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PA 6.6 Headaches? Find Relief with High-Performance Polyamides for Structural Applications

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SPECIALTY POLYMERS

Presenters

Philippe Brasseur

Philippe Brasseur is a Customer Technical Development Engineer at Solvay Specialty Polymers and has provided customers with technical service and application design support for nearly 20 years. He joined Solvay in 1995 as a CAD Designer and Project Manager supporting the Automotive Industry, and has since supported diverse industries, including Aerospace, Healthcare and Consumer Goods. He holds a Bachelor of Science degree in Mechanical Engineering from the Industrial School of Brussels.

Thomas Kohnert

Thomas Kohnert is the Global Product Manager for Omnix® HPPA and Ixef® PARA high-performance polyamides, which are part of Solvay's Semi-Crystalline Specialty Polymers Business. Prior to joining Solvay in 1997, he worked at Hoechst AG and General Electric Plastics. Previous to his current position, Thomas was responsible for several high-growth markets in Europe, including global responsibility for Membranes. He earned a Bachelor of Science degree in Polymer Engineering from the University of Applied Sciences in Darmstadt, Germany.

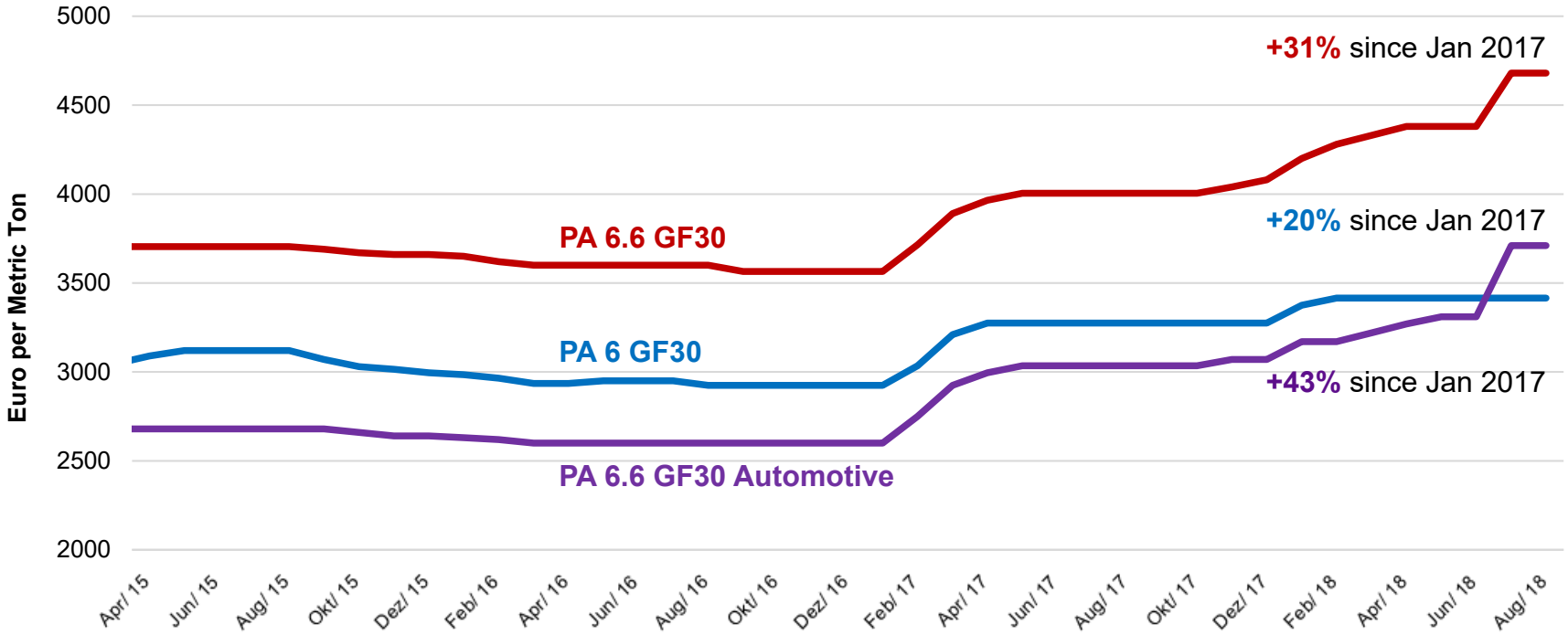
Topics for Today

1. Overview of PA 6.6 Pricing
2. Polyamide performance spectrum
3. Effect of Moisture Absorption on Performance
4. Applications using Omnix® HPPA and Ixef® PARA
5. Total Value Proposition
6. Q&A

Outlook for PA 6.6

- PA 6.6 is in tight supply
- Prices are skyrocketing
- Demand for PA 6.6 is increasing
- Seven force majeures declared in 2018
- Several years for more supply to come on line
- Will get worse before it gets better

