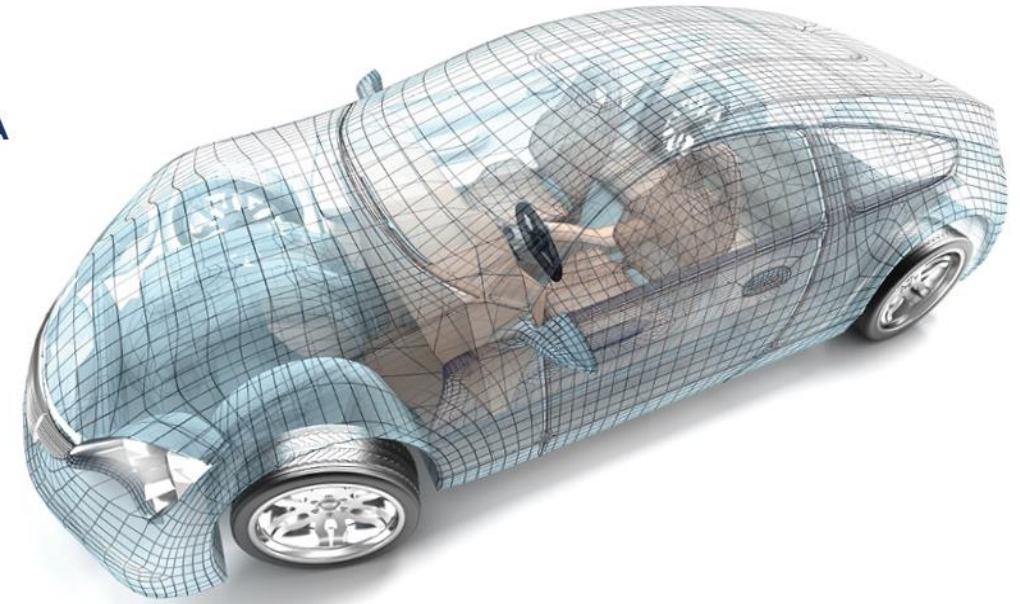




**THERMOPLASTIC
COMPOSITES CONFERENCE**

**APRIL 29 - MAY 1, 2020 | SAN DIEGO, CA, USA
HYATT REGENCY LA JOLLA AT AVENTINE**



Overmolding with Continuous Fiber Reinforced Thermoplastic Composites for Selective Reinforcement

**Presented By: Brent DeSilva
Advanced Application Development and Technical Service Engineer
PolyOne Advanced Composites**

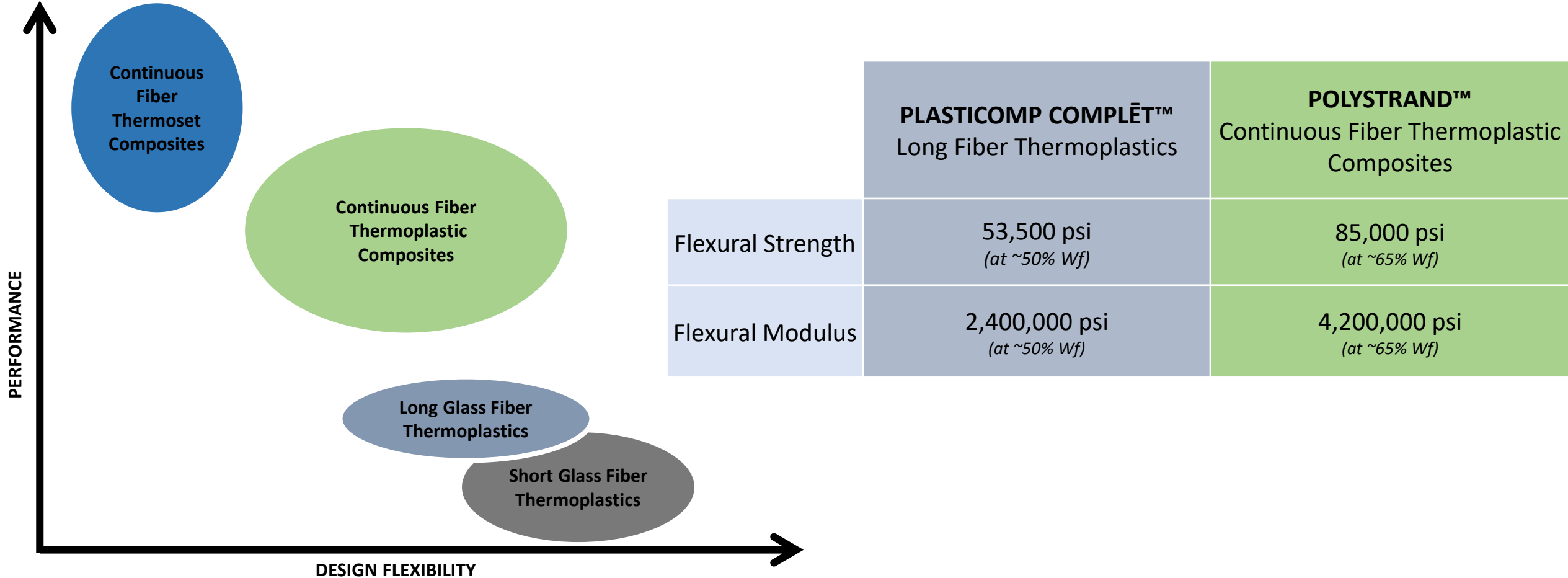
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AGENDA

