

SOLVAY SPECIALTY POLYMERS



Progress beyond

e-Motor/Drive Solutions



Fabrizio Terzolo | Customer Technical Development

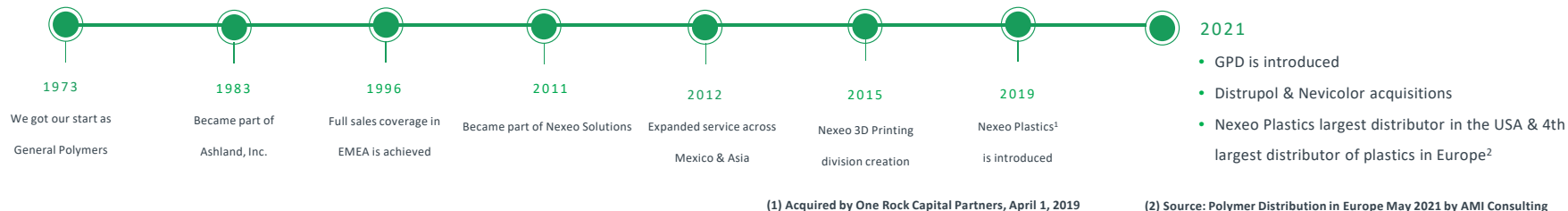


EMEA Corporate Overview

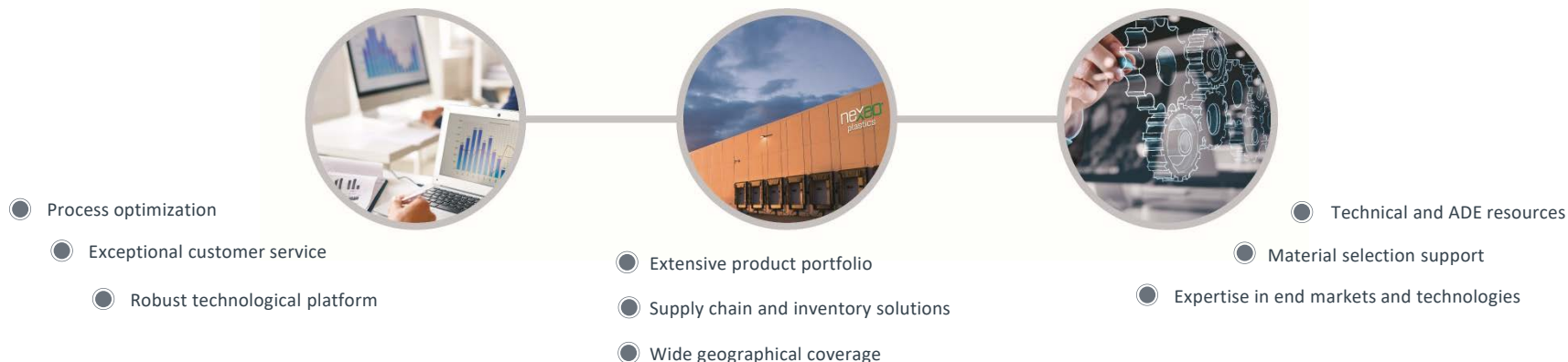


Who We Are

Almost 50 years of leadership In plastics distribution



Representing **quality products** from world-class suppliers, and serving a diverse customer base across
North America, Asia, Latin America, Europe, Middle East and Africa

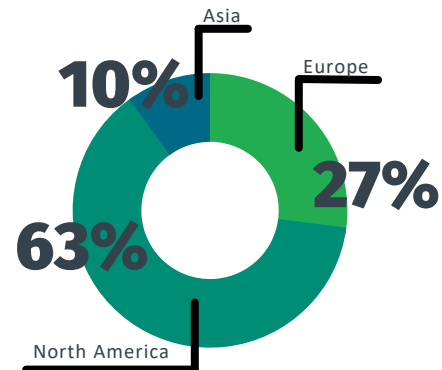


Where We Are



FY 2020 Sales by Region

	Regional Overview		
	AMERICAS	EUROPE	ASIA
Sales Coverage	North America	Pan-European	Central/Eastern China
#Warehouses	9 and 60 (3PL)	17 (3PL)	15 (3PL)
Fleet	140 units (private fleet) & 3PL	3 PL	3PL



Added Compounding and Lab Services

Added Capabilities

Strong Tailor-made
compounds capabilities

Colored or transparent, masterbatch, toughened
& extra-reinforced, self-lubricated, special &
technical blends, food contact & medical
compounds, flame retardant...

