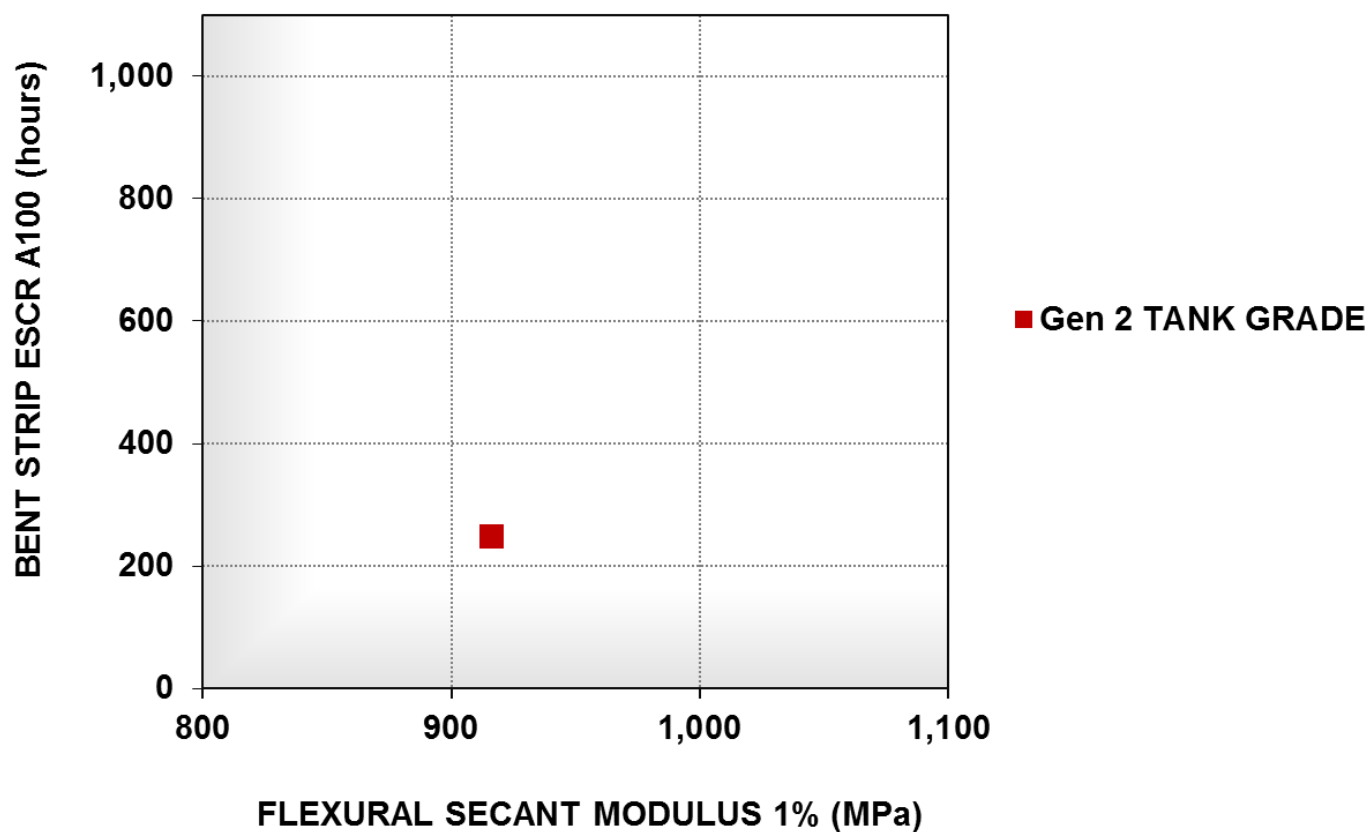
0.945 g/cm³



What's New - SURPASS® RMs245-U/UG

RMs245-U/UG

