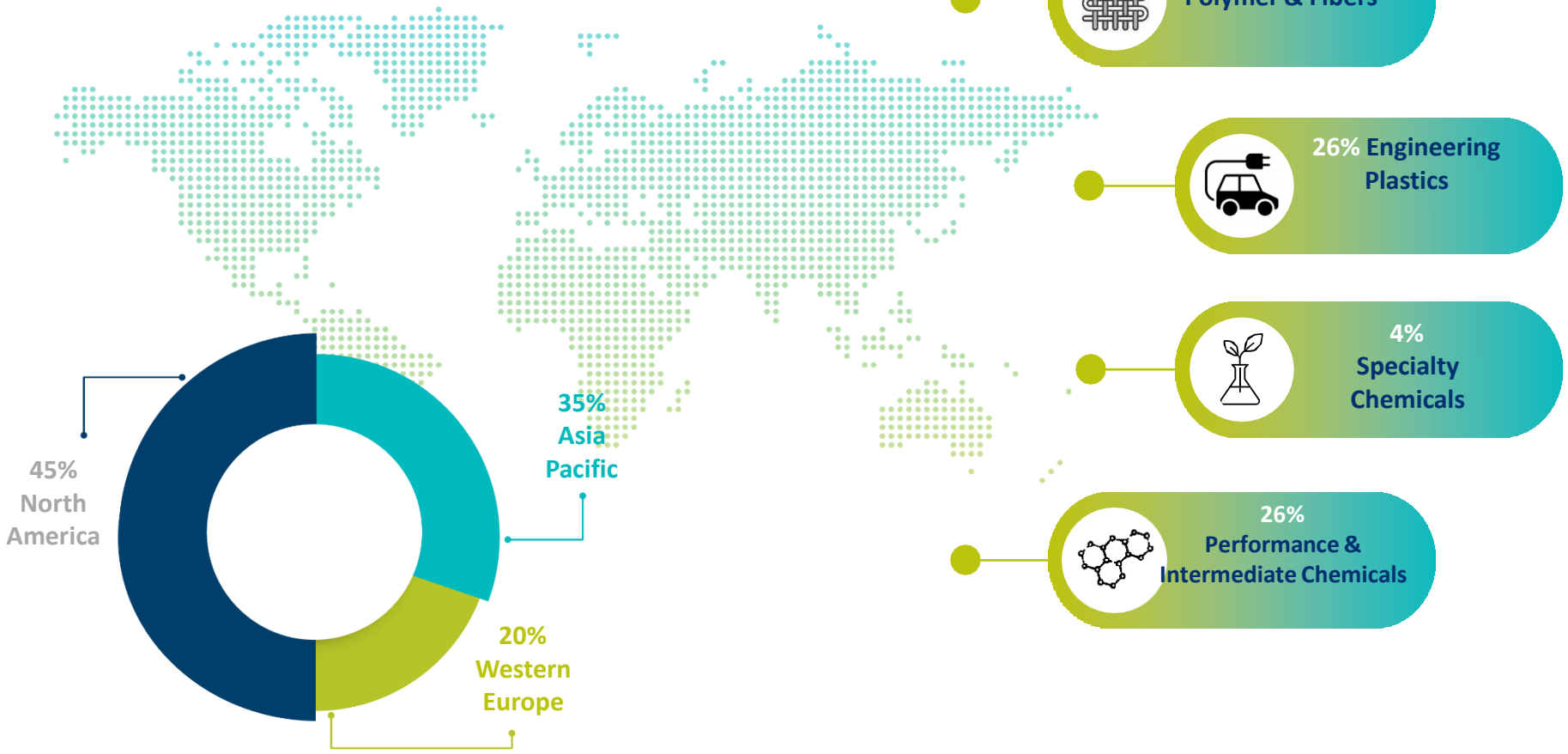
ASCEND®
PERFORMANCE MATERIALS

Ascend Performance Materials is focused on improving quality of life today and inspiring a better tomorrow

Our business



- **44%** Polymer & Fibers
- **26%** Engineering Plastics
- **4%** Specialty Chemicals
- **26%** Performance & Intermediate Chemicals

2022 Key Metrics

$3 billion revenue

2900+ employees

21% product vitality

80% reduction in GHG emissions by 2030

0.27 TRIR top-decile safety

Ascend is the largest fully-integrated PA66 resin manufacturer

World-class manufacturing across North America, Europe and Asia.

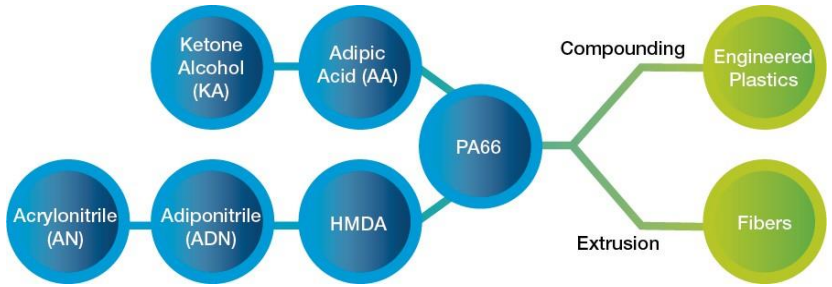
Innovation Centers in Detroit, Suzhou and Paris.

Global application development and field service engineers.