Tooling for special projects

Circular economy services

Arburg training center

And more...

Lab Facilities

Infrared FT-IR



DSC

Q-sun

Elemental Analyzer

UV-Vis Spectrophotometer

Dynamometer

Mold Flow

Karl-Fisher

Viscosimeter

Atomic Emission Spectroscopy

Taber Test

Glow wire

Ionic Chromatograph

Recycled products

LCA & Carbon Foot Print Analysis

ISO 14001

On-site trainings at recycling plant

New Big Bags recycling project



NEVICOLOR



Italy



43 employees



> 3000 grades



57-years experience

SOLVAY SPECIALTY POLYMERS



Progress beyond

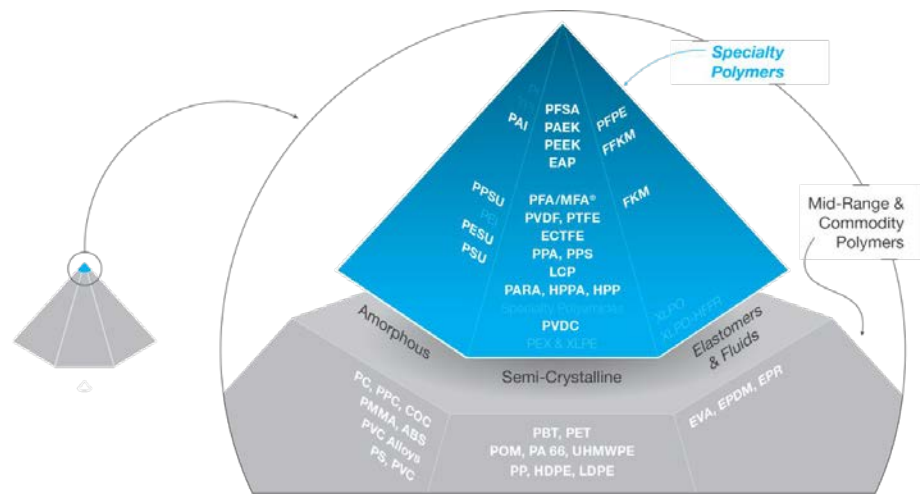
e-Motor/Drive Solutions



Fabrizio Terzolo | Customer Technical Development

INDUSTRY LEADER IN SPECIALTY POLYMERS

Tiny molecules, huge impact



A combination of Key Performance Factors



Lightweighting



Fire resistance



Mechanical performance



Resistance to harsh environments



Broad range of temperature



Surface properties

AMODEL® PPA

High-temperature polyamides with high strength retention and continuous use temperatures of up to 180°C. Retains excellent electrical properties in high humidity and chemically aggressive environments

RYTON® PPS

Dielectric and insulating properties stable over a wide range of conditions. Excellent dimensional stability for precision-molded components. A remarkable combination of both long-term (up to 220°C) and short-term (up to 260°C) resistance to temperatures

KETASPIRE® PEEK & HYFLON® PFA

Dielectric and insulating properties stable over the widest range of conditions. An ultra performance thermoplastic suited to severe service environments that offers excellent thermal performance, friction & wear with best in class fatigue resistance

TORLON® PAI

An alternative to traditional isocyanate-based polyamide-imide with good electrical properties and high resistance to severe service environments. An ultra performance thermoplastic that offers best in class strength and stiffness upto 275°C with friction & wear performance

GALDEN® PFPE

The ideal solution for immersion cooling of electrical components as it offers the widest service temperature range, ability to resist arcing, is non-flammable, and is compatible with a wide range of materials

FOMBLIN® PFPE

The ideal lubrication solution for the automotive industry, meeting lubrication challenges by providing the best possible performance for the most demanding applications

TECNOFLON® FKM

Seals, gaskets, [hoses](#) and [O-rings](#) are more durable and significantly longer lasting than those made from other synthetic rubbers. Components retain their flexibility and strength in extreme operating temperatures, ranging from -55°C to 250°C.