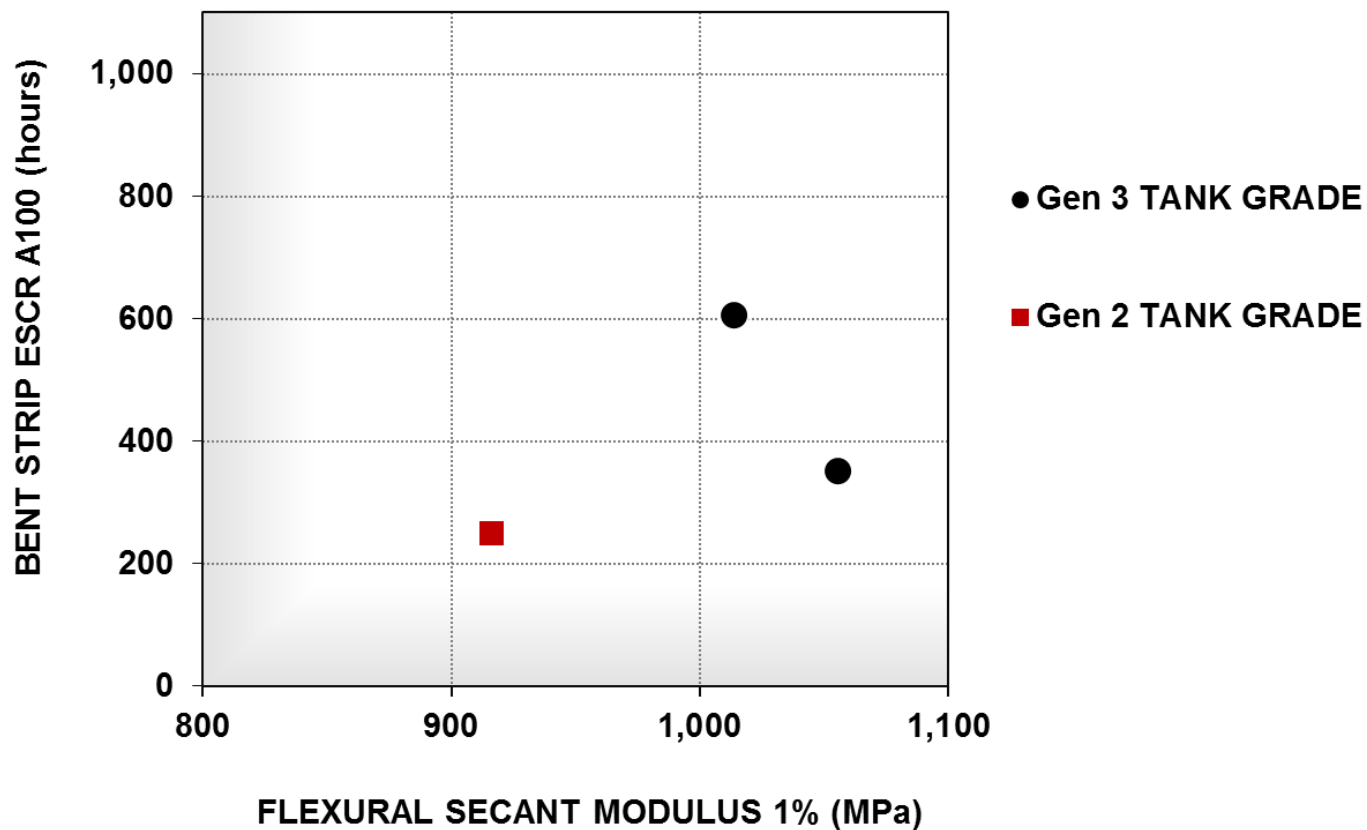
Stiffness / ESCR Balance



What's New - SURPASS® RMs245-U/UG

RMs245-U/UG

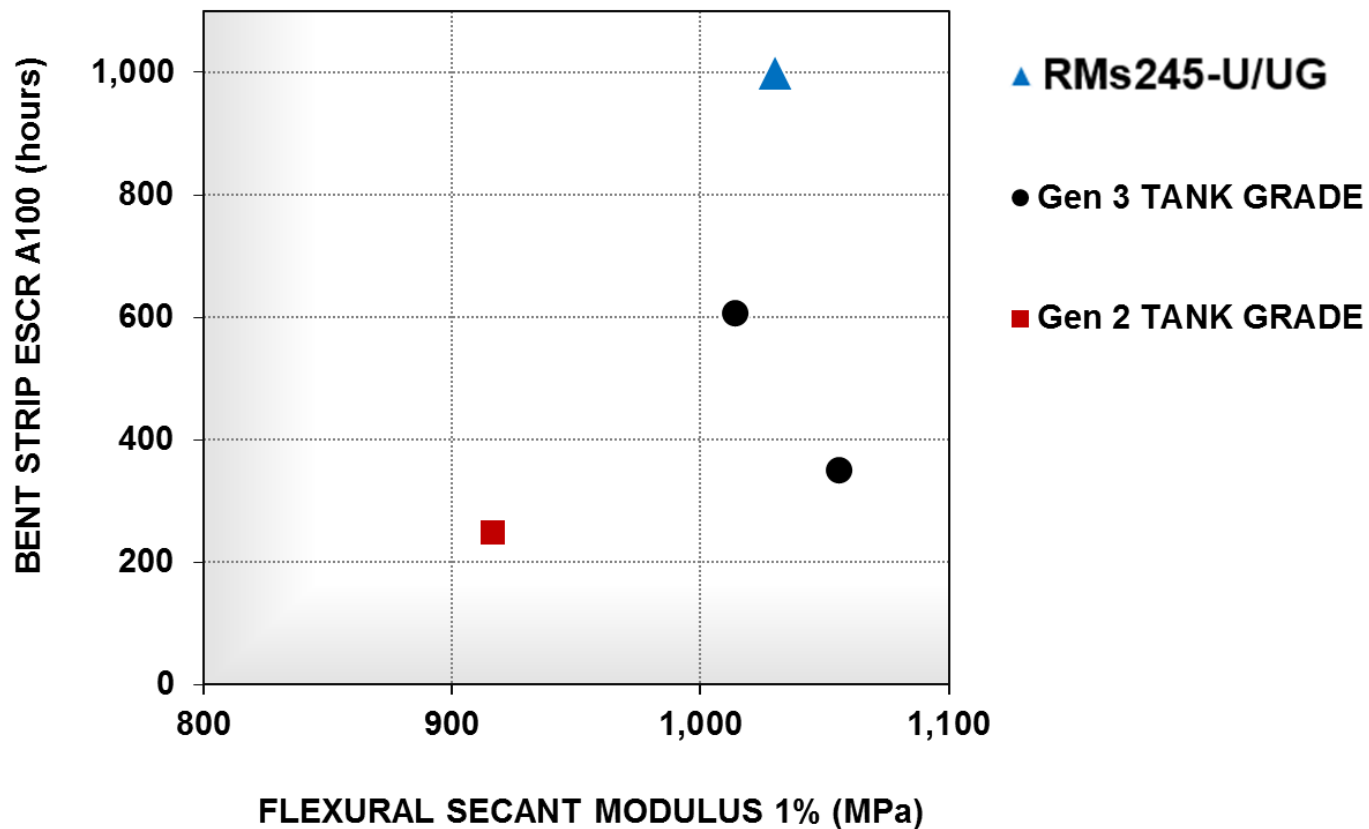