Impact of PA 6.6 Shortage on Pricing



Source: Kunststoff Information, KI Polymer Pricing

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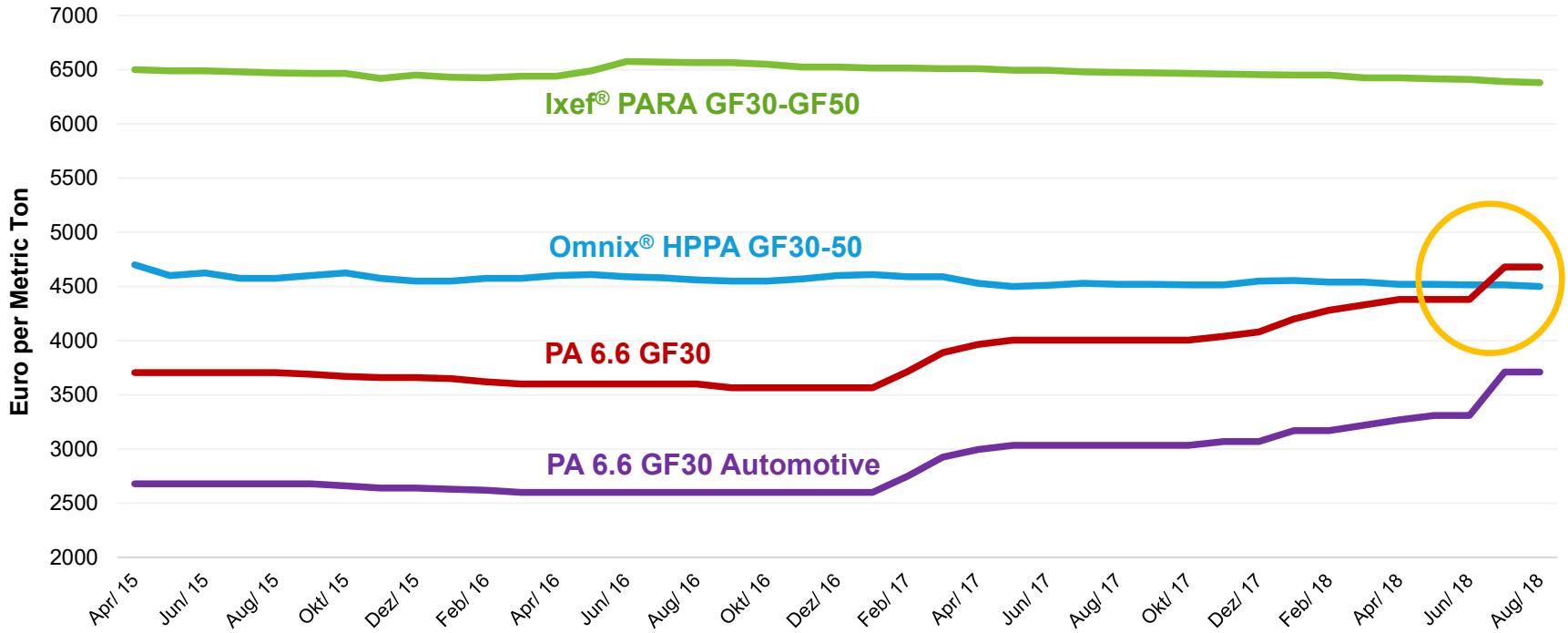
PA 6.6 Pricing vs. High Performance Polyamides



Source: Kunststoff Information, KI Polymer Pricing

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Polyamide Performance Spectrum

PA 6.6

Linear Molecular Structure

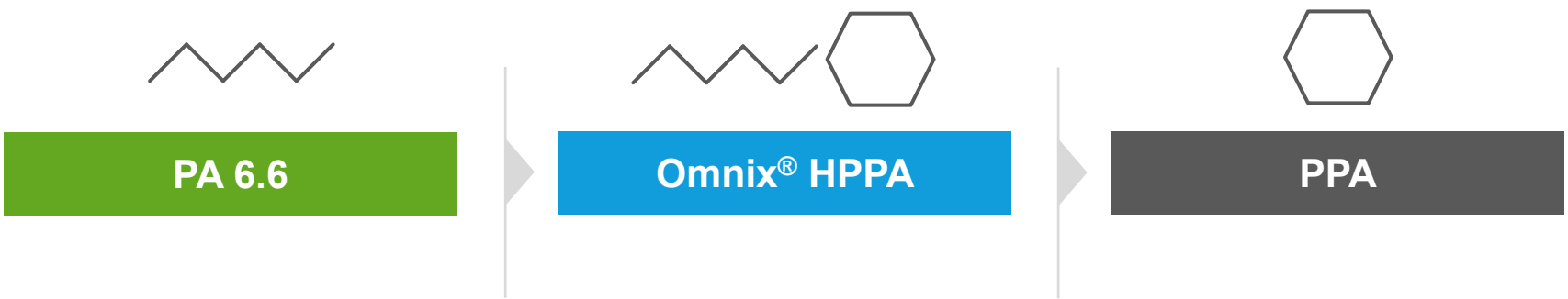
- Chemical resistance
- Good mechanical performance
- Good heat resistance
- High moisture absorption

PPA

Partially Aromatic Structure

- Broader chemical resistance
- Higher mechanical properties
- Higher heat resistance
- Lower moisture absorption

Omnix® HPPA's Chemistry Similar to PA 6.6



Omnix® high-performance polyamides (HPPA) deliver higher performance than PA 6.6 and can be injection molded using the same equipment.