BATTERIES



HYDROGEN



e-MOTORS / e-DRIVES



POWER ELECTRONICS



Solutions centered on improving electrified vehicle **efficiency**, **safety**, **light-weighting**, & **performance**

Strategy

- Increase power density
- Light-weight system
- Improve heat transfer
- Develop next gen breakthrough

Strategic Initiatives

- Long Range capacity
- Safety
- Optimise resources
- Develop next gen breakthrough

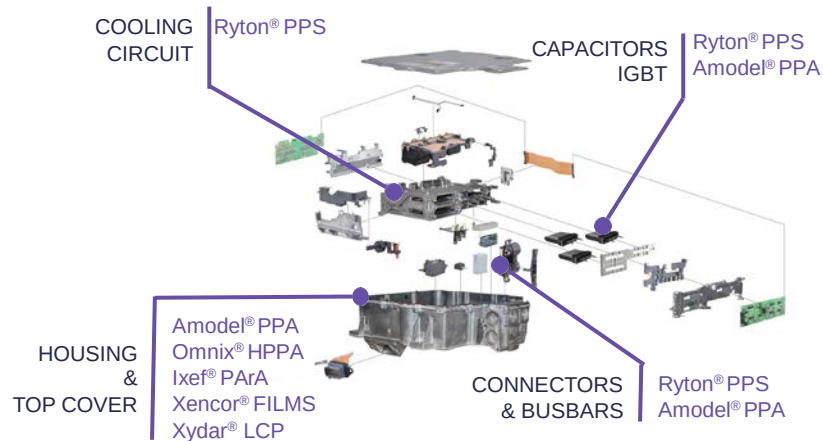
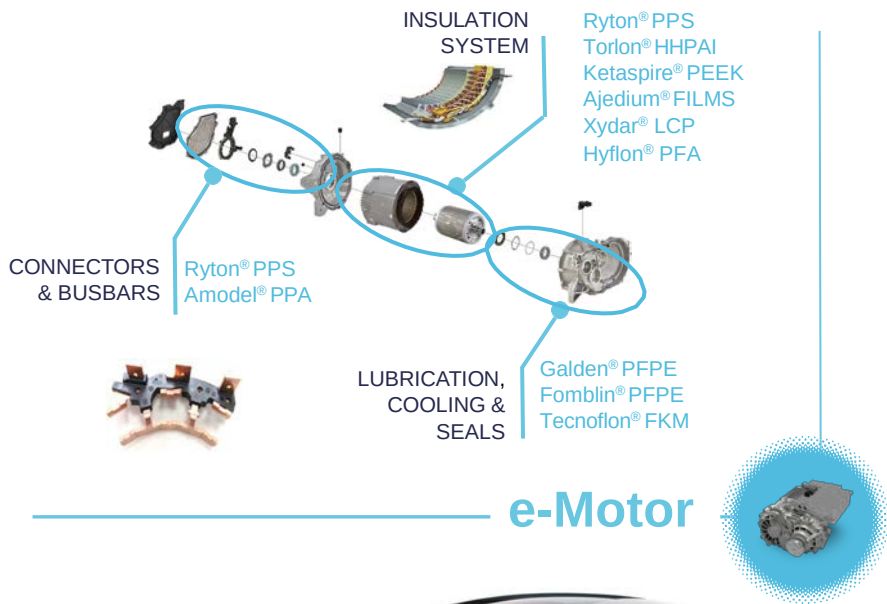
Strategic Initiatives

- Increase power (inc slot fill)
- Miniaturization of electrical components
- Improved PDIV
- Improved heat transfer