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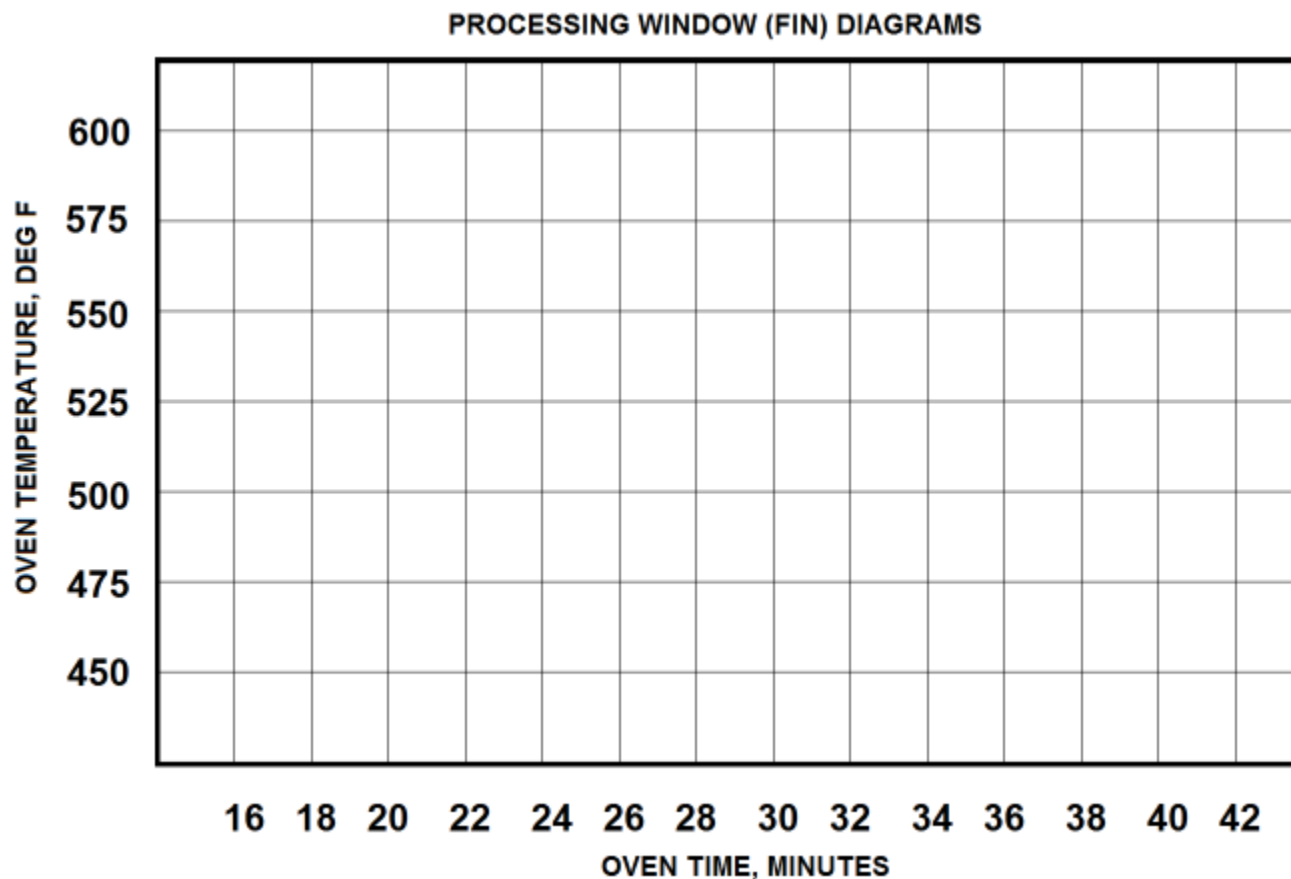
RMs245-U/UG