Polyamide Performance Spectrum

PA 6.6

Standard Performance

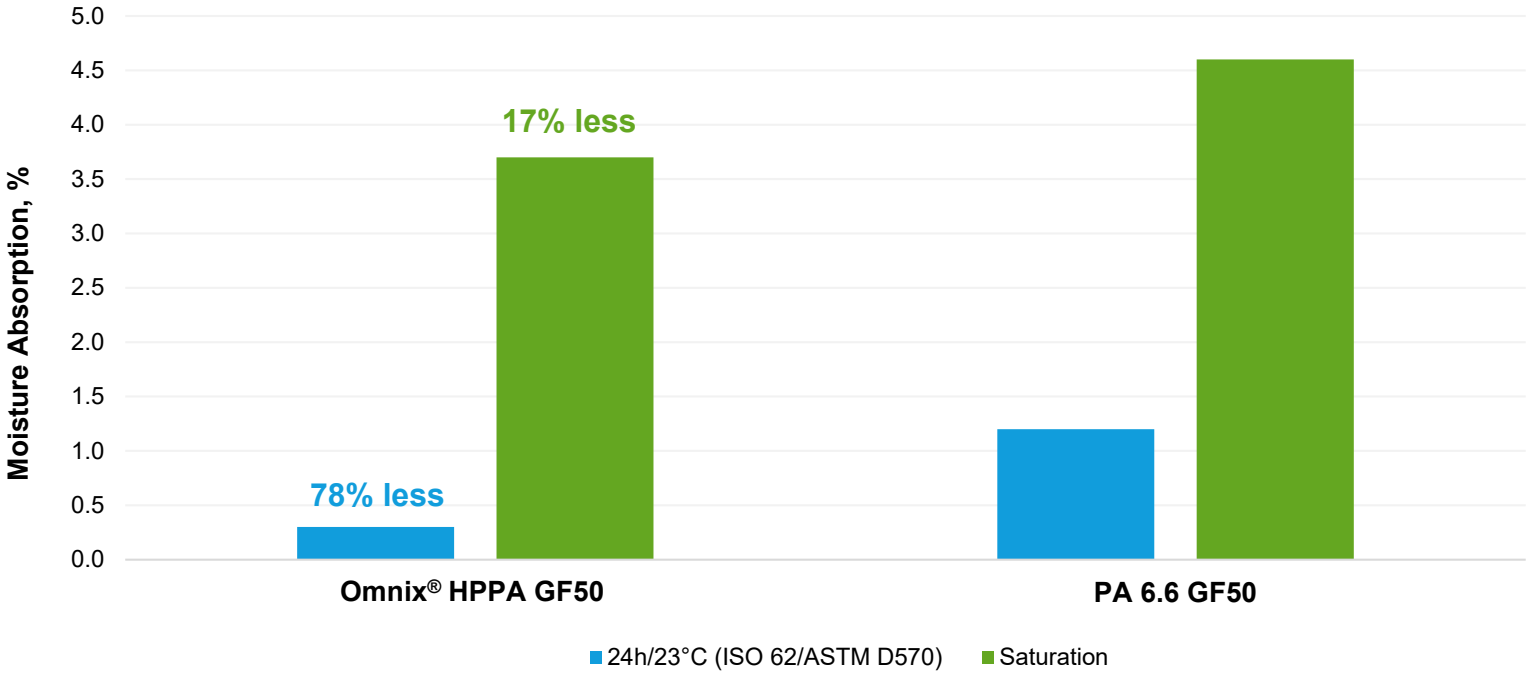
- Chemical resistance
- Good mechanical performance
- Good heat resistance
- High moisture absorption

Omnix® HPPA

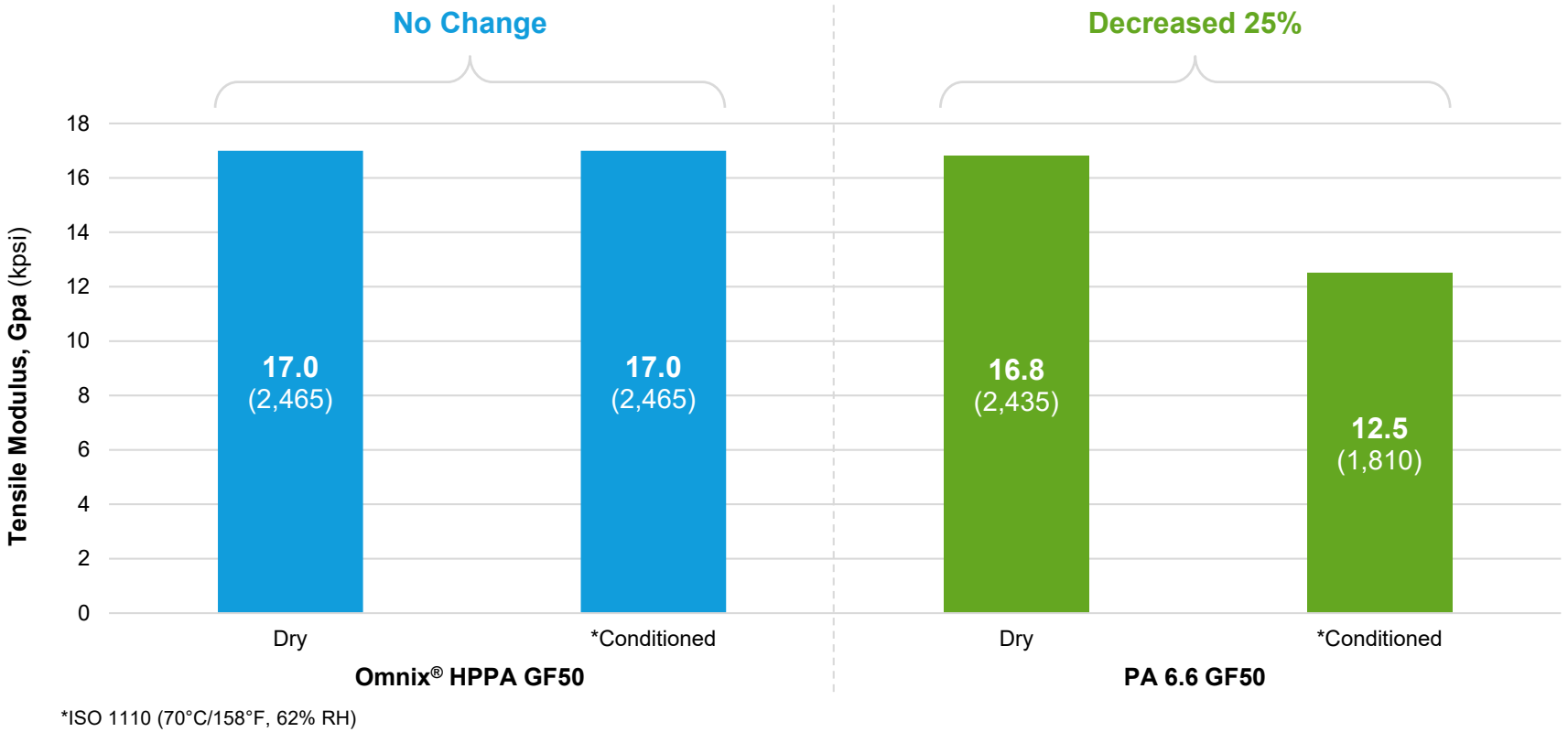
Best of PA 6.6 plus...