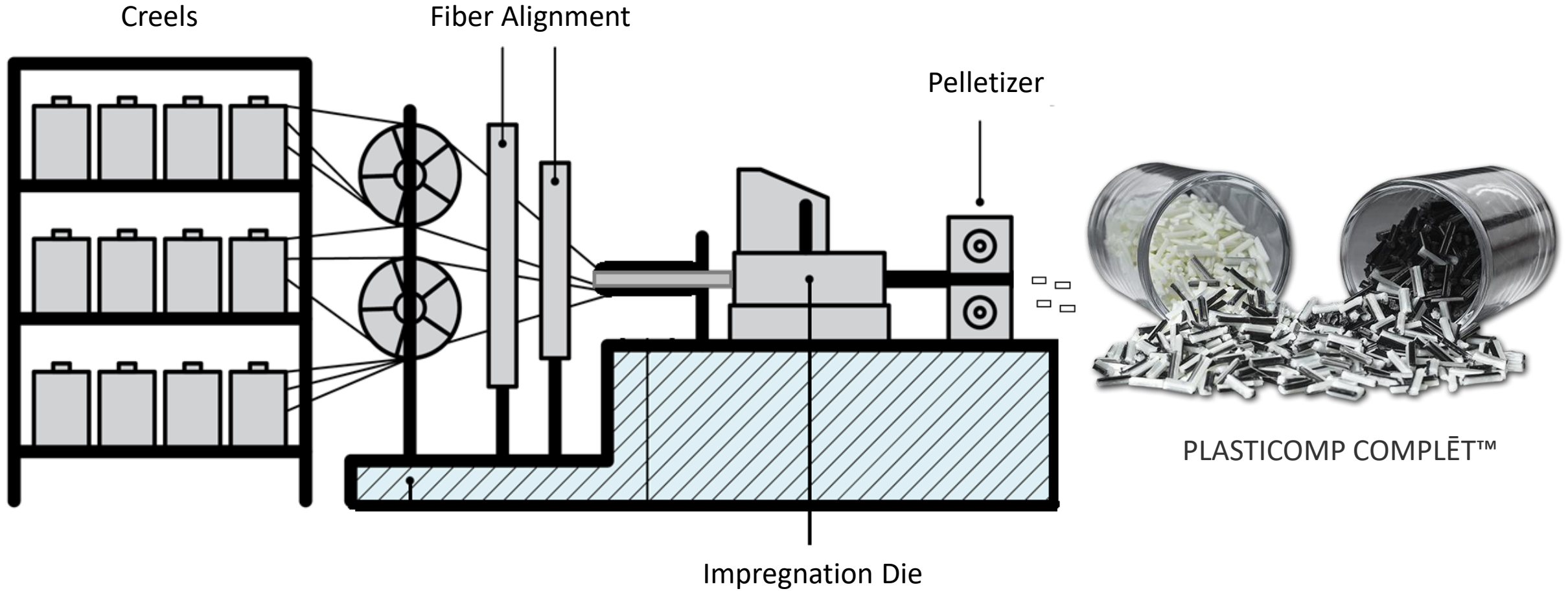
- Materials – Comparison and Contrast
- Injection Overmolding with CF RTP
- Performance Comparison
- Applications
- About PolyOne Advanced Composites