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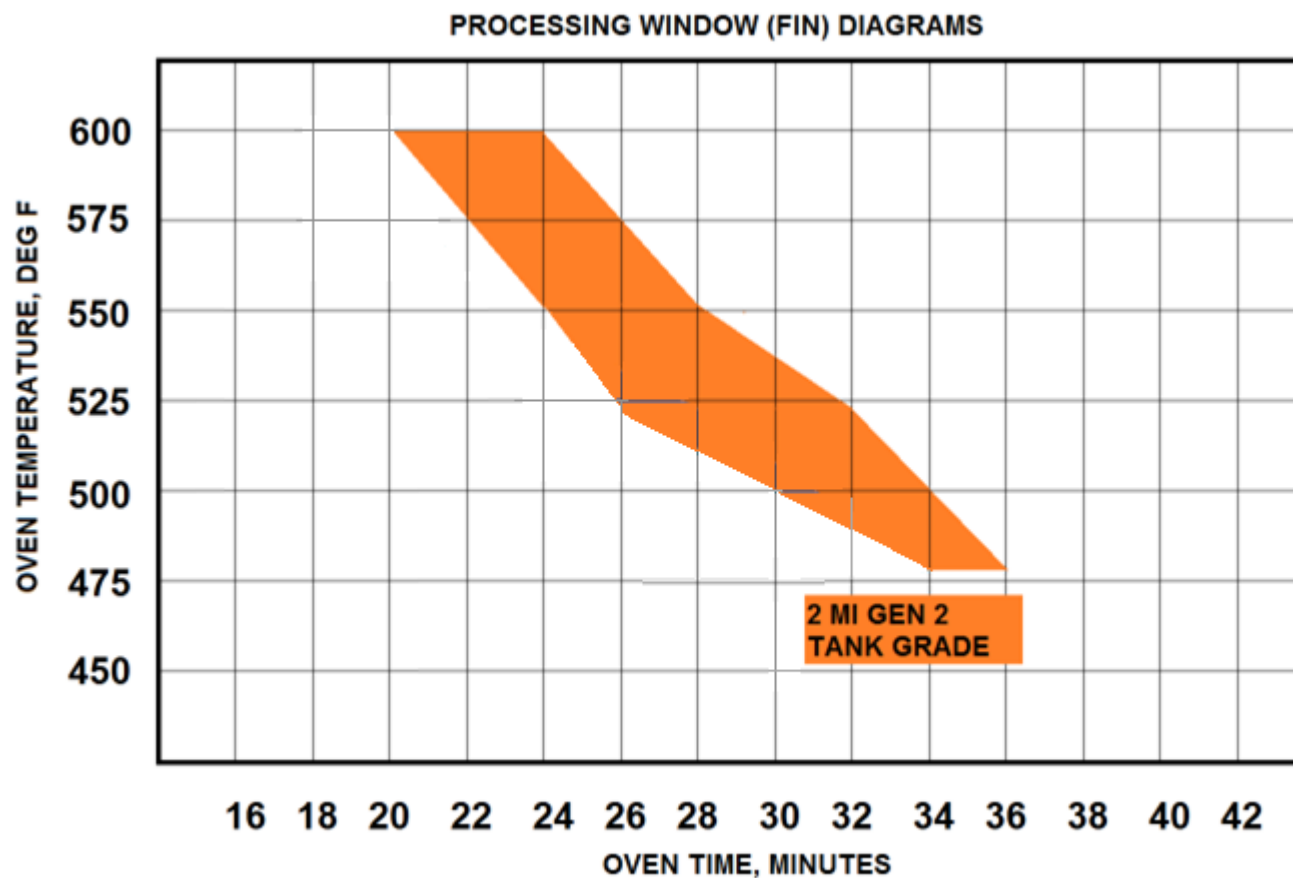
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RMs245-U/UG Processing Window



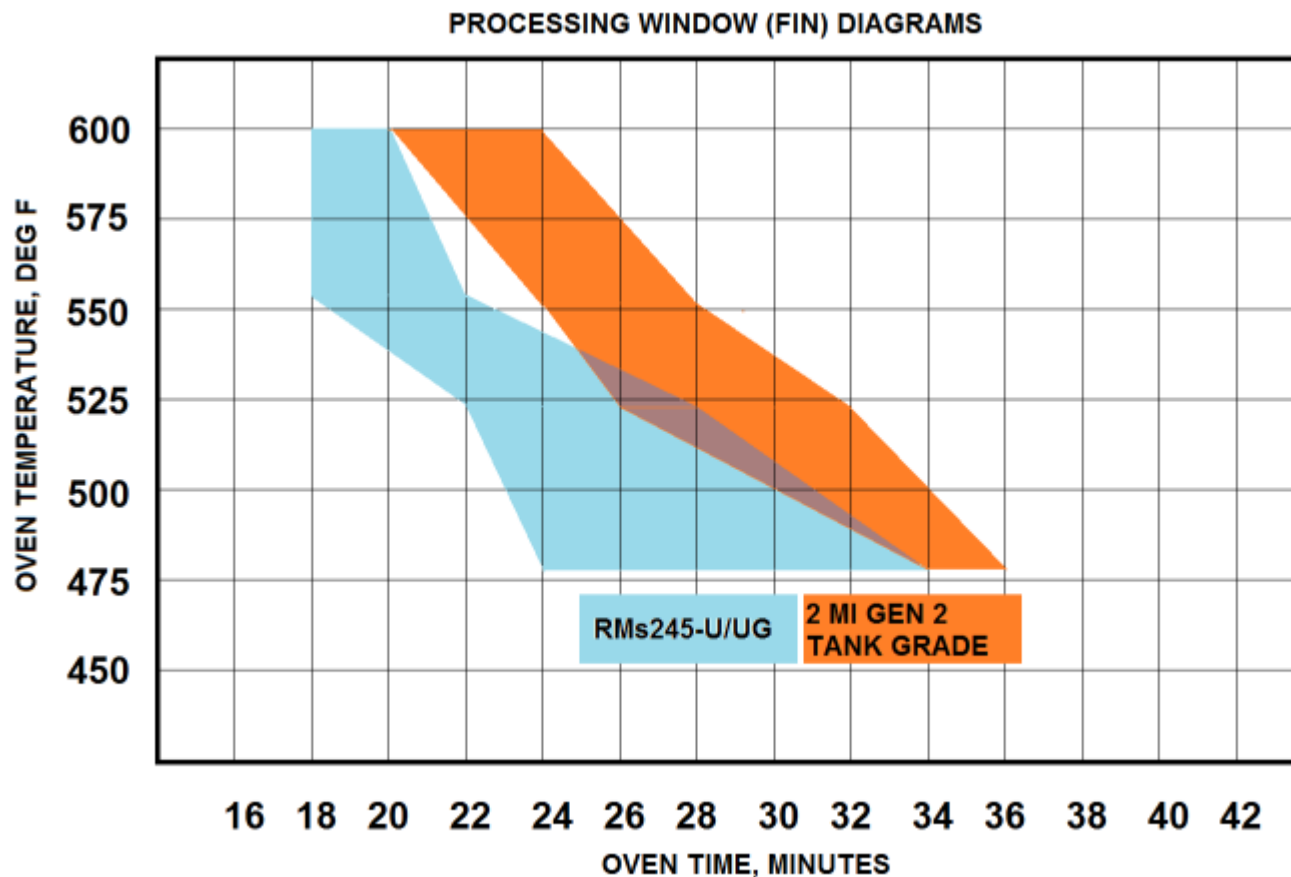
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RMs245-U/UG Processing Window