Backwards integrated in intermediate & specialty chemicals

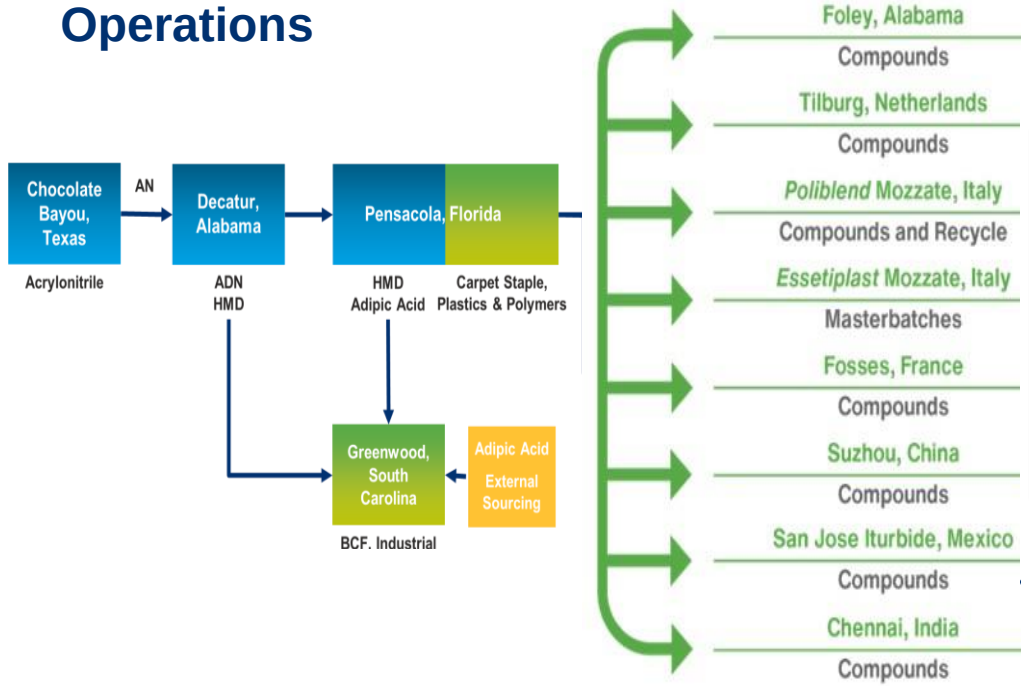
Over 1 Billion pounds of PA66 sold annually

Nylon66 Process

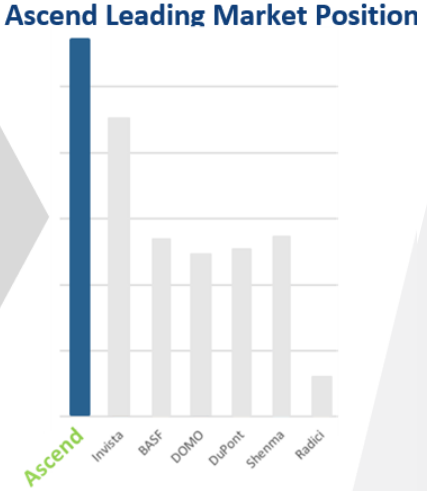


There are only four Adiponitrile (ADN) plants in the world. Production technology is proprietary and closely held by 2 companies (Ascend and Invista).

Ascend Business Operations



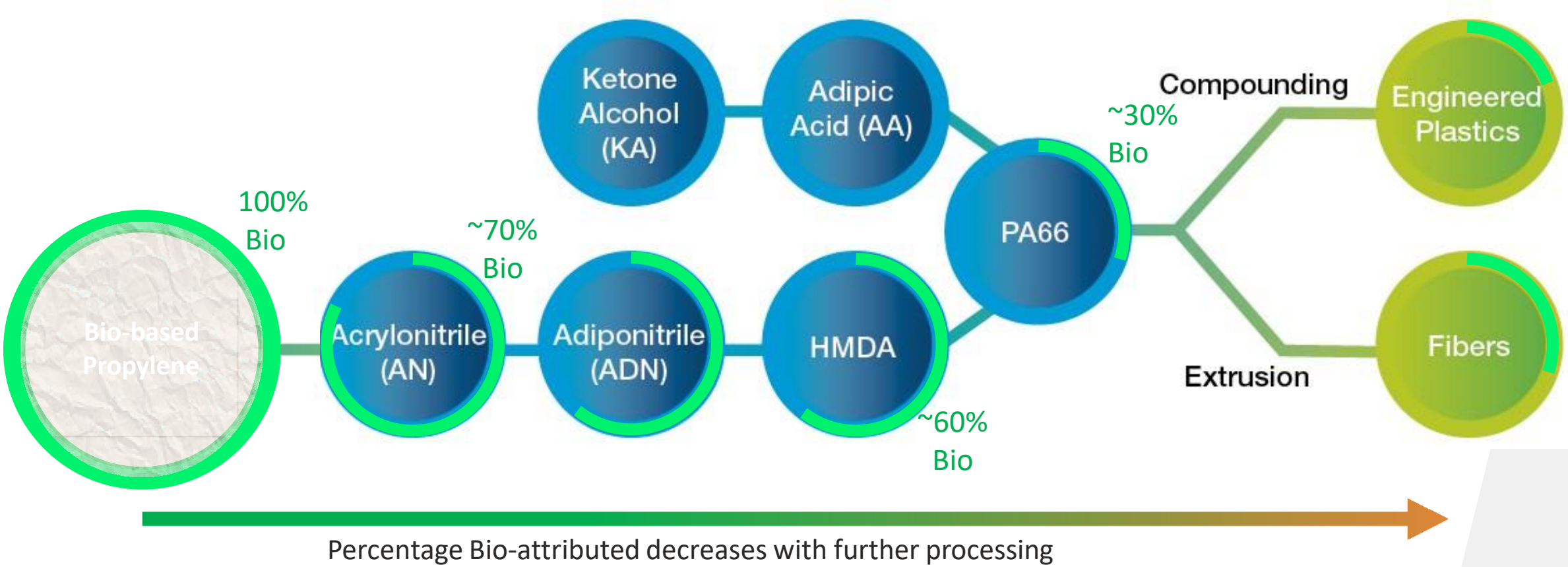
Ascend Leading Market Position



❑ Chemicals ❑ Plastics/Polymer/Fibers

What this looks like for Ascend

Illustrative example of Bio-based feedstock distribution utilizing the mass balance approach



Note: Allocation of bio-feed stock and accounting for waste reduces bio-attributed content

Ascend Performance Materials Mexico
San Jose de Iturbide Plant

San Jose De Iturbide Guanajuato

Four Extrusion Lines

Compounding Capacity
Vydyne, Starflam, ReDefyne
IM, FR, GF, XHT

- Location close to main Auto Hub in Mexico
- 500 miles from the US border
- Warehousing and Bulk Tank Capabilities
- Real State Ready for Plant Expansion
- Servicing the main industries in Mexico:
  - Automotive
  - E-mobility
  - Fasteners

Key metrics :

Capacity 35,000,000 Pounds	70+ employees	Carbon Neutral	ISO 9001	IMMEX Registered

We understand your applications and our dedicated team is here to help you go to market faster

Key markets we serve

Automotive

E-mobility

Electrical & Electronics

Consumer & Industrial

Cable Management

Specialty Chemicals

Healthcare

Textiles & Safety Systems

We have a broad portfolio of specialty solutions

ASCEND PERFORMANCE MATERIALS

vydyne pa 66

PA66 and PA6 resins and compounds.