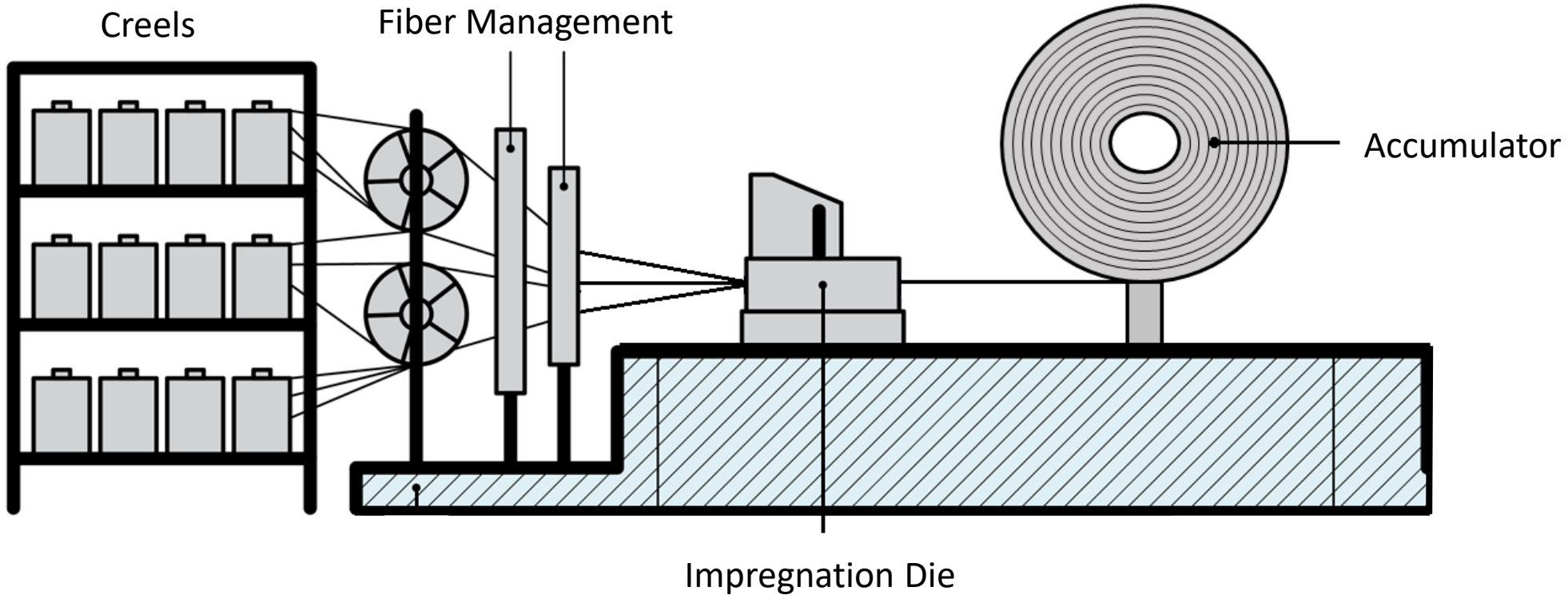
PERFORMANCE VS. DESIGN FLEXIBILITY



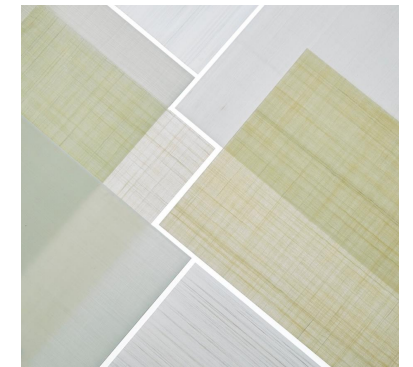
LONG FIBER REINFORCED THERMOPLASTIC COMPOSITES



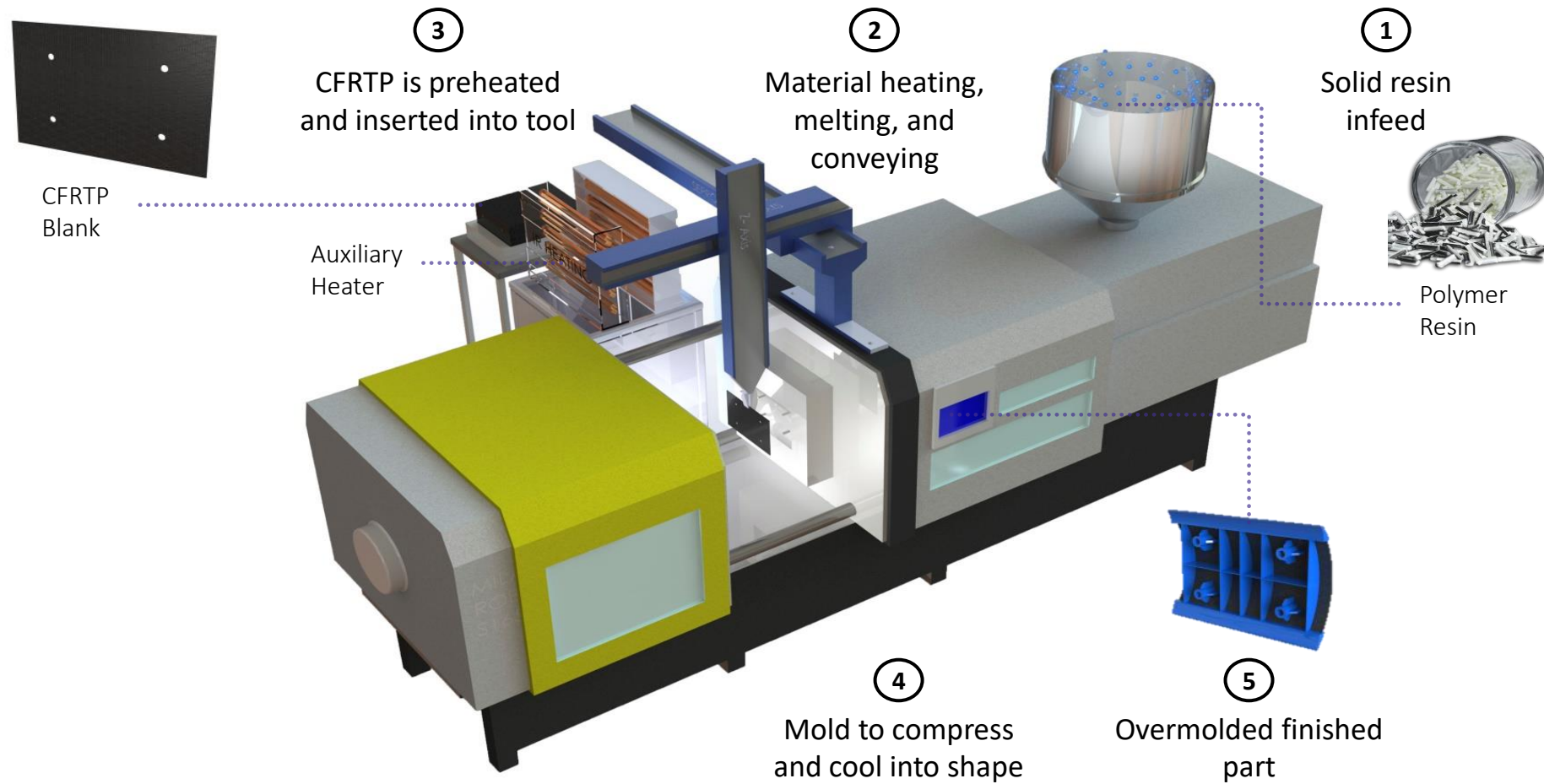
CONTINUOUS FIBER REINFORCED THERMOPLASTIC (CFRTP) COMPOSITES

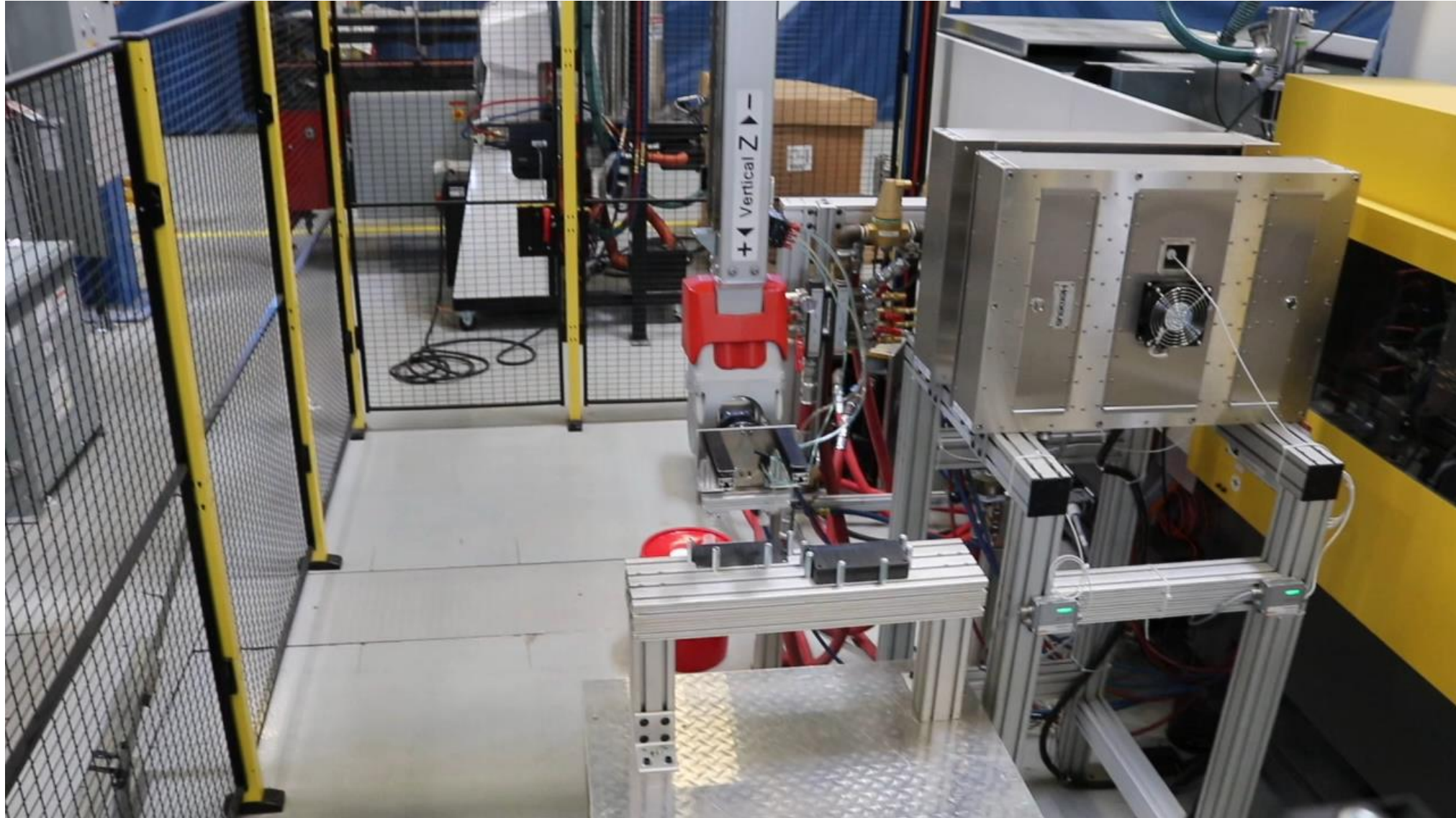


POLYSTRAND™ CFRTP

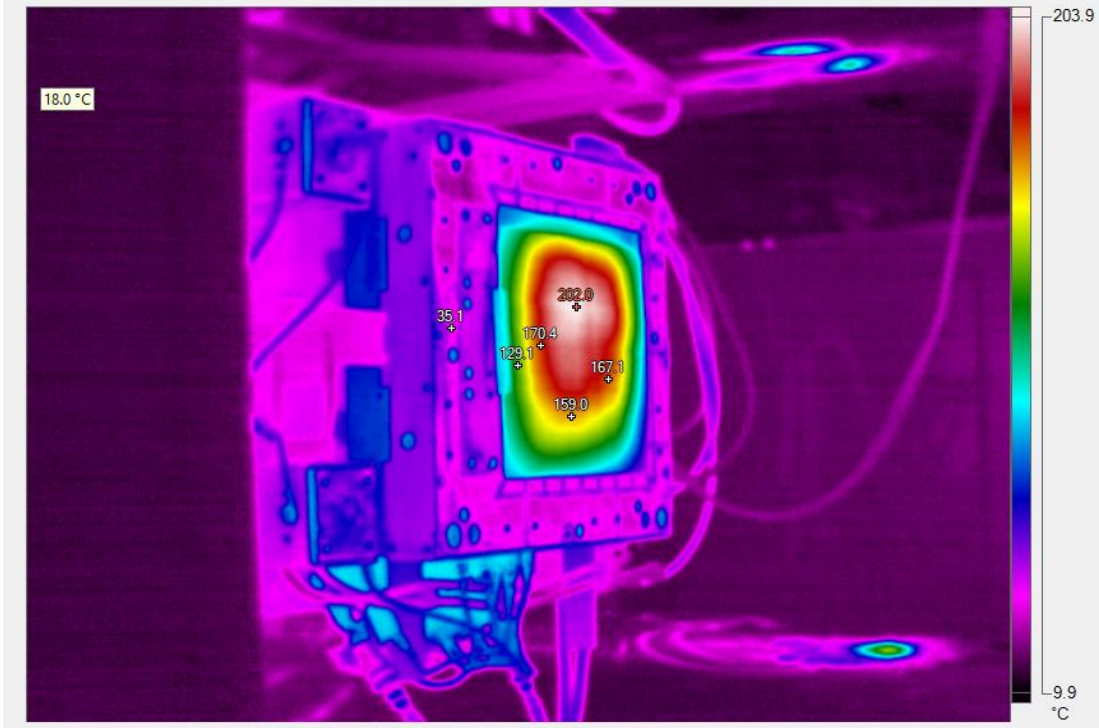


INJECTION OVERMOLDING WITH CFRTP



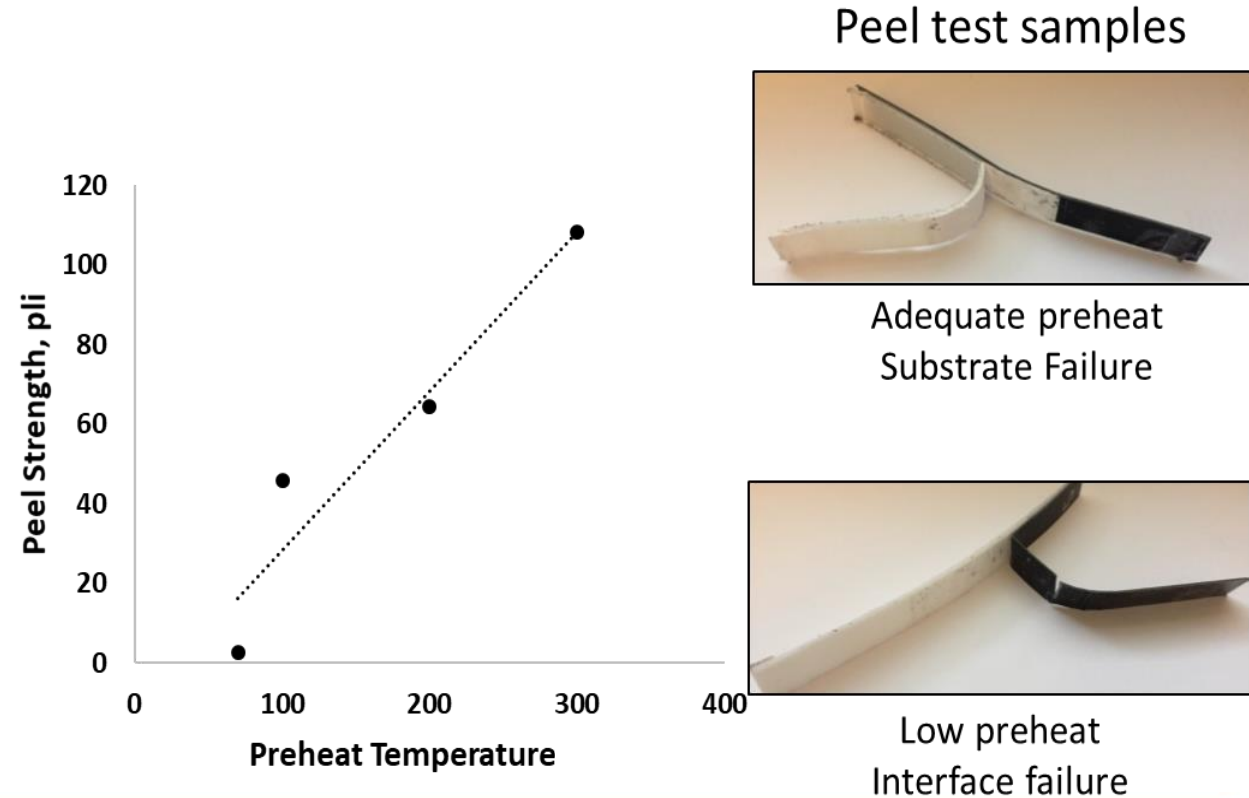


LAMINATE PREPARATION - Preheating



OVERMOLD LAMINATE PREHEATING	Uni & X	Tri & Quad	5-Ply and Above
Polypropylene	160°C	180°C	190°C