What's New - SURPASS® RMs245-U/UG

RMs245-U/UG Processing Window



What's New - SURPASS® RMs245-U/UG

Hydrostatic Design Basis

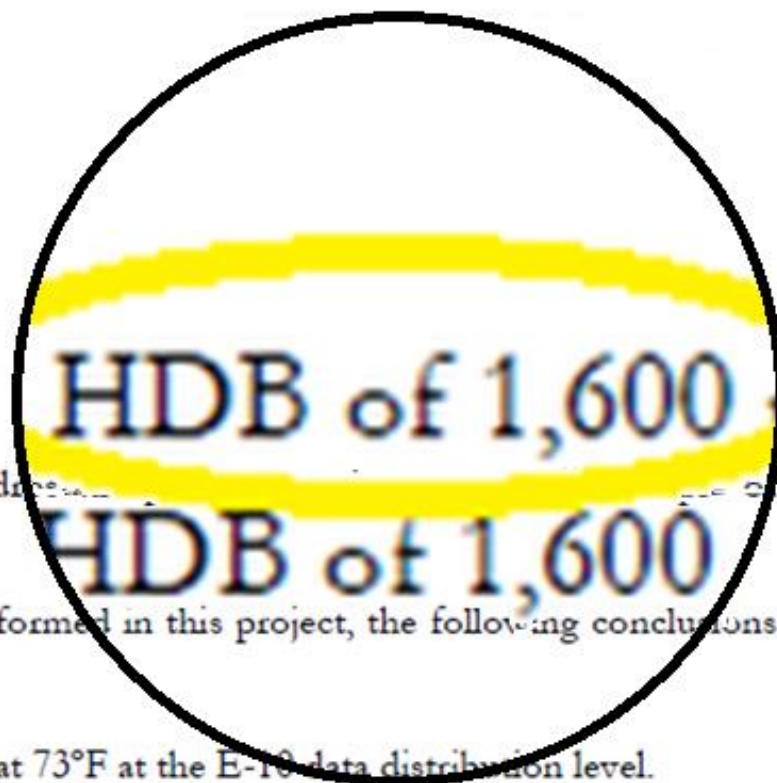


Executive Summary

The purpose of this project was to conduct hydrostatic testing on HDPE Rotational Molding resin compound.

Based on the sample provided and the testing performed in this project, the following conclusions are made:

- Sample 14-393 meets an HDB of 1,600 psi at 73°F at the E-10 data distribution level.
- The sample validates an HDB of 1,600 psi at 73°F per Table 3 of ASTM D2837-13e1.



What's New - SURPASS® RMs245-U/UG



10,000 GALLON HD VERTICAL TANK

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What's New - SURPASS® RMs245-U/UG



330 GALLON HORIZONTAL LEG TANK

Image used with permission of R.A.W. Tanks

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330 GALLON TANK CONTAINMENT

Image used with permission of R.A.W. Tanks

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IBC tank

Image by permission of Solar Plastics

What's New - SURPASS® RMs245-U/UG

300-GALLON TRASH CART - REPLACING XLPE

Image used with permission of
Rotational Molding Inc.



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LAUNDRY CART - Note straight walls