- Lower water absorption
  - Better dimensional stability
  - Better retention of mechanical properties
- More aesthetic surface appearance

Moisture Absorption of Omnix® HPPA vs. PA 6.6

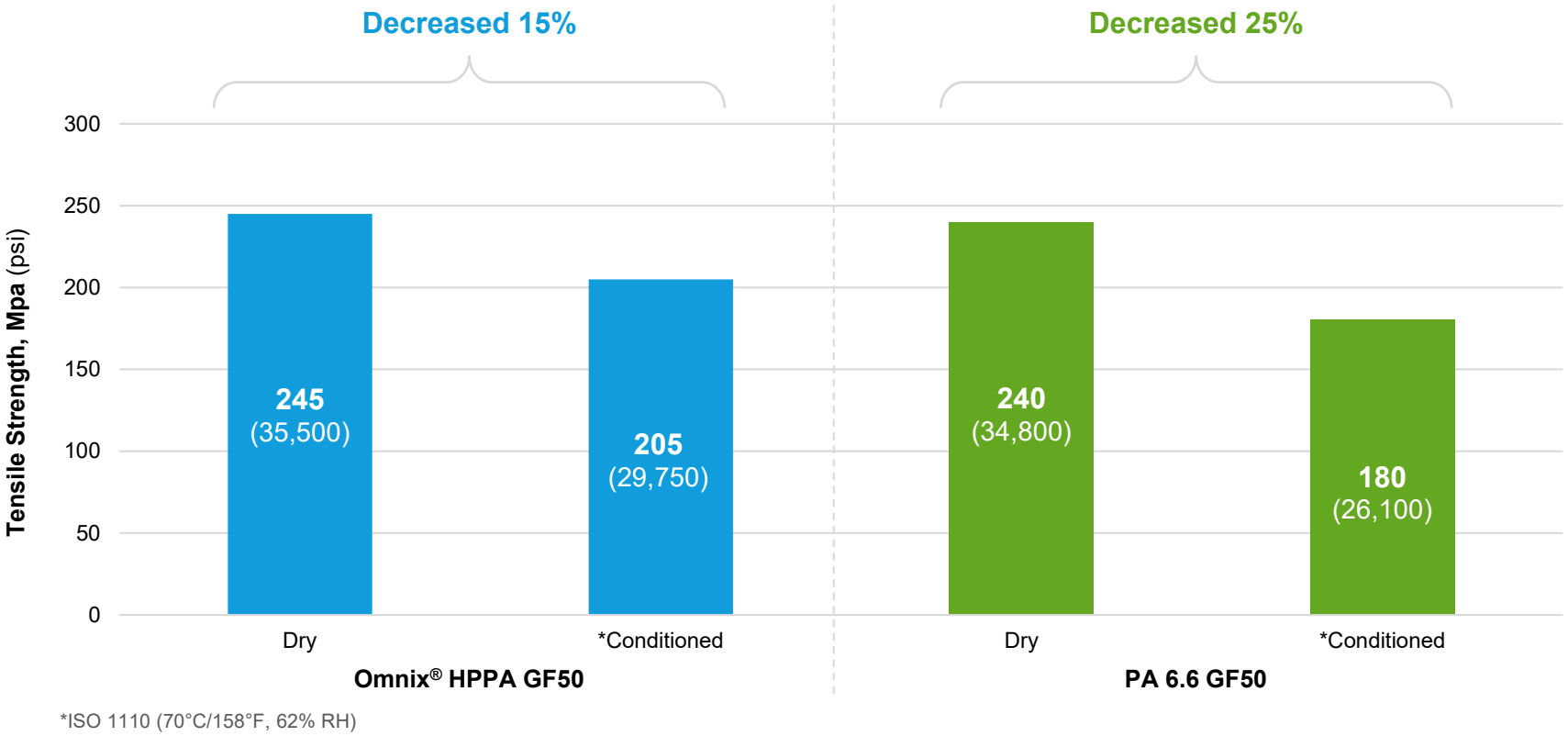


Effect of Moisture Absorption on Tensile Modulus



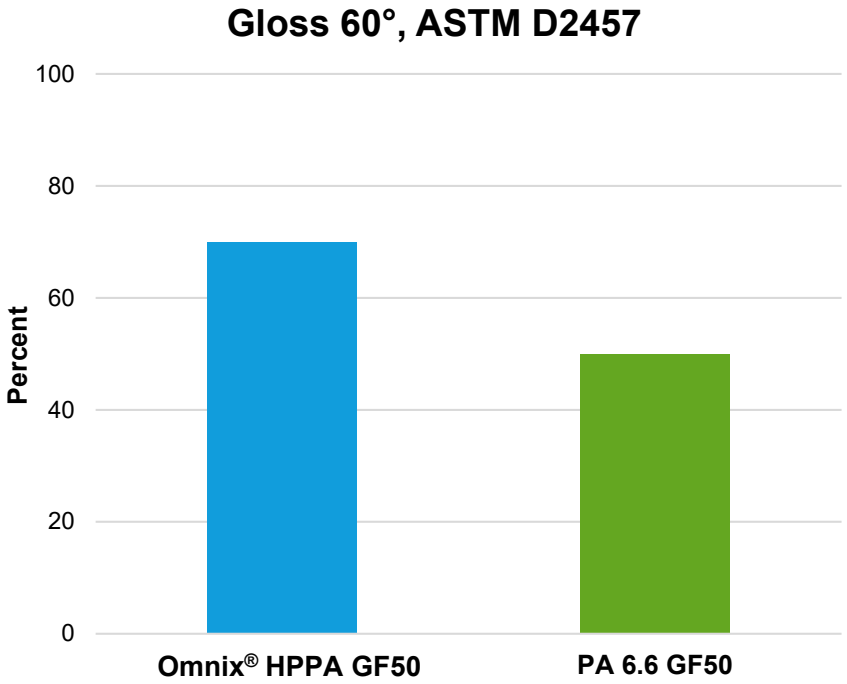
*ISO 1110 (70°C/158°F, 62% RH)

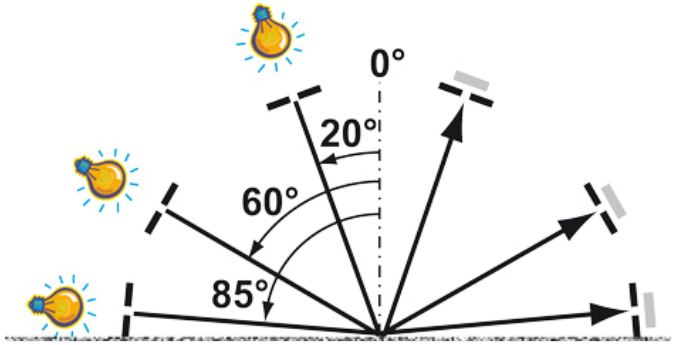