Polyamide 6 (Nylon 6)	170°C	190°C	200°C
Polyethylene	150°C	160°C	180°C

- Preheating is essential for optimal interfacial bonding
- Insufficient preheating can result in a depressed ultimate failure strength
- Preheating is also allows for forming of laminates into complex curvatures



Peel test samples



Adequate preheat
Substrate Failure



Low preheat
Interface failure

LAMINATE APPLICATION - Geometry

- Targeted laminate placement is governed by part geometry
 - Injection flow path
 - Part / application thickness
 - Laminate thickness
 - Radius of curvature for 2D and 3D shapes


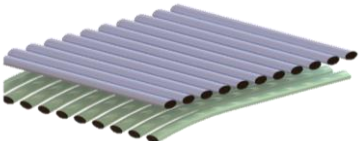
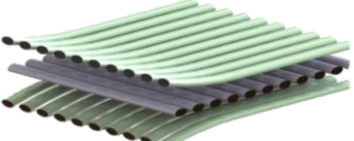
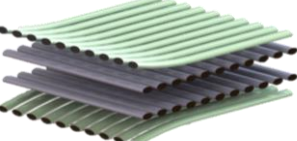


TEST MATRIX

Base Resins – PlastiComp™ LFT

<p>LCF40-PA66 Long Carbon Fiber 40%, Nylon 6,6</p>	<p>LGF50-PA66 Long Glass Fiber 50%, Nylon 6,6</p>	<p>LCGF50-PA66 Long Carbon & Glass Fiber 50%, Nylon 6,6</p>
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Laminates – Polystrand™ CFRTP

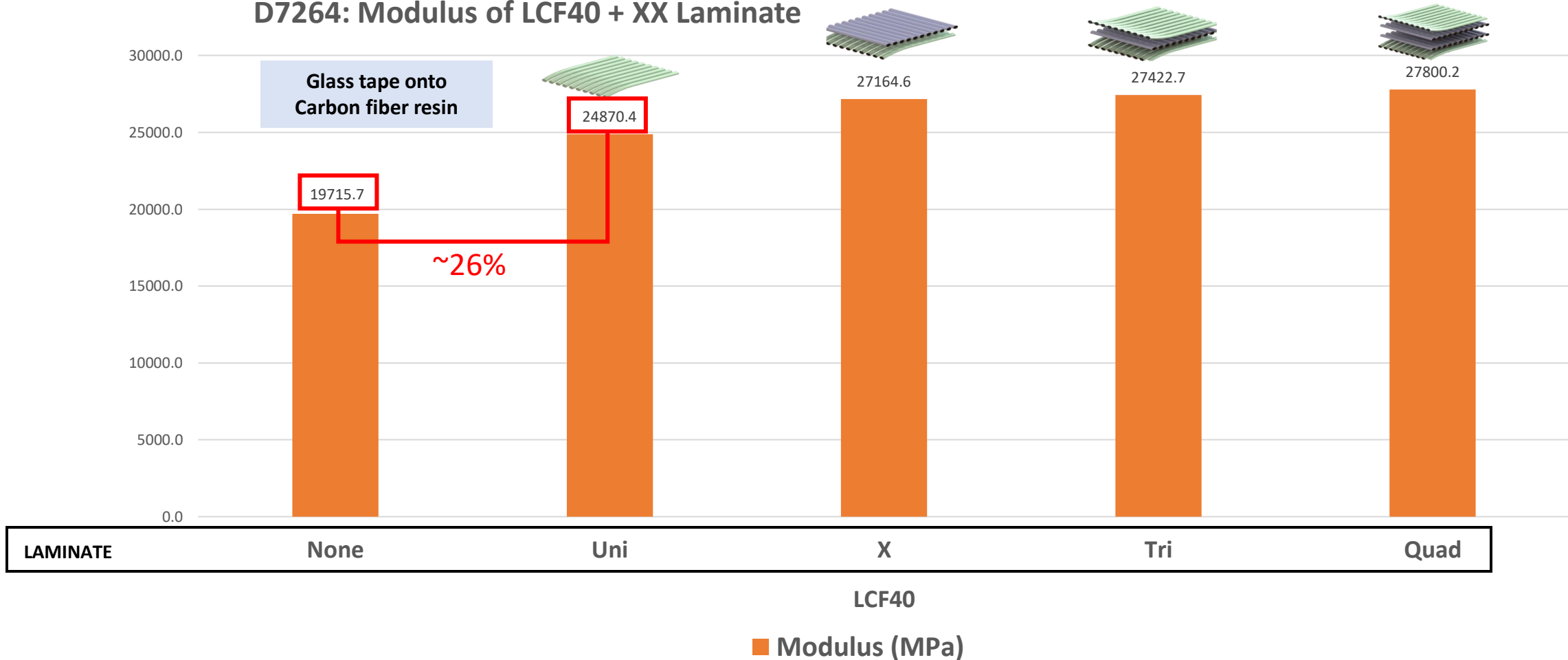
<p>Uni-Ply </p>	<p>X-Ply </p>	<p>Tri-Ply </p>	<p>Quad-Ply </p>
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Standardized Testing