AVS, XHT

Starflam®

Flame-retardant PA66, PA6 and PA66,6 resins and compounds.

HiDURA®

Specialty polyamides including long-chain, copolymers, amorphous nylon and medical grades.

Acteev™

Antimicrobial technology to protect textile, nonwoven and health care applications with zinc.

Re Defyne™

Certified circular polyamides including post-consumer recycled and pre-consumer materials.

Automotive

Ascend's fully integrated production and global operations ensure the quality and consistency of material the automotive industry can rely on.

We have a proven track record of working with suppliers and automakers to bring better performance throughout the vehicle – from the exterior to under-the-hood applications.

Lightweighting

High strength, temperature resistance and durability for metal replacement

Improving Engine Efficiency

Ensure your application performs in the harshest environments

Comfort

Reduce engine and road noise with cutting edge technology

Ascend's solutions for ICE

Structural Enhancement

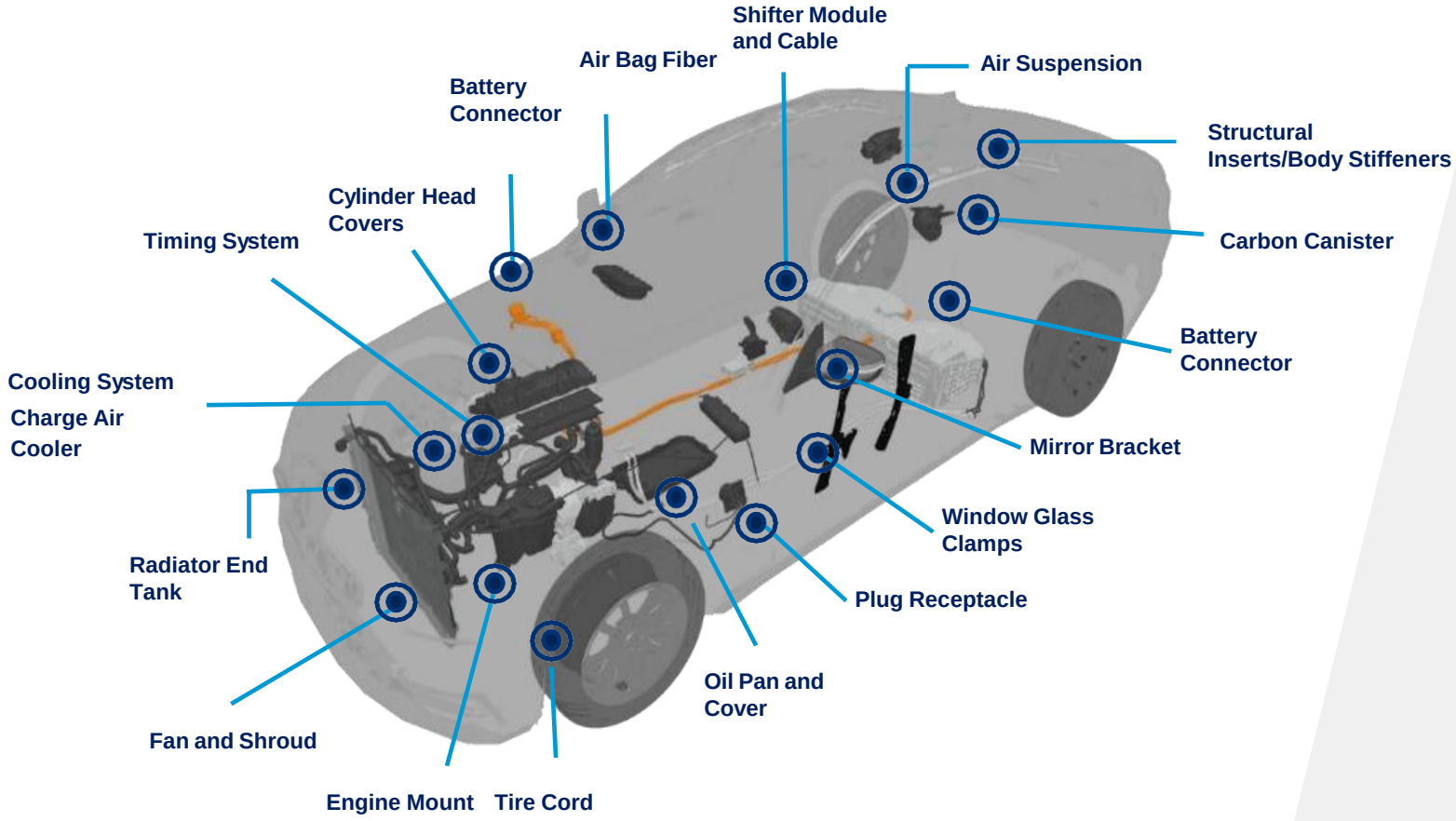
- Enhanced modulus (R5XX)
- Impact modified (4XH)
- Dimensionally stabilized (R8XX)
- Chrome-platable

Thermal Management

- Enhanced thermal aging (HT, XHT)

Chemical Resistance

- Hydrolysis resistant (HR)
- Calcium chloride resistant



Exterior Opportunties

For exterior components, Vydyne offers versatile, reliable and customizable resins. Our quality and consistency make the difference in your production efficiency.

External Mirror Bracket

- **Minimize vibration and withstand** a demanding assembly process
- In certain applications, **adhesion to metal** is essential as well
- **Vydyne R543H** superior strength and stiffness
- **Vydyne R860** optimal balance of strength, stiffness, damping characteristics and adhesion to metal
- **PA66** resins are also more **cost effective than polyester, zinc and magnesium options**.

