

Business Line High Performance Polymers

Evonik
Resource Efficiency Segment

September 2015



EVONIK
INDUSTRIES



Nutrition & Care



Sales
€4,924 m



Adj. EBITDA / Margin
€1,435 m / 29.1%

Animal Nutrition

Baby Care

Health Care

Personal Care

Household Care

Comfort & Insulation

Interface & Performance



Resource Efficiency



Sales
€4,279 m



Adj. EBITDA / Margin
€896 m / 20.9%

Silica

Crosslinkers

Oil Additives

Coating & Adhesive Resins

High Performance Polymers

Active Oxygens

Silanes

Coating Additives

Catalysts



Performance Materials



Sales
€3,435 m



Adj. EBITDA / Margin
€309 m / 9.0%

Performance Intermediates

Acrylic Polymers

Acrylic Monomers

Functional Solutions

Agrochemicals & Polymer Additives

CyPlus Technologies