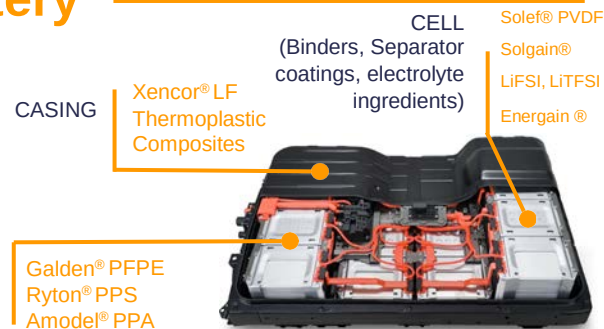
Strategic Initiatives

- Increase Thermal efficiency
- Increase safety (FR / e-Corrosion)
- Reduce Packaging & Weight
- Develop EMI breakthrough

E-Mobility BEV Solutions



Battery



e-MOTOR Solutions that Improve Power & Efficiency

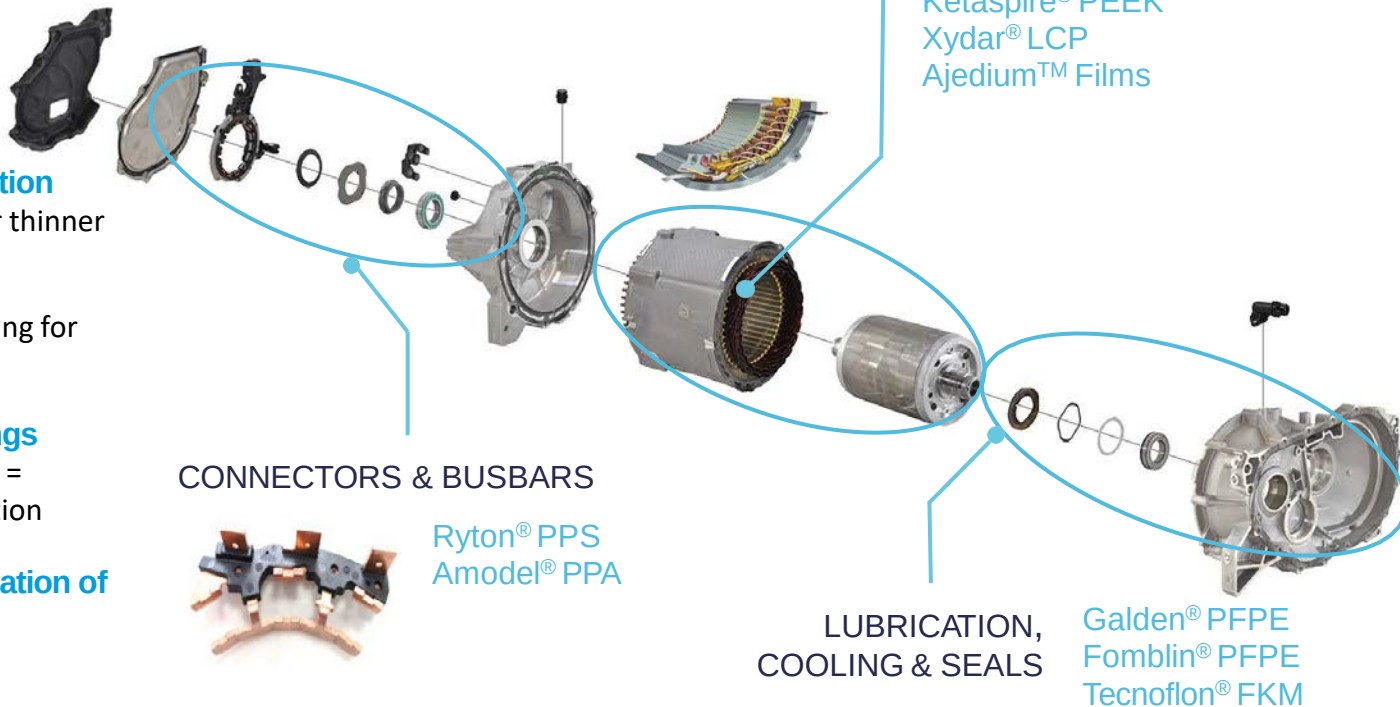
E-motor Innovations: Improving Slot Fill with additional Cu

#1 **Monolayer slot films** and **Injection molded slot liners** & **wedges** for thinner liners = more Cu density