Effect of Moisture Absorption on Tensile Strength



*ISO 1110 (70°C/158°F, 62% RH)

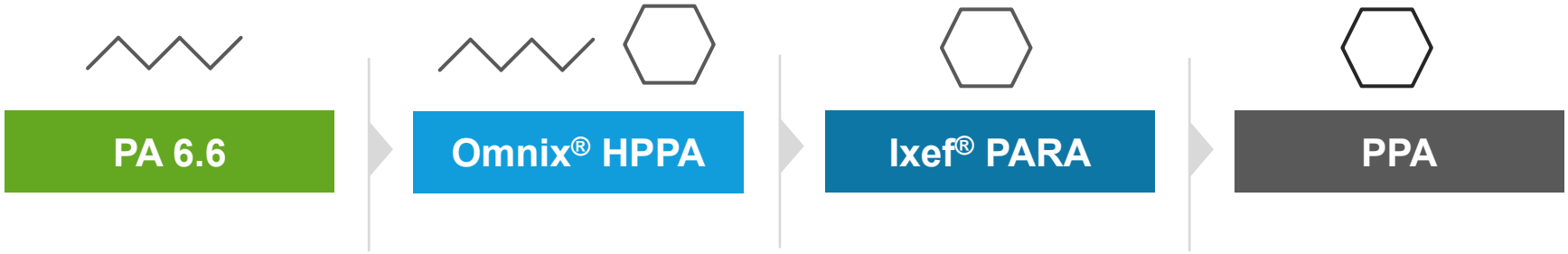
Surface Appearance of Omnix® HPPA vs. PA 6.6





Reflected light measured at 60°demonstrates the superior surface finish of Omnix® HPPA

Polyamide Performance Spectrum



Ixef® polyarylamide's (PARA) chemistry is more similar to PPA and completes the performance spectrum between PA 6.6 and PPA.