<p>D7264 4-Point Flex</p>	<p>D3763 Dynatup Impact</p>	<p>D790 Elevated Temp. Flex</p>
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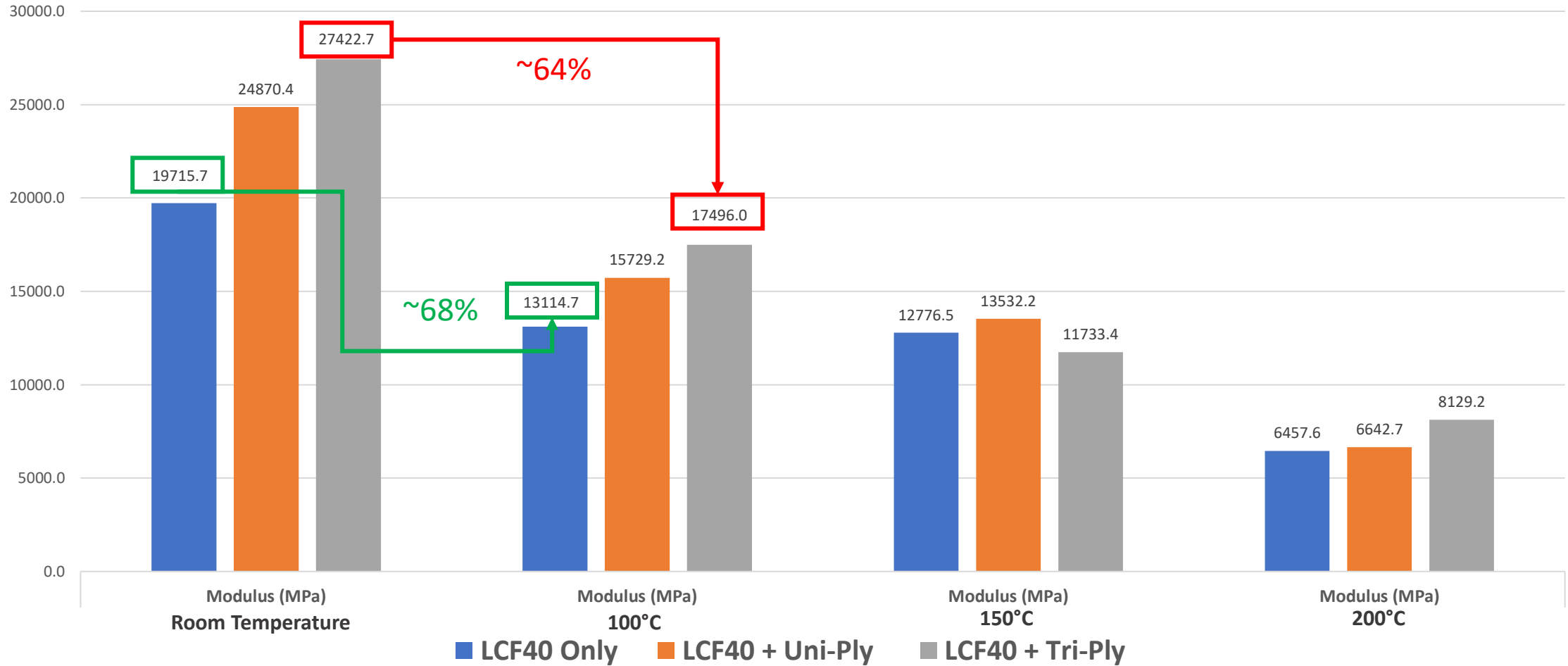
PERFORMANCE – FLEX