Used by permission of Rotational Molding Inc

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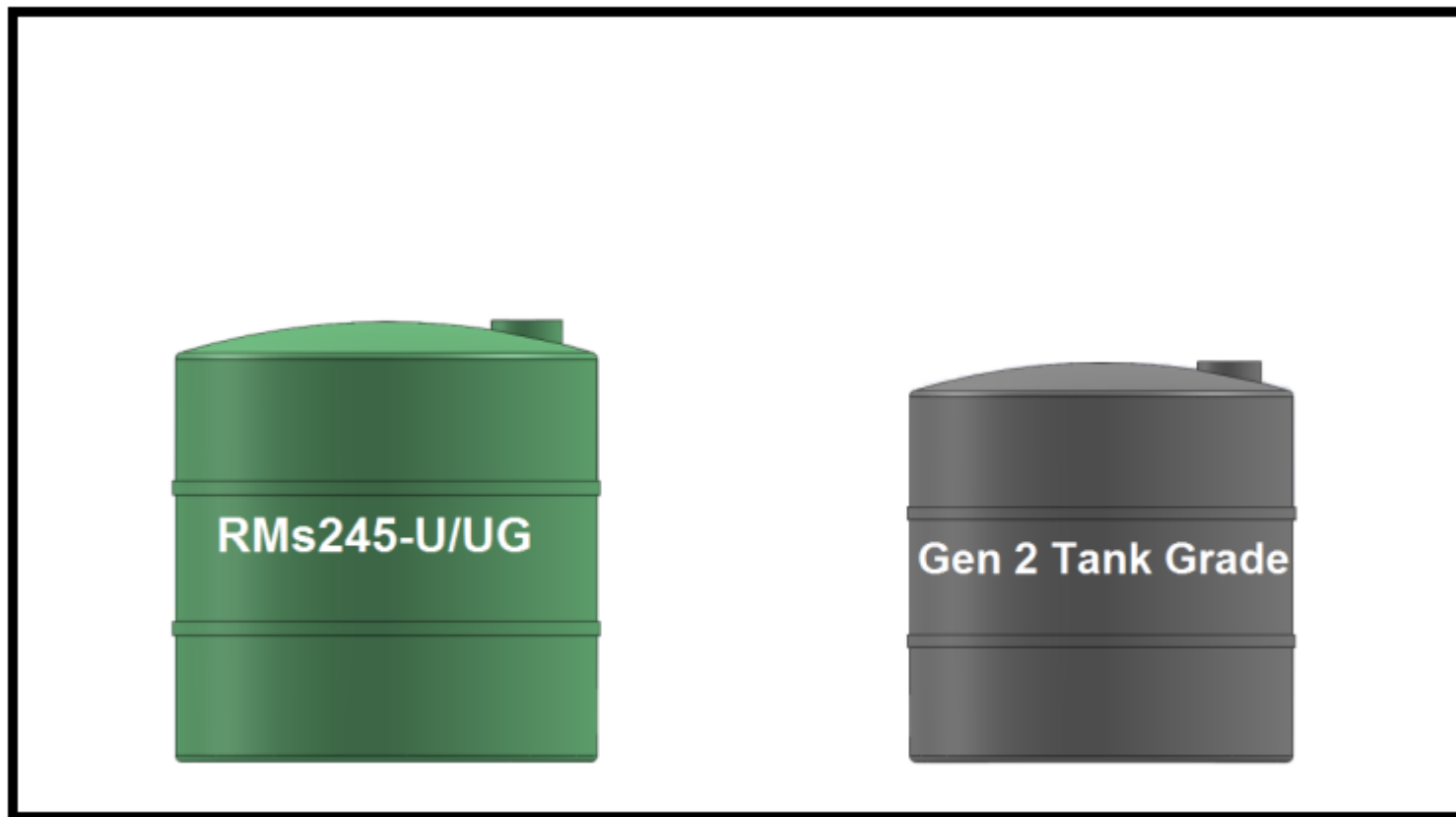


2-lb PIPE RACK WITH KISSOFFS

Image by permission of Rotational Molding Inc.

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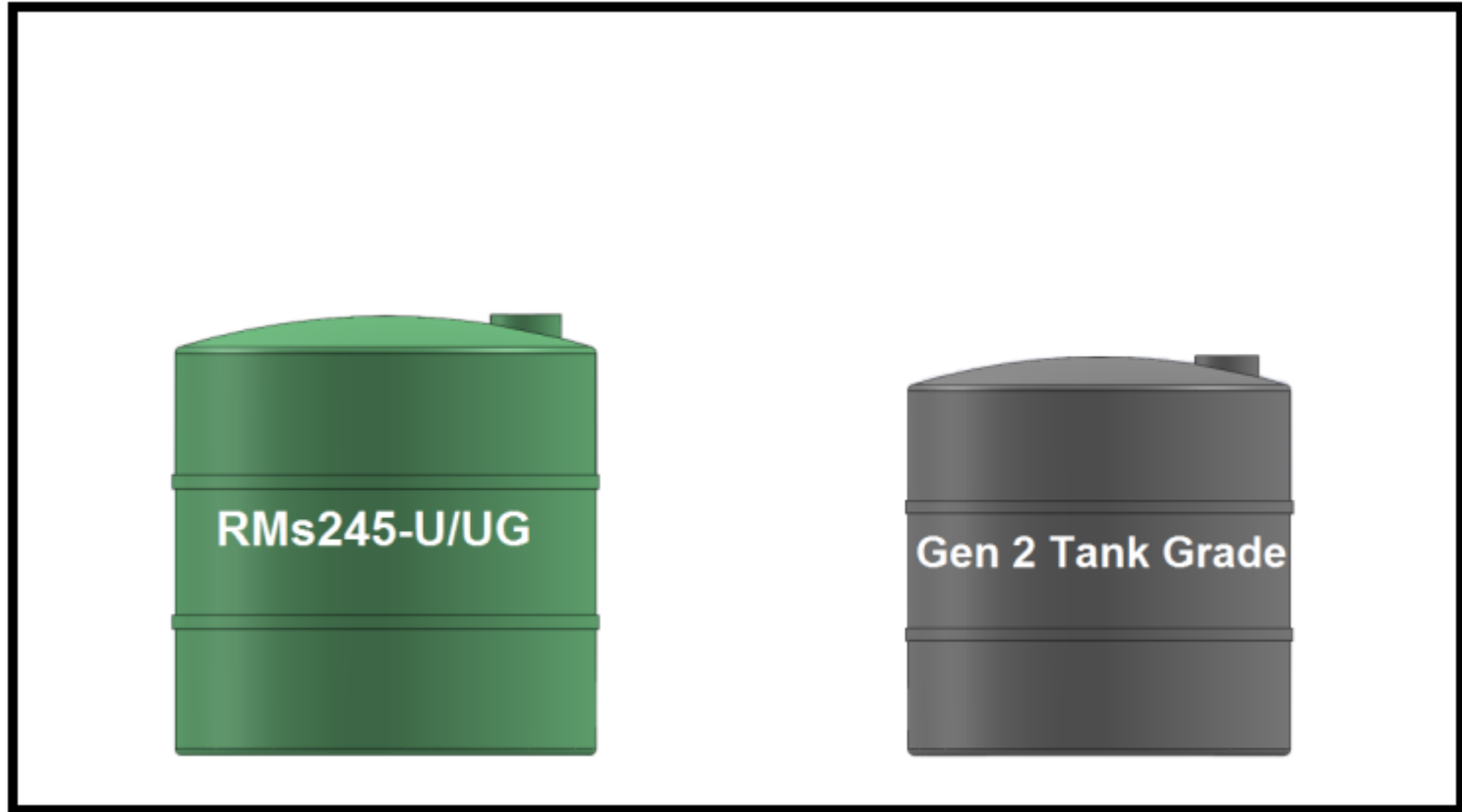
RMs245-U/UG Other Properties