Polyamide Performance Spectrum

Omnix® HPPA

Best of PA 6.6 plus…

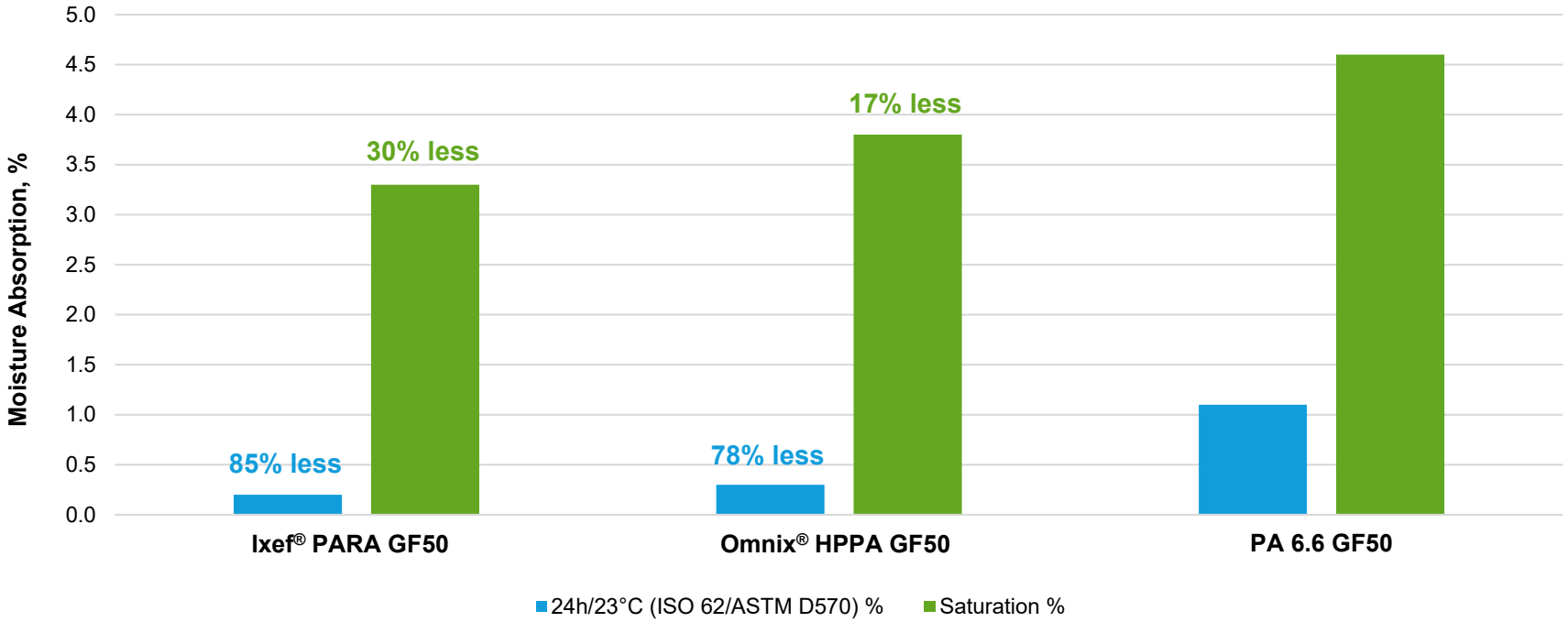
- Lower water absorption
  - Better dimensional stability
  - Better retention of mechanical properties
- More aesthetic surface appearance