#2 **Monolayer magnet wire** coating for thinner coating = more Cu density

#3 **Rotor encapsulants & coatings** allowing for elimination of epoxies = greater magnet durability & insulation

#4-High CTI materials = **miniaturization of electrical components** for space constraints

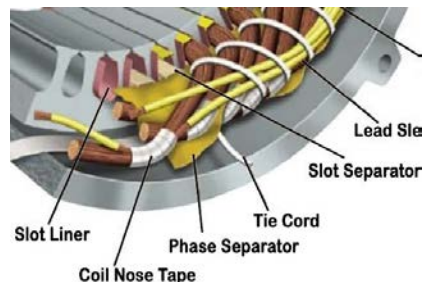


#1 Slot Liner & Wedge Solutions driving E-motor Performance

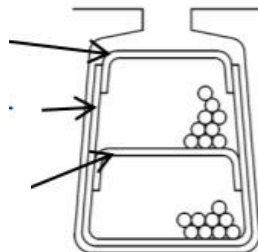
Thinner constructions allowing > **Copper Slot Fill**

Solvay solutions for Slot Insulation (liners, wedges)

APPLICATION / COMPONENT



Wedge
Slotliner
Separator



REQUIREMENTS

- Electrical Properties at Temperature
- Thermal Rating up to 240 oC
- Thermal Conductivity
- Stiffness
- Tear/Puncture Strength
- Good Varnish impregnation
- Single layer/thinner solution

Solvay Offer:

Ketaspire[®] PEEK
Xydar[®] LCP

VALUE PROPOSITION

- Higher dielectric strength at elevated temperatures
- Thermal rating up to 240°C
- Better thermal conductivity
- Good varnish adhesion
- Dust-free during slitting
- Sufficient stiffness to support automatic insertion process
- Outstanding resistance to organics, acids, bases, steam & hot water

SOLVAY'S RANGE OF PRODUCTS

Film Solutions

Thickness: 0.05mm-0.20mm

- Ajedium™ PEEK Film

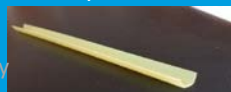
Injection Molded Solutions

Thickness: 0.3mm - 0.8mm

- Xydar[®] G-930

Slot Wedges

- Xencor™ PPA
LGF 1930 HS



#2 Magnet Wire Solutions driving E-motor Performance

Thinner constructions allowing > **Copper Slot Fill**

Solvay solutions for Magnet Wires

APPLICATION / COMPONENT



REQUIREMENTS

- Thermal Endurance up to 260°C
- Electrical Properties at Temperature
- Chemical Resistance
- Abrasion Resistance

Solvay Offer:

Ketaspire[®] PEEK
Hyflon[®] PFA

VALUE PROPOSITION

Extrusion solutions: Ketaspire[®] PEEK

- Extrusion on round or shaped profiles with good concentricity and thickness control
- Excellent dielectric strength at temperature
- Thermal endurance up to 240°C
- Chemical resistance to coolants, solvents, and varnishes
- Extreme abrasion resistance during insertion, bending and wrapping for coil windings
- Favorable adhesion to metals

Extrusion solutions: Hyflon[®] PFA

- Higher thermal endurance (>250 °C)
- High chemical resistance
- Very high dielectric properties

SOLVAY'S RANGE OF PRODUCTS

Extrusion solutions: Ketaspire[®]

- KT-880
- KT-820
- KT-825

Extrusion solutions: Hyflon[®]

- P450
- M640

#3 Rotor Encapsulation & Coatings driving E-motor Performance

Elimination of epoxy improves magnet durability & insulation

Solvay solutions for Magnet Encapsulation

APPLICATION / COMPONENT



REQUIREMENTS

- Flow
- Adhesion to magnet and steel
- Abrasion resistance
- Insulation of magnets

Solvay Offer:

Torlon® PAI

VALUE PROPOSITION

- Electrically insulative, thermoplastic coating eliminates the need for epoxy
- Good flow needed for long flow path through rotor slots
- Coating materials have great abrasion resistance