UP TO 10% FASTER PROCESSING

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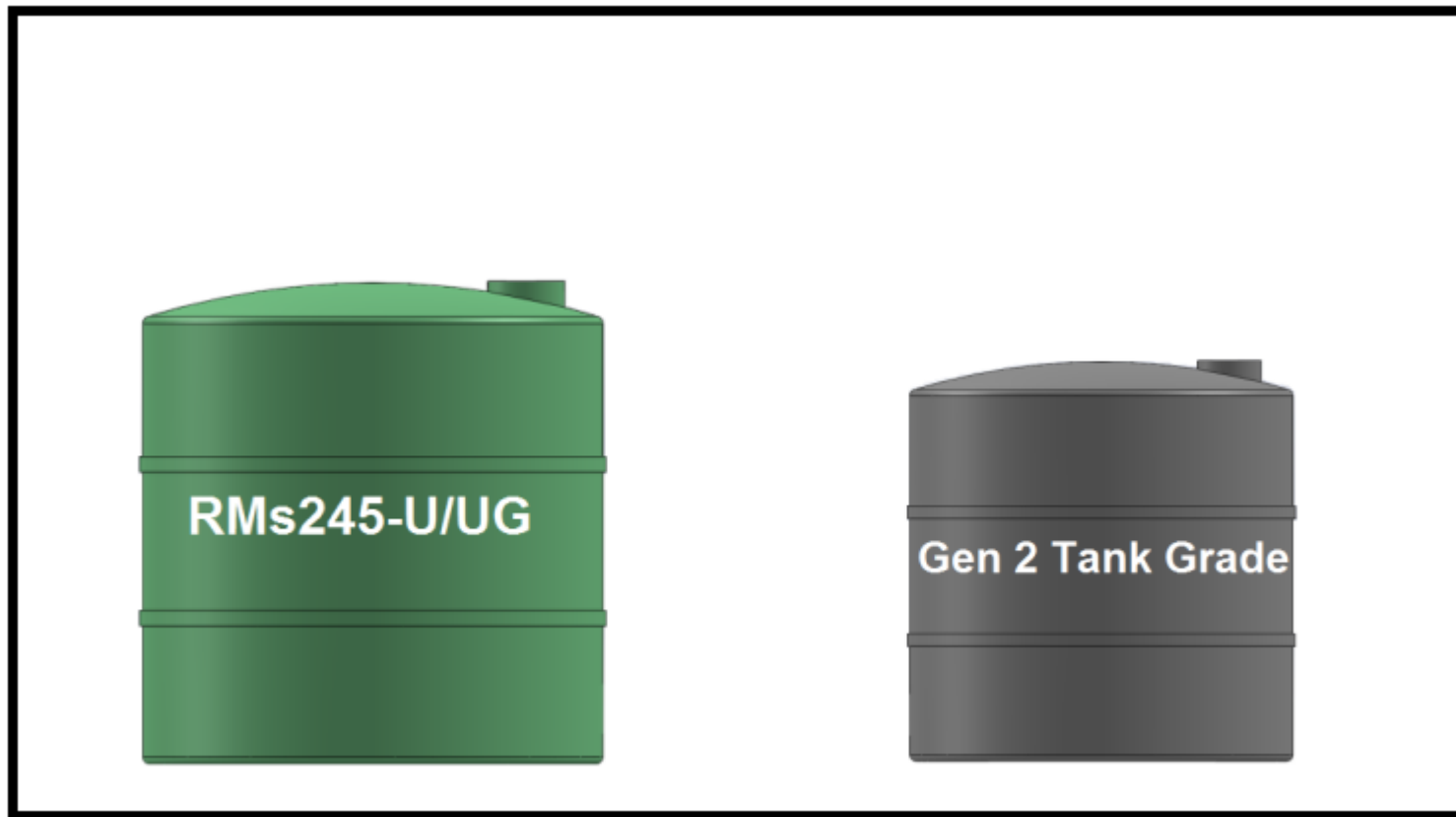
RMs245-U/UG Other Properties