Ixef® PARA

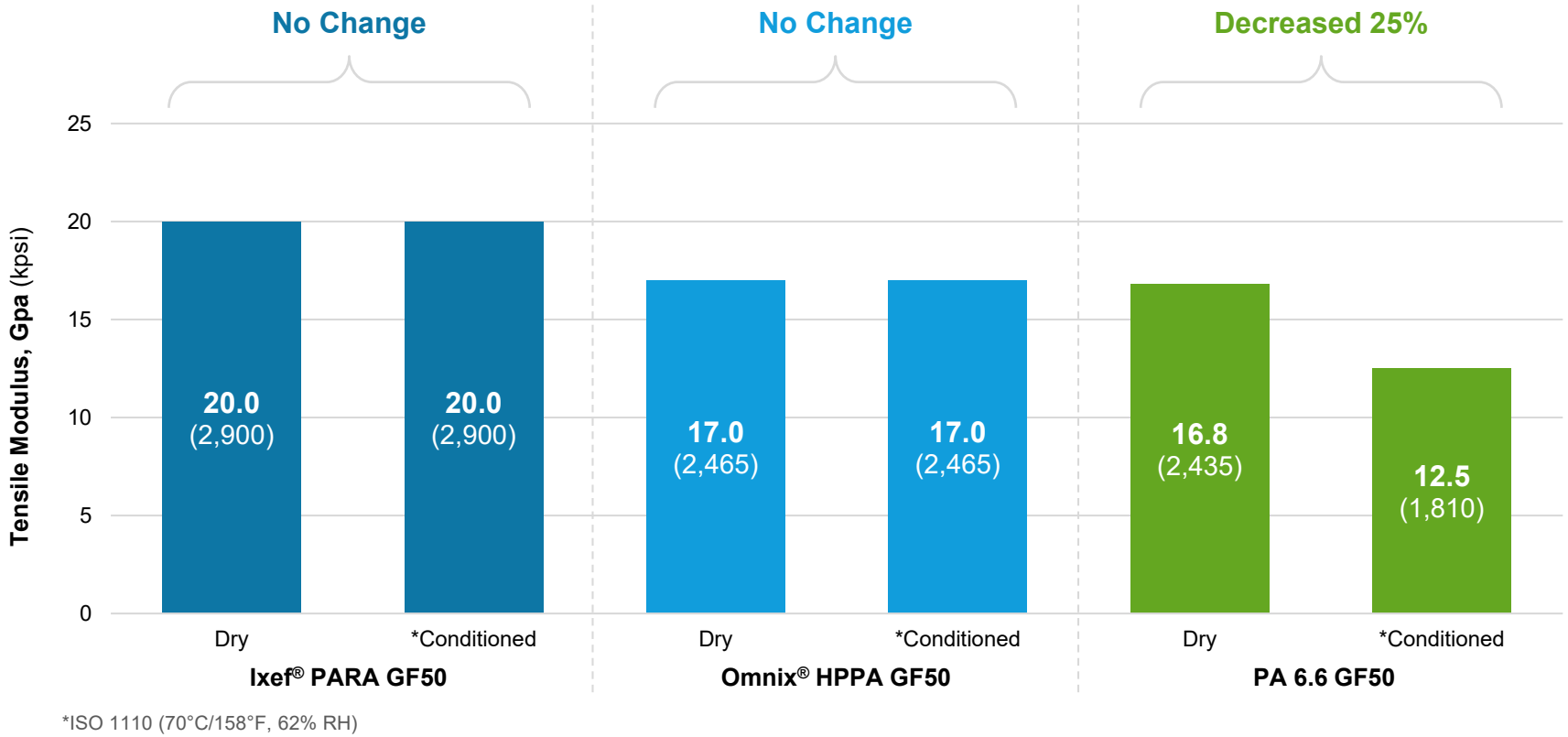
Best of Omnix® HPPA plus…

- Even lower water absorption for exceptional dimensional stability
- Ultra-smooth surface finish for unparalleled aesthetics in structural thermoplastics
- Metal-like feel

Moisture Absorption Comparison to PA 6.6



Effect of Moisture Absorption on Tensile Modulus



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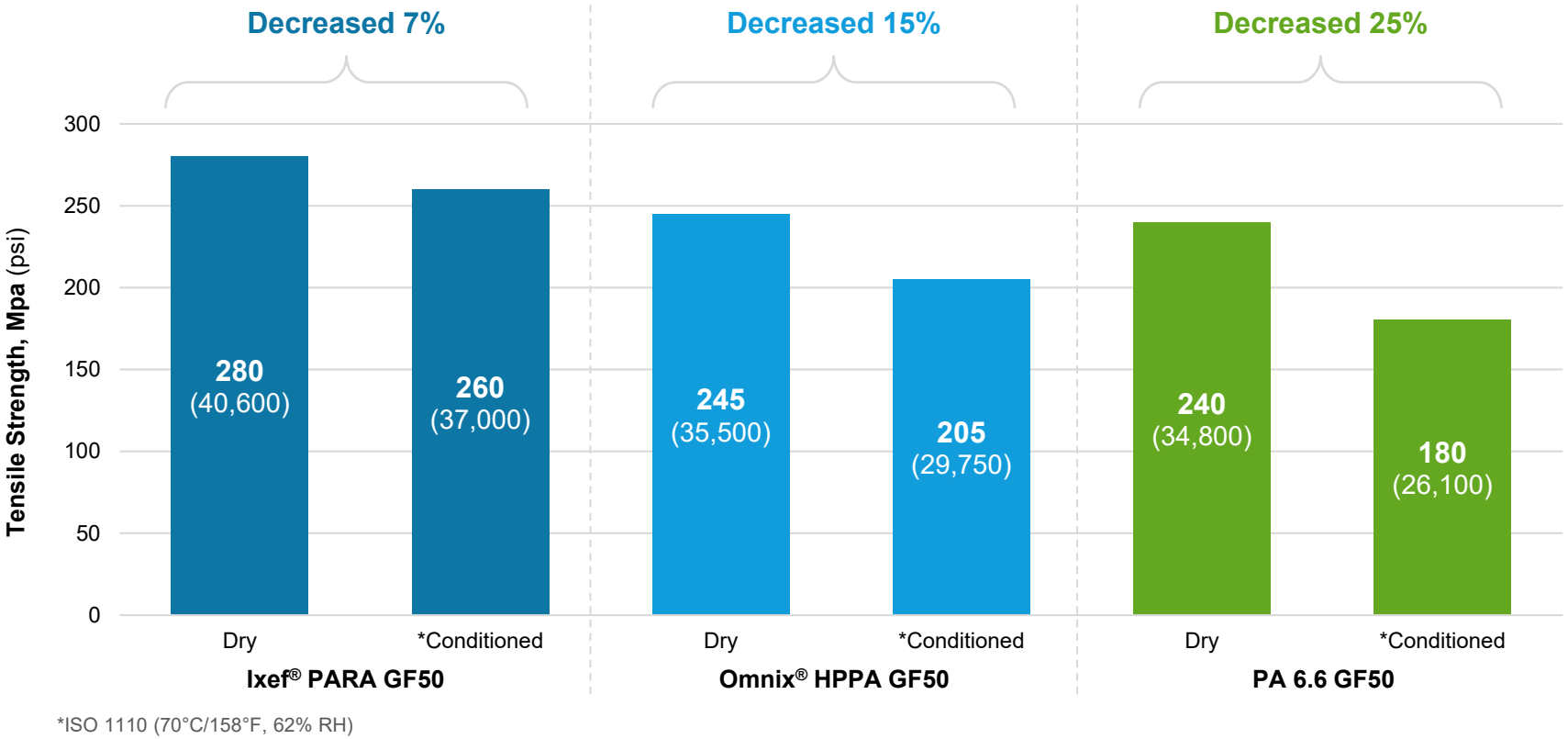
Effect of Moisture Absorption on Tensile Strength