Exterior Hood Release

- Critical component because it must **balance strength and wear**
- lubricity and wear resistance for consistent action
- strength and stiffness needed to engage the release mechanism
- **Vydyne R533H**: balance of **strength** and **stiffness** with a **good wear and lubricity**. The ease of molding allows many design features to be added to the part to improve its functionality.

Fuel filler door

- Good appearance with **no warpage**
- Due the high temperature paint baking process, it demands the ability to **handle high temperatures**.
- It requires **stiffness** to overcome the closure spring and maintain its shape
- **Vydyne R228** These properties allow for a part to be designed to **meet the demanding painting** and bake environment and still have an **outstanding appearance**

Headlight bezel

- Smooth surface **with no warping**
- **Vydyne 21SPR** and **22HSP** can be vacuum-metallized without a surface pretreatment
- The intense heat generated by headlights can exceed the capabilities of traditional materials like PC and PBT. **Vydyne PA66 offers a cost-competitive, high-temperature alternative.**
- **Vydyne 21SPR:** Superior balance of properties allowing for part design that meets the demanding headlight environment and still has an outstanding appearance.

Wheel Cover

- Pleasing appearance, with **no warping**
- paint-baking process requires an ability to **handle high temperatures**
- maintain **stiffness** to resist the clamping spring and yet hold its shape. In use, the wheel cover must **deflect minor impacts.**
- **Vydyne R220** guarantee a part that meets the demanding painting and bake environment while maintaining an **outstanding appearance**

Exterior Opportunties

Additional Applications

- **Front Cover**
- **Front End Module**
- **Fuel filler cap**

Ascend - Exteriors | Ascend Performance Materials (ascendmaterials.com)

Powertrain Opportunties

Material	Commercial Grade	Description	Applications	Examples
PA66	**Vydyne® 22HSP NT**	Unfilled, lubricated, heat stabilized PA66 resin	▪ Cable Glands / E& E ▪ Body Stiffeners & Crash Inserts	 
PA66-I	**Vydyne® 41H NT**	High impact-modified, heat stabilized PA66 resin	▪ Body Stiffeners & Crash Inserts ▪ Hood & Brake release	 
PA66-I	**Vydyne® 47H BK0501**	Medium impact-modified, heat stabilized PA66 resin	▪ Hood & Brake release ▪ Carbon Canister	 
PA66-GF50	**Vydyne® AVS1AF1 BK0781**	50% glass fiber reinforced, heat-stabilized PA66 designed for injection molding applications	▪ Body Stiffeners & Crash Inserts • Engine mount component	 
PA66-I-GF33	**Vydyne® R433H BK0746**	Reinforce downgauged steel and aluminum used in vehicle body-in-white (BIW) structures, helping reduce weight without sacrificing safety or comfort.	▪ Transmission Cover ▪ Body Stiffeners & Crash Inserts ▪ Hood & Brake release ▪ Engine mount components ▪ 48V Battery Housing (Hybrid and Electric) ▪ High-Voltage Cable Guide ▪ Engine Oil Pan	   

Powertrain Opportunties

Material	Commercial Grade	Description	Applications	Examples
PA66-GF25	**Vydyne® R525H BK02**	25% glass-filled, heat-stabilized PA66 based resin designed for injection molding applications	▪ Radiator End tank ▪ Bearing Cage Retainer ▪ Hood & Break release	  
PA66-GF30	**Vydyne® R530H BK0201**	30% glass-filled, heat-stabilized, high viscosity PA66 based resin designed for injection molding applications.	▪ Cooling fan ▪ Engine Coolant Inlet ▪ Fan Shroud ▪ Radiatior End Tank ▪ Thermostat Housing ▪ Cylinder Head Cover ▪ Fuel Rail ▪ Oil Fill Tube ▪ Transmission Filter ▪ Cooling line valves and connectors (Hybrid and Electric) ▪ Carbon Canister ▪ Hood and Brake Release ▪ Engine Oil Pan ▪ Charge Air Cooler End Tank ▪ Body Stiffeners & Crash Inserts ▪ Turbo Duct ▪ Idler Pulley	        
PA66-GF35	**Vydyne® R535H BK02**	35% glass-filled, heat-stabilized PA66 based resin designed for injection molding applications.		

Powertrain Opportunties

Material	Commercial Grade	Description	Applications	Examples
PA66-GF33	**Vydyne® R533H BK02**	33% glass-filled, heat-stabilized PA66 based resin designed for injection molding applications	▪ Cooling fan ▪ Engine Coolant Inlet ▪ Fan Shroud ▪ Cylinder Head Cover ▪ Oil Module and Filter ▪ Tranmission Cover ▪ Fuel Rail ▪ Oil Fill Tube ▪ Transmission Filter ▪ Shift Housing / Shift Module	
PA66-GF43	**Vydyne® R543H BK02**	43% glass-filled, heat-stabilized PA66 based resin designed for injection molding applications.	Shift Housing / Shift Module	

[Materials Database (ascendmaterials.com)]

eMobility

ASCEND PERFORMANCE MATERIALS

eMobility Trends and Challenges

Lightweight, Comfort and Safety have been megatrends identified decades ago

Combination of metals, Plastics, Composites, and adhesives to deliver safety, efficient thermal management, and reduced NVH are even more critical.