10% HIGHER STIFFNESS

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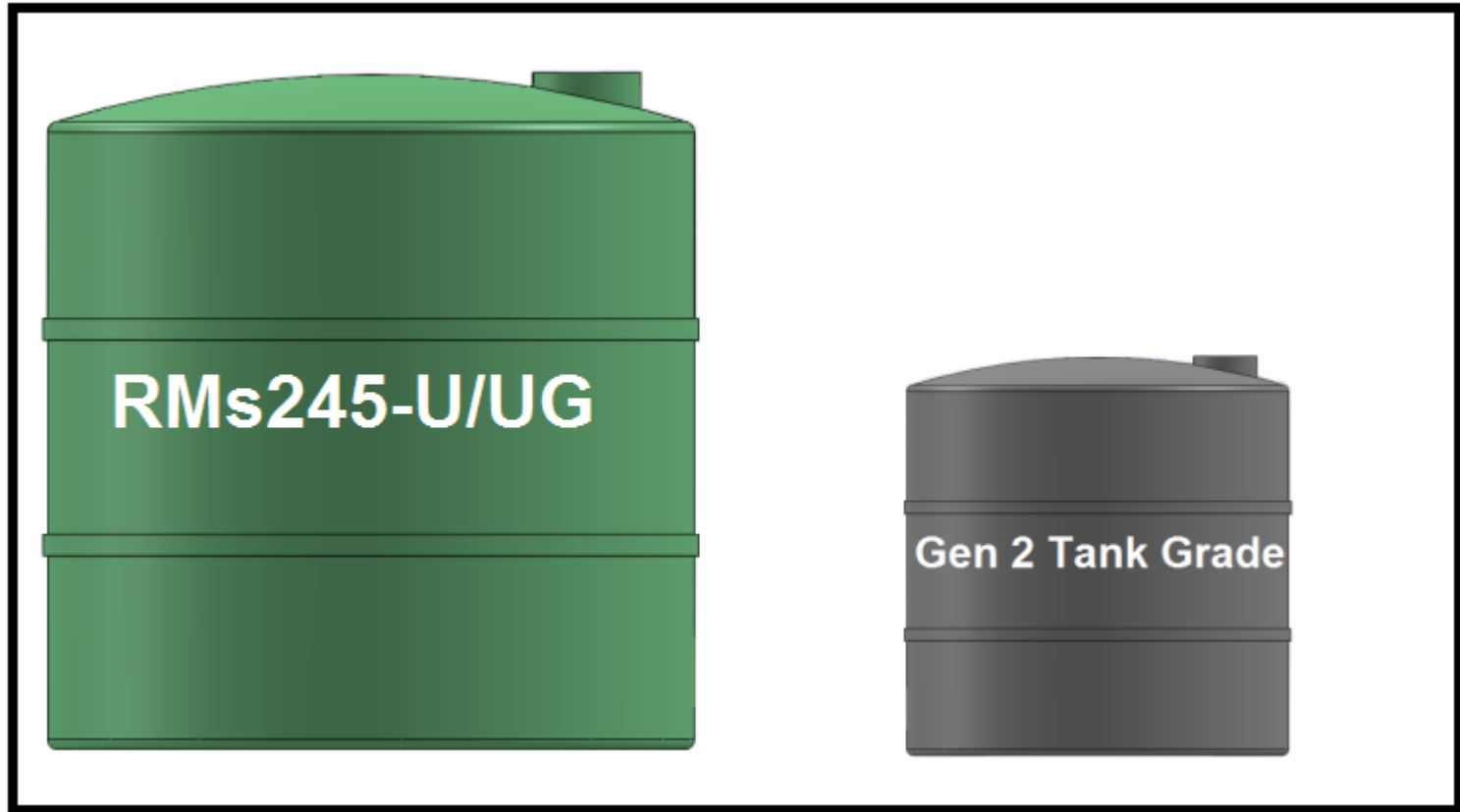
RMs245-U/UG Other Properties



20% HIGHER HDB RATING

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RMs245-U/UG Other Properties



70% HIGHER ESCR


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RMs245-U/UG

Other Properties

- Excellent Whiteness
- Easy Mold Release
- Excellent Interior Finish
- Low Warping
- Good Flow in Smaller, More Complex Parts

What's New - SURPASS® RMs245-U/UG Summary



polyethylene

SURPASS® RMs245-U(UG) Resin
Octene Copolymer sHDPE Rotational Molding Resin

product data sheet

Property	ASTM ⁽¹⁾	Typical Values ⁽²⁾
Melt Index ⁽³⁾	D 1238	1.7 g/10 min
Density	D 792	0.945 g/cm ³
		METRIC UNITS ENGLISH UNITS
Melting Point (DSC)		127 °C 261 °F
Flexural Modulus	(4) D 790	1,030 MPa 149,400 psi
Yield Strength	(5) D 638	23 MPa 3,300 psi
Elongation at Yield	(6) D 638	11 % 11 %
ESCR, (F ₅₀)	(6) D 1693	> 1 000 h
Heat Distortion Temperature		
- 66 psi (4.64 kg/cm ²)	D 648	63 °C 145 °F
- 264 psi (18.66 kg/cm ²)	D 648	43 °C 109 °F
ARM Low Temperature Impact	(7)	
- 0.125" (3.17 mm)	ASTM Method	N/A J N/A ft-lb
- 0.250" (6.35 mm)	ASTM Method	> 245 J > 180 ft-lb

(1) Properties designated have been determined using methods which are in accordance with, or substantially in accordance with, the specified testing standards.

(2) Typical Values represent average laboratory values and are intended as guides only, not as specifications.

(3) Condition 190°C/2.16 kg.

(4) 1% Strain Value. From compression molded samples.

(5) Type IV specimen, 2" (50.8 mm) per minute test speed, 0.075" (1.9 mm) thickness compression molded samples.

(6) Condition A & B, 100% IGEPL, 50°C, F50 values. From compression molded specimens.

(7) -40°C on rotomolded samples.

Melt Index **1.7**

Density **0.945**

Features


- Exceptional low temperature impact properties
- Broad processing window
- High stiffness for very large tanks, combined with exceptional ESCR performance
- Superior whiteness for improved part appearance, resistant to gas fading
- NSF listed for Standards #24, 51, 61
- Broad application use and potential for resin consolidation
- Good interior finish on large tanks
- UL 94 HB
- HDB rating 1600 psi

Additives

- Processing antioxidants
- UV stabilizers (estimated UV resistance >UV20)

Applications

- Septic tanks
- Very large tanks (up to 20,000 gallons)
- Agricultural tanks as small as 3,000 gallons


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