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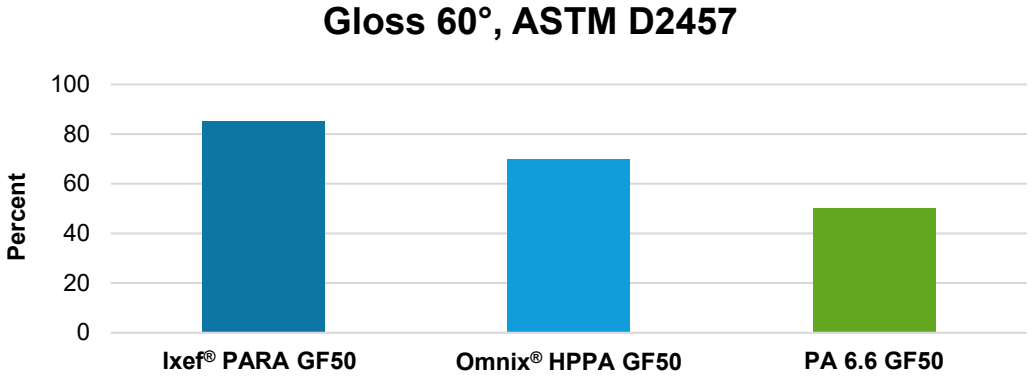
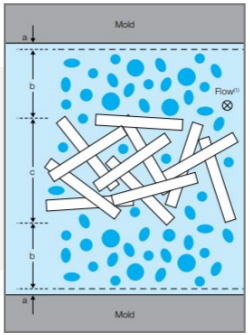
Ixef® PARA Provides Best-in-Class Surface Finish



- Ultra-smooth, resin-rich surface
- Low tendency for sink marks in both thin and thick components



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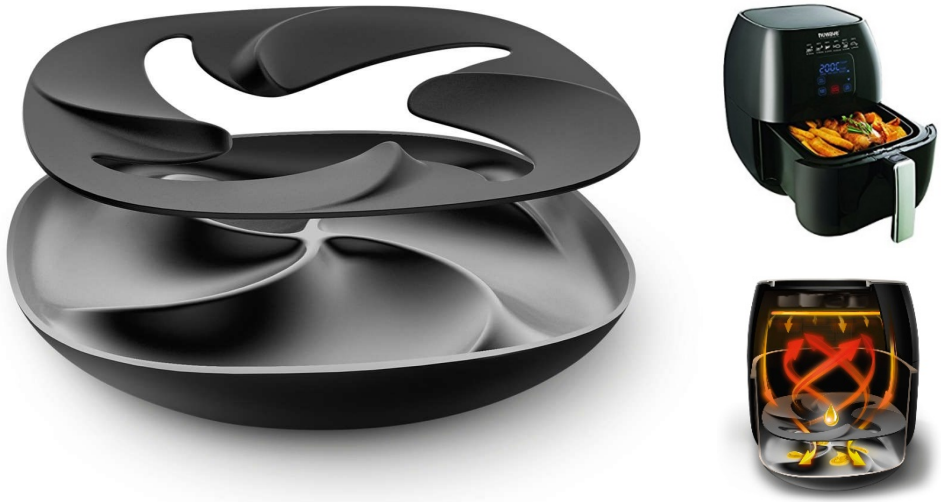
Used in a Diverse Range of Applications

Industries	Omnix® HPPA	Ixef® PARA
Automotive	✓	✓
Aircraft & Rail	✓	✓
Consumer	✓	✓
Construction	✓	✓
Healthcare		✓
Oil & Gas		✓
Renewable Energy		✓
Sports & Leisure	✓	✓

Consumer | Air Fryer Oil Collector

Why Omnix® HPPA?

- High stiffness
- Hot oil resistance
- Chemical resistance
- Food contact approvals
- Better surface appearance than glass-filled PA 6.6



Automotive | Clutch Cylinder

Why Ixef® PARA?

- High stiffness
- Chemical resistance
- Low water absorption for dimensional stability
- Ultra-smooth surface for low friction, tight seal and no draft angle
- Reduce cost and weight

Sports & Leisure | Performance Bow

Why Ixef® PARA?

- High stiffness
- Surface aesthetics
- Low creep
- High fatigue resistance
- Low water absorption
- Ease of processing

Construction | Stair Plate Holder

Why Ixef® PARA?

- High stiffness
- Ultra-smooth surface finish for unparalleled aesthetics in structural thermoplastics
- Metal-like feel
- Eliminates painting
- Resistance to cleaners
- Ease of processing

Healthcare | Surgical Instruments

Why Ixef® PARA?

- Biocompatibility
- High stiffness
- Lightweight ergonomics
- Gamma-stabilized colors

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Total Value Proposition

- Omnix® HPPA offers better performance at the same price as PA 6.6 and can be injection molded on the same equipment
- Global availability of Omnix® HPPA & Ixef® PARA
- Global regulatory approvals (food, drinking water)
- Stable pricing ahead
- Specialty grades available
- Technical support worldwide

Thank You for Your Time Today!

Q&A

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