D7264: Modulus of LCF40 + XX Laminate



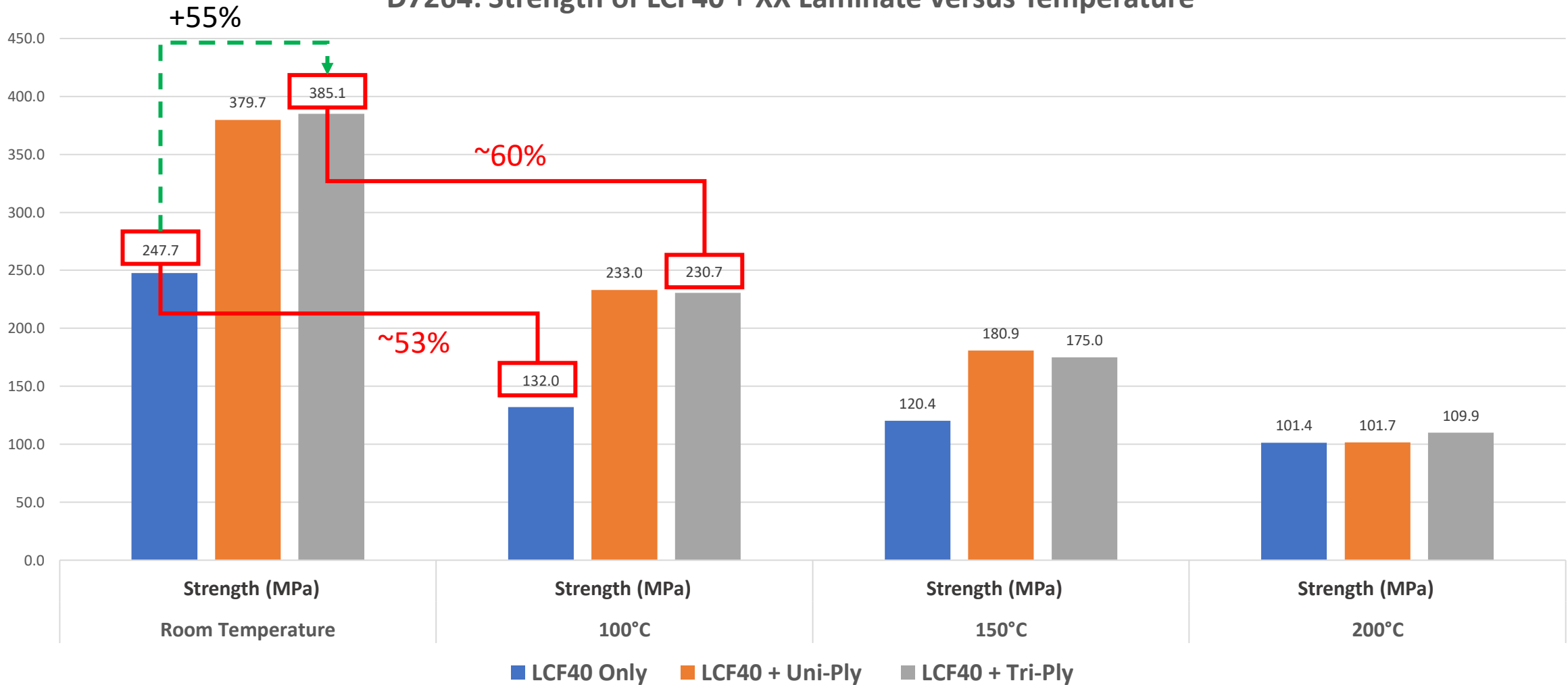
PERFORMANCE – TEMPERATURE

D7264: Modulus of LCF40 + XX Laminate versus Temperature



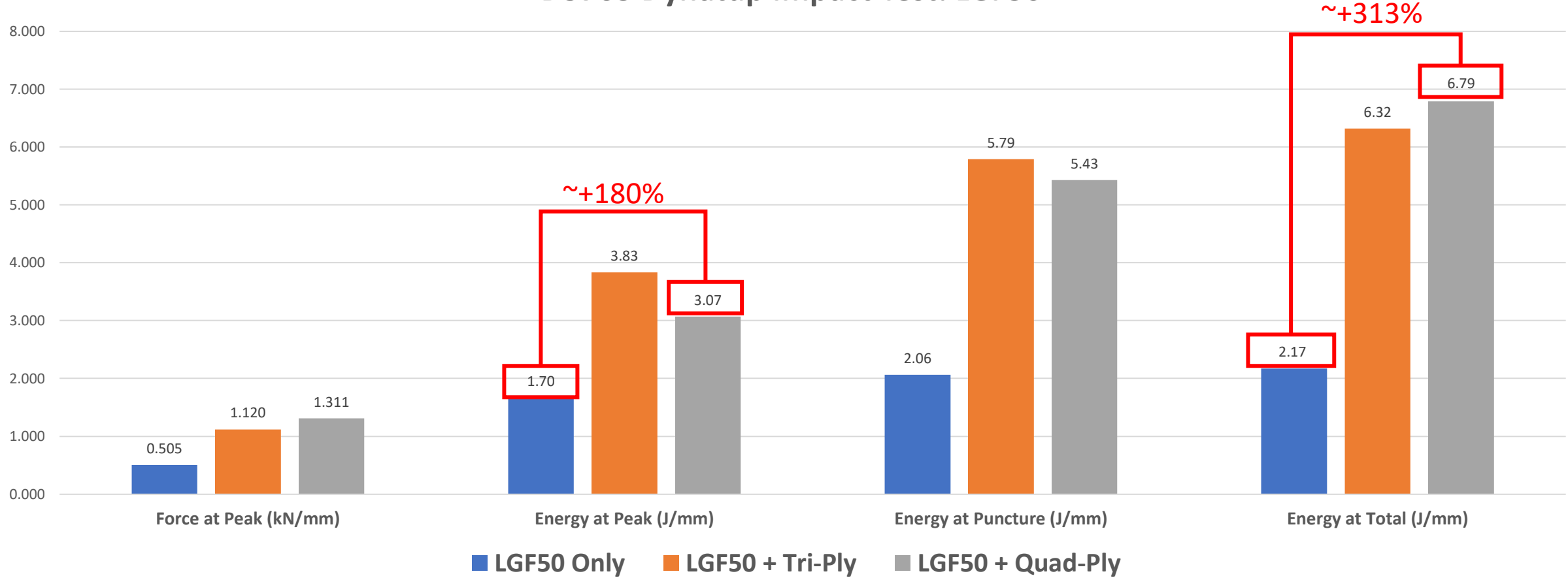
PERFORMANCE – TEMPERATURE

D7264: Strength of LCF40 + XX Laminate versus Temperature



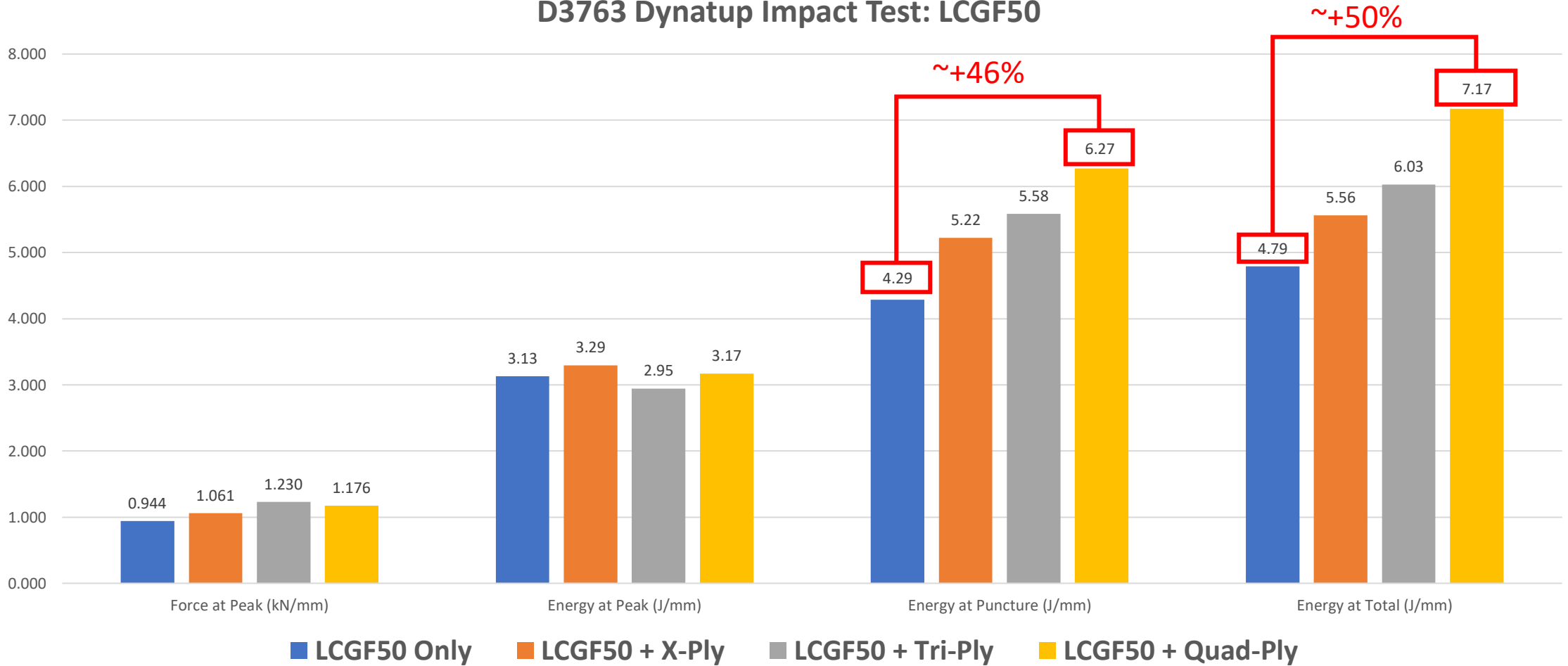
PERFORMANCE - IMPACT

D3763 Dynatup Impact Test: LGF50

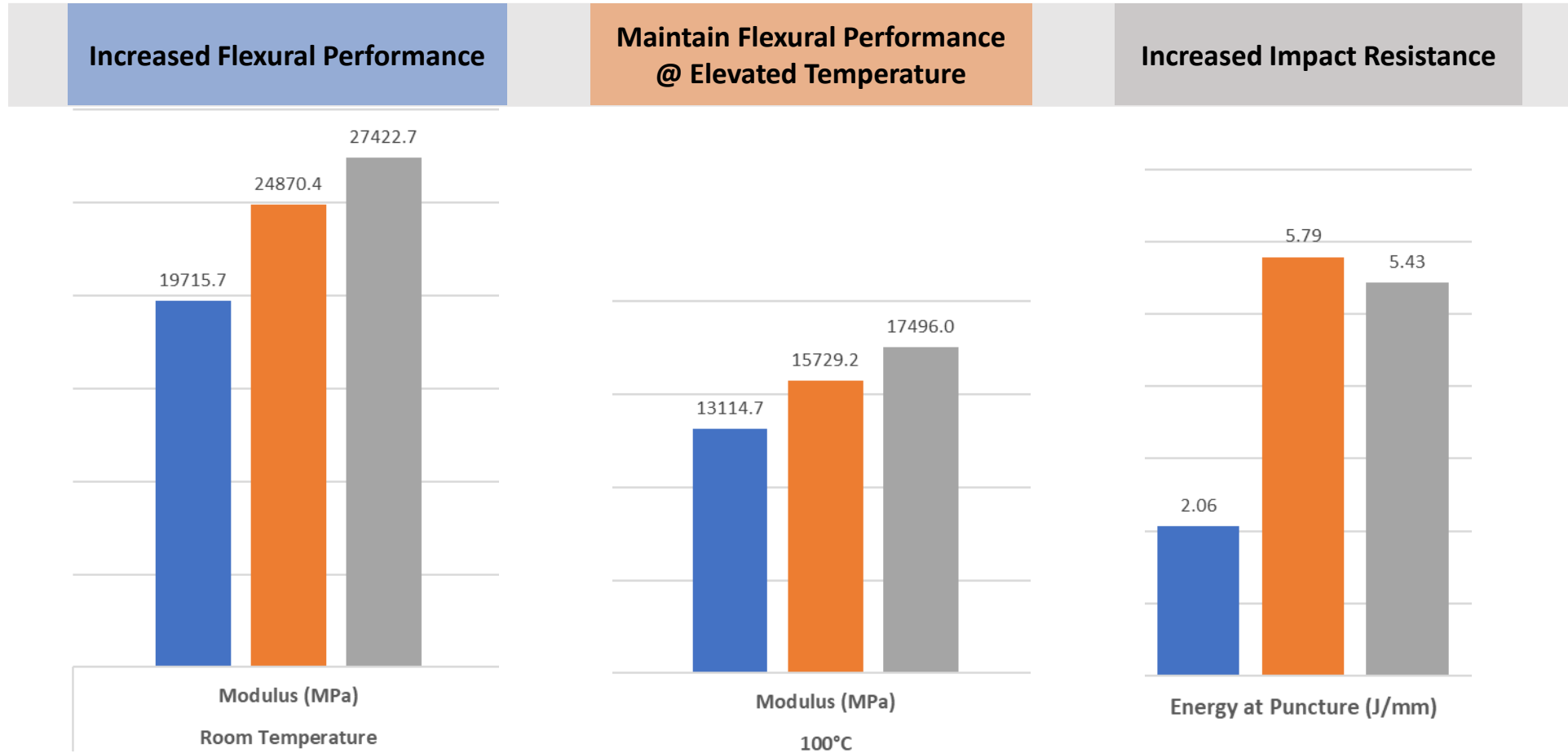


PERFORMANCE - IMPACT

D3763 Dynatup Impact Test: LCGF50



MECHANICAL SUMMARY



For low weight penalty, significant mechanical increases in flex, mechanical retention, and impact.

APPLICATIONS

SNOWBOARD BINDING



OIL PAN



AUTOMOTIVE HATCH COVER



STRUCTURAL DEMONSTRATOR



POLYONE ADVANCED COMPOSITES



GLASFORMS

Thermoset Composite Pultrusions
Continuous Filament Wound
Poles & Tubes



**GORDON
COMPOSITES**

Unidirectional Thermoset
Composite Laminates & Barstock



POLYSTRAND

Continuous Fiber Reinforced
Thermoplastic (CFRTP) Tapes,
Laminates & Sandwich Panels

QUESTIONS?

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PolyOne[™]