SOLVAY'S RANGE OF PRODUCTS

Torlon® PAI

- Torlon® AI-10
- Torlon® AI-30 (water based)
- Torlon® HHPAI*

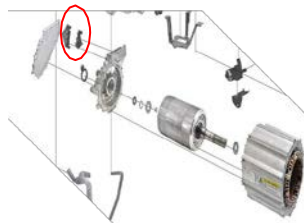
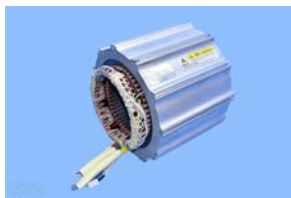
#4 High CTI Materials driving E-motor Performance

Electronic component miniaturization

= space & weight savings

Solvay solutions for Terminal Leads/Bus Bar

APPLICATION / COMPONENT



REQUIREMENTS

- Dielectric Strength at Temperature
- V-0
- Thermal shock
- CTI
- Corrosion Resistance

Solvay Offer:

Ryton® PPS

Amodel® PPA

VALUE PROPOSITION

Amodel® PPA

- >600 CTI for miniaturization of designs
- Amodel Supreme has near complete retention of CTI over time at temps <150°C
- Best in class thermal shock resistance

Ryton® PPS

- Near complete retention of CTI over time at temps >150°C

SOLVAY'S RANGE OF PRODUCTS

Amodel® PPA

- Amodel® AE-8935
- Amodel® HFFR 1133
- Amodel® Supreme AE-9933
- Amodel® Supreme AE-9950
- Amodel® Supreme HFFR 9933*

Ryton® PPS

- Ryton® R-4-240
- Ryton® R-4-220

#4 High CTI Materials driving E-motor Performance

Electronic component miniaturization

= space & weight savings

Solvay solutions for HV connectors, Rods, Busbar

APPLICATION / COMPONENT

- AC & DC High Voltage Connectors
- AC Connectors rods



Connectors



Busbars



Connection Rods:

When the Power Electronics system is directly fitted on the eMotor, you may find Connector Rods instead of traditional Cable + HV connectors (same function with different design)

REQUIREMENTS

- FR V0
- Halogen free
- Stiffness
- Low Water uptake (Dimensional Stability)
- High T° Resistance (up to 180°C)
- New eMobility fluid resistance (rods)



Solvay Offer:

Amodel® PPA (AE & Supreme)
Ryton® PPS

Value Proposition:

Amodel® Supreme

- >600 CTI for miniaturization of designs
- Near complete retention of CTI over time at temps <150°C
- Best in class thermal shock resistance

Ryton® PPS

- Near complete retention of CTI over time at temps >150°C

SOLVAY'S RANGE OF PRODUCTS

Amodel®

- Amodel AE-1133 / AE-4133
- Amodel AE-8930/35/50/60

Ryton® PPS

- Ryton R4-200
- Ryton R4-240
- Ryton BR111
- Ryton XE 5430

Amodel® Supreme

Amodel AE-9933 / 50

#4 High CTI Materials driving E-motor Performance

Electronic component miniaturization

= space & weight savings

Solvay solutions for Capacitors (IGBT)

APPLICATION / COMPONENT

- Capacitors Support for IGBT



The IGBT is the component which allows to transform Direct Current (DC) into Alternative Current (AC).
There are 3 of them in an inverter.
It is really the heart of the Inverter.

REQUIREMENTS

- FR V0
- Halogen free
- Low Water uptake (Dimensional Stability)
- Heat Resistance (110°C to 150°C)

Solvay Offer:

Amodel[®] PPA (AE & Supreme)
Ryton[®] PPS

Value Proposition:

Amodel[®] Supreme

- >600 CTI for miniaturization of designs
- Near complete retention of CTI over time at temps <150°C
- Best in class thermal shock resistance

Ryton[®] PPS

- Near complete retention of CTI over time at temps >150°C
- Outstanding glycol resistance

Summary



- Our E-Motor Solutions include those for
 - Slot liners leading to better copper slot fill
 - Magnet wire enabling greater copper slot fill and potential elimination of paper insulation
 - Bus-Bar & terminal miniaturization creating space and weight savings for improved e-motor packaging
- Please contact us to learn more or to request samples

Contact:

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Thank you.



Progress beyond