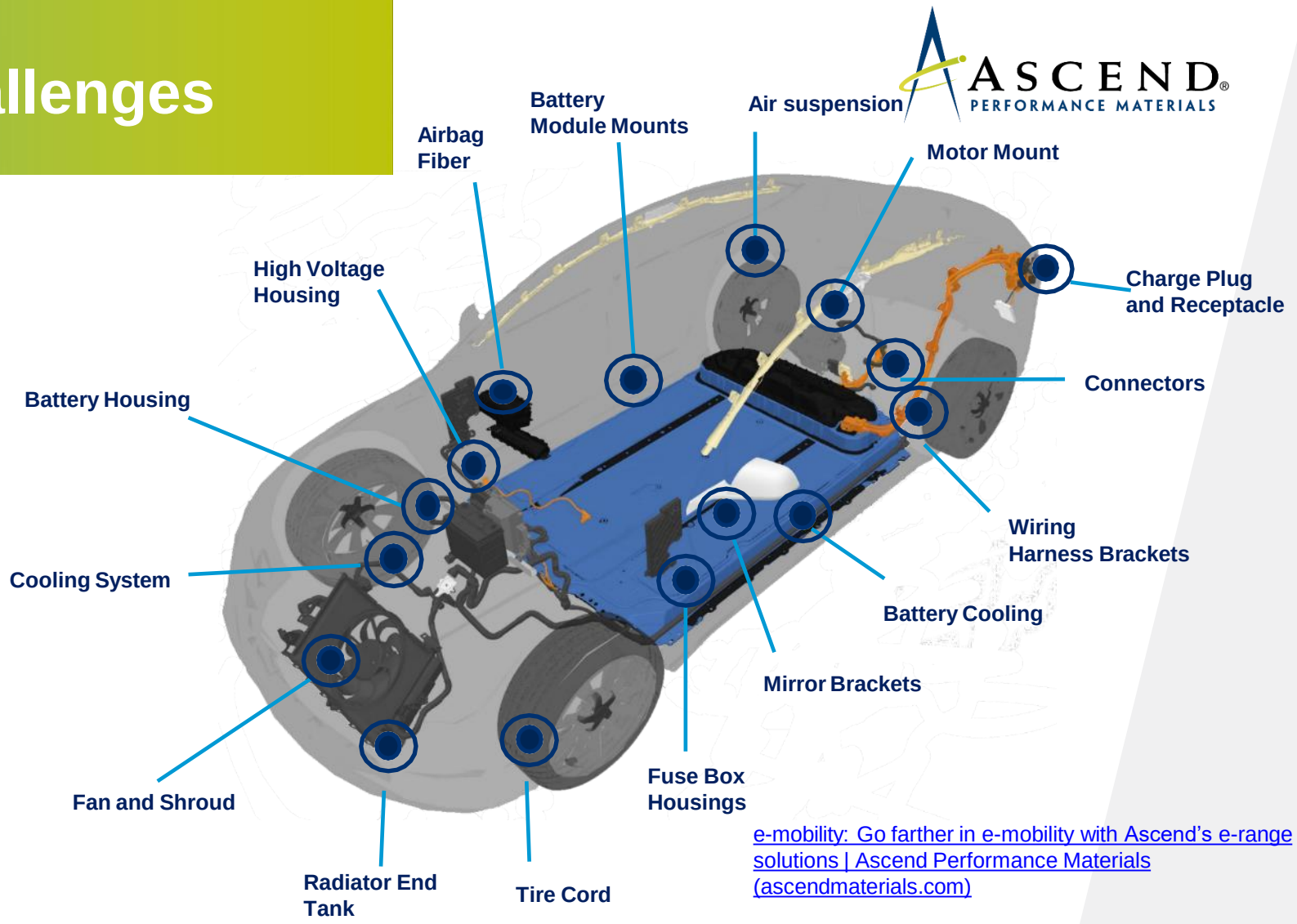
Range anxiety: Efficiency and speed in the charge. Drives need for light weight

Safety: Electrical insulation along with non-halogen flame retardant solutions

High Voltage: Corrosion resistance for electrical contacts becomes critical

Thermal exposure: Increased usage times due to extended charge cycles

Package and Complexity: driving thinner walls and structural integrity.



[e-mobility: Go farther in e-mobility with Ascend's e-range solutions | Ascend Performance Materials (ascendmaterials.com)]

Our approach to addressing these industry challenges aligns with our core competencies to develop value add solutions to the industry.

1) Under Safe Power Structure

2) Reliable Thermal Management

3) Secure and Comfortable Ride

Mobility Ecosystem

Passenger Cars
- ICE
- BEV
- HEV/PHEV
- FC

Commercial Vehicles
- ICE
- BEV
- FC

2 Wheelers
- ICE
- BEV

e-Range

ICE

Safe Electrical Infrastructure

Connectors

BDU

EV Batteries

Sensors

Starflam®

Reliable Thermal Management

Auxiliary Heater

Coolant Pumps

Couplings & Tubes

TMM

RET

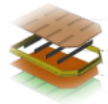
Multi Valve

HIDURA™

Secure and Comfortable Ride

Motor Mounts

Cross Car Beam



Battery Structures

Air Springs

AVS

Efficient Powertrain

CHC

Oil Pan

Fasteners

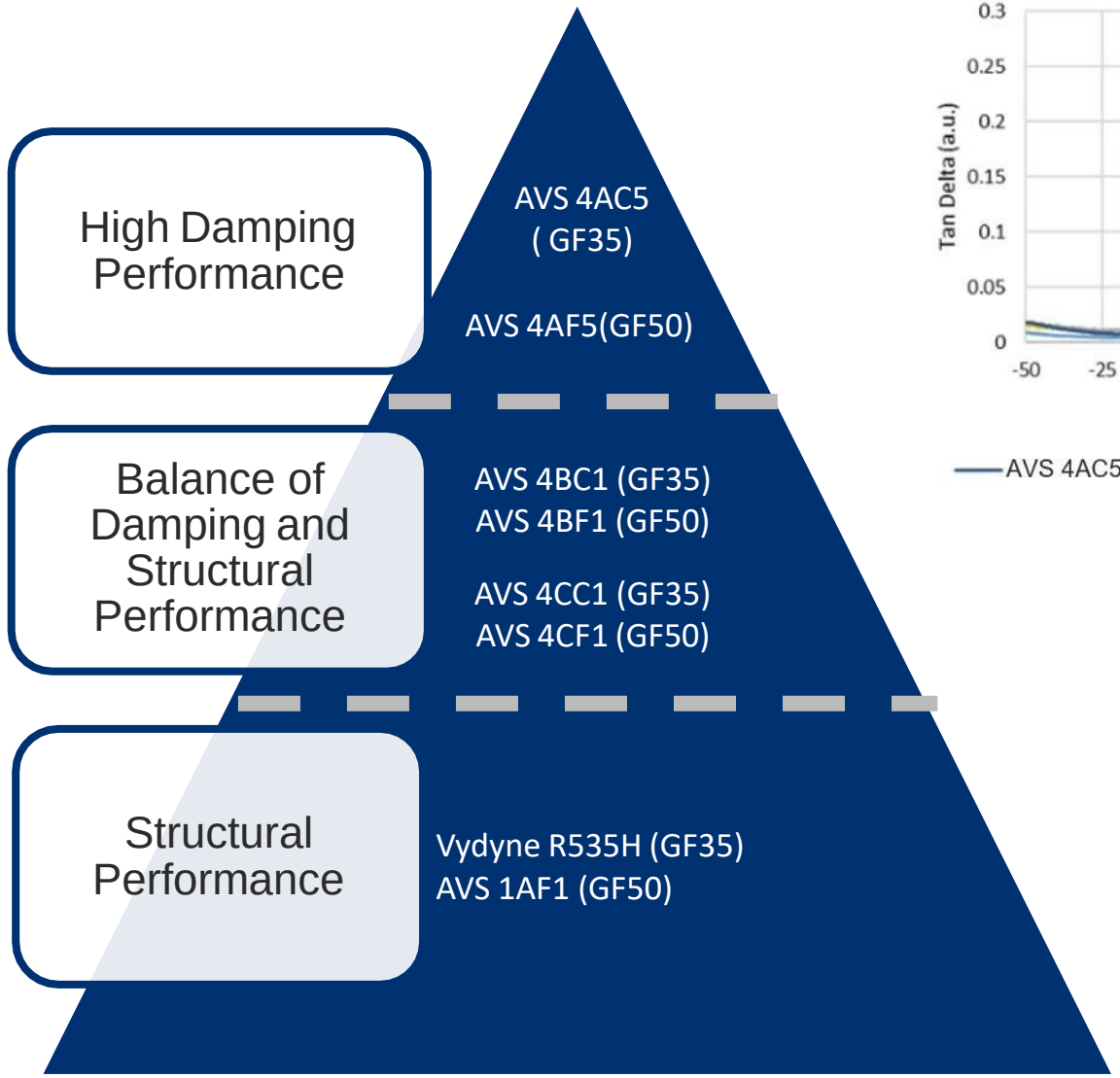
Crash Inserts

vydyne pa66

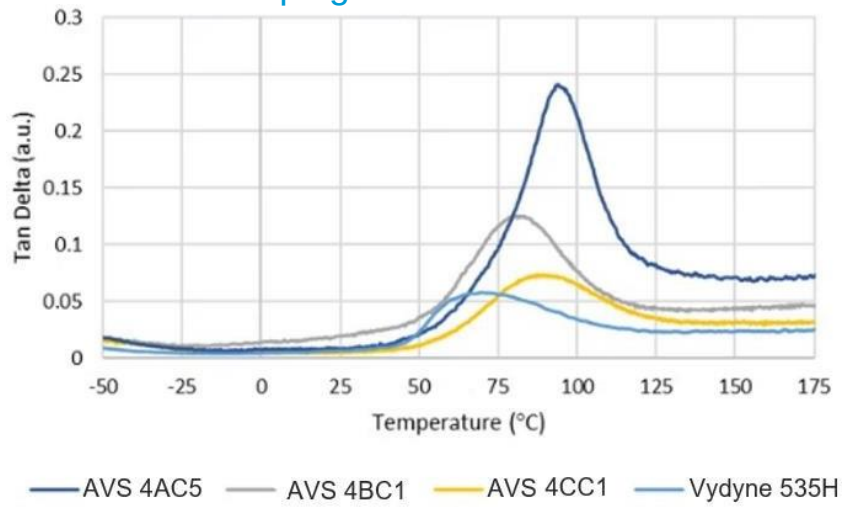
vydyne pa6

Re Defyne™

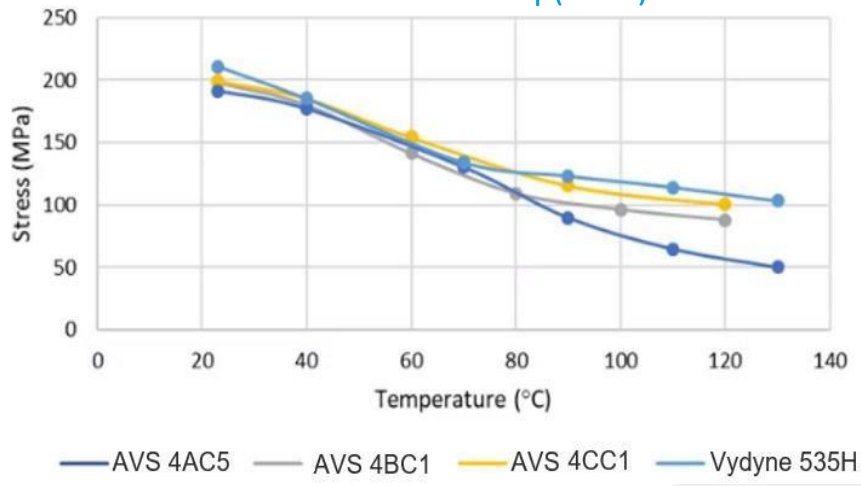
Vydyne® Anti-Vibration System Portfolio



Damping Curve – Tan Delta

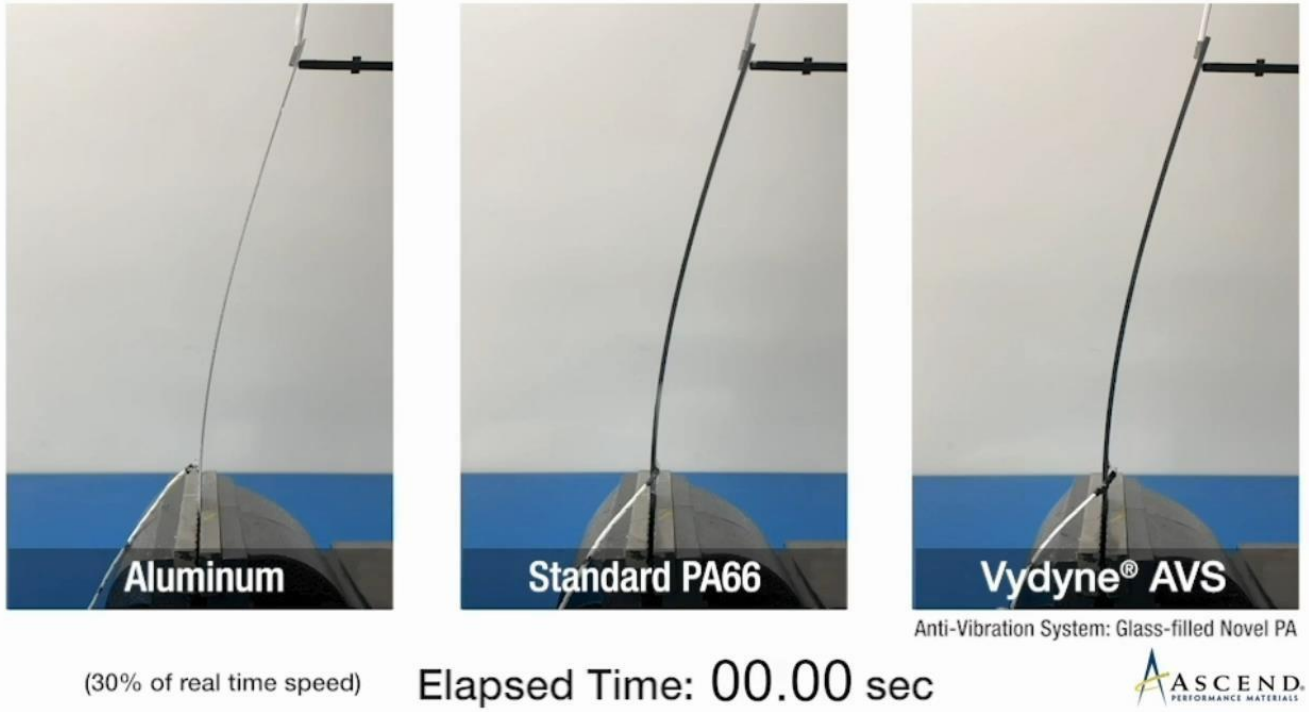


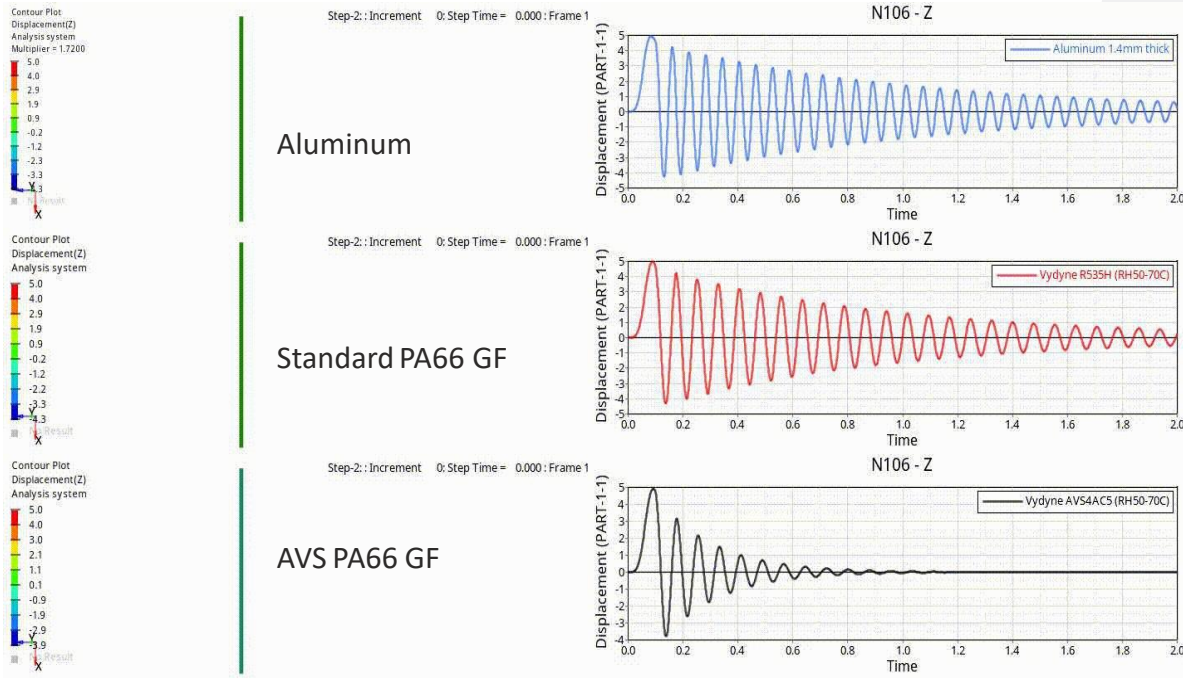
Tensile Stress vs. Temp(DAM)



Cantilever Beam : Low Frequency, < 100Hz

- Evaluate viscous damping of multiple materials: AVS, Standard PA66 and Aluminum
- Demonstrates the correlation between test and simulation using a simple boundary condition





- Sample surface temperature: 90°C
- Natural Frequency: 14.5 Hz

A full FR portfolio

Starflam®

ASCEND PERFORMANCE MATERIALS

Highest Performance

Flame, Electrical, Mechanical

Tailor Made Products

Functional Requirements

c UL us UL

Environmental Requirements

PA6-GF FR V-2

Circuit Protection
GWFI 960°C
CTI > 450

PK0052E
PZ0042E
PZ0052E
PW0042E

PA66-GF V-0 FR(52)

Contactor, MCCB
UL94 V-0
CTI 600

AFR450X2
AFR450X1
AFR470X2

Unreinforced PA6 & PA66 V-0

Connectors, Terminals
UL 94 V-0
RTI up to 150°C

P10002E
R10002E
AFR200Y
BFR200Y
315J
366H
377H

PA66 GF V-0

Miniaturization
UL 94 V-0 @ 0.2 mm
GWFI 960°C @ 0.4 mm
CTI 600

RF0057E
R10002E
RF0023E
525K

RF0097P
RF0077E
RF0057E
RF0047E

PA GF V-0

Structural
UL 94 V-0
Modulus > 13000 MPa
RTI_{mech} = 150°C

PF0047E
RF0068E
525H

PA GF V-0

Transportation & Seats
Low Smoke & Toxicity
NF F 16-101, -102
EN 45545 R22&R23 HL3
Aesthetics

FR350J
RF0055E

PA66+6 V-0

Appliances
UL 94 V-0
VDE GWIT 775°C
No Flame

RF0057E
PF0057E

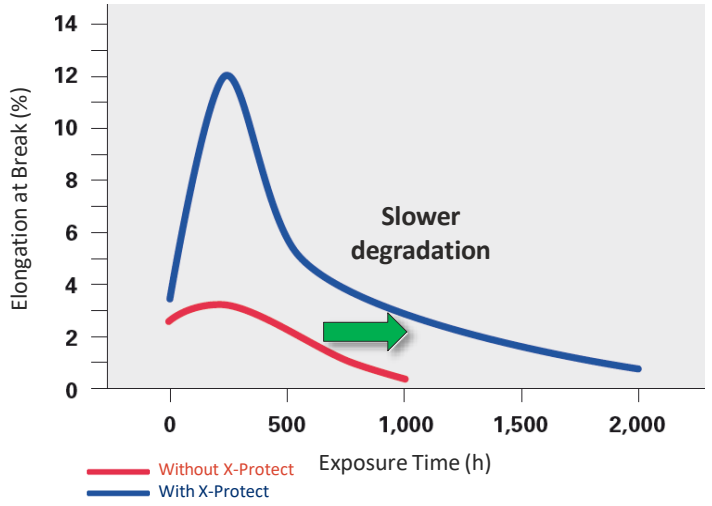
PA6 & PA66 GF25 5VA

Photovoltaics
UL 94 5VA
UL f1 rating
RTI 140°C, CTI 600

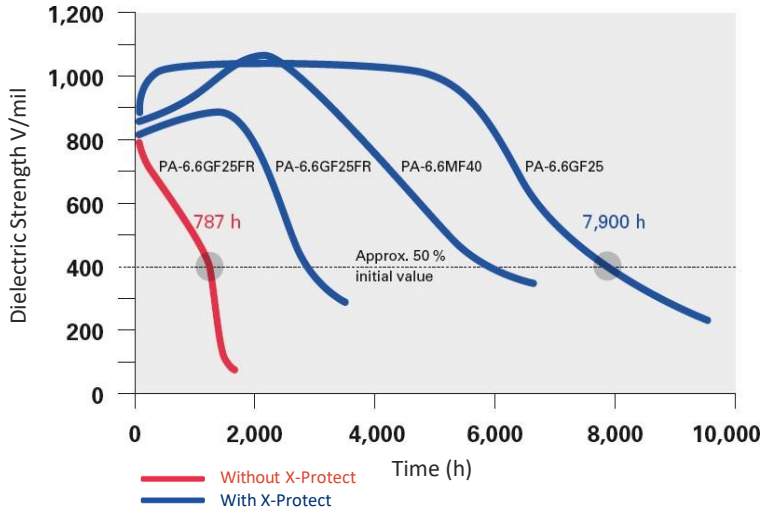
Starflam® X-Protect Polyamide

Effect of X-Protect technology

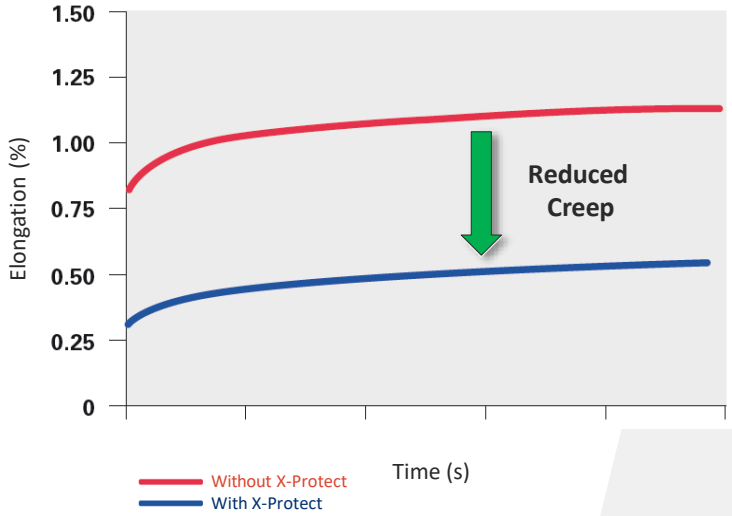
Hydrolysis testing
50/50 glycol/water coolant at 130°C



Better retention of dielectric strength



Creep testing at 100°C
applied stress level of 15 MPa



Track record: HV cable guides and mounts

Application description:

- High-voltage cables in plugin hybrid and electric vehicles move power to and from the battery and various systems throughout the car. Cable guides and mounts must withstand temperature fluctuations, constant vibration and high force impact to secure and protect high-voltage cables running throughout the vehicle.

CTQ's:

- Low temperature Impact and vibration resistance
- Electrical insulation
- Colorable
- Chemical resistance

Ascend solution:

Property (DAM)	Units	Ascend Vydyne® 49H	Ascend Vydyne® 47H	Ascend V
Density	g/cc	1.11		
Tensile Strength @ Break	MPa			
Tensile Elongation @ Break	%			
Notched Charpy Impact @23 °C				
Notched Charpy Impact				
Dielectric Stre				
Volu				

properties

* Target

Track record: Charger plugs and interface

Application description:

- Charger plugs and face covers are critical in the charging of EV, PHEV vehicles. High voltage passes thru these components to charge the vehicles and they must withstand use across a range of temperatures.

CTQ's:

- High strength/modulus
- V0 flammability
- Electrical insulation
- Chemical resistance

Ascend solution:

Property (DAM)	Units	Ascend Vydyne® 909	Ascend Vydyne® ECO525*	Ascend V
Density	g/cc	1.41		
Tensile Strength @ break	MPa	132		
Tensile Modulus	MPa	9,1		
Notched Charpy Impact @23 °C	kJ/m^2			
HDT @1.8 MPa	°			
Flammability				
CTI				
Dielectric Str				
Volu				

Vydyne R535J

Automotive approvals

Over 180 approvals publicly granted

APTIV

Delphi Technologies

HYUNDAI

TOYOTA

BOSCH
Invented for life

Ford

RENAULT

Valeo

FCA
FIAT CHRYSLER AUTOMOBILES

GM

SAE INTERNATIONAL

[Click here to view complete list of automotive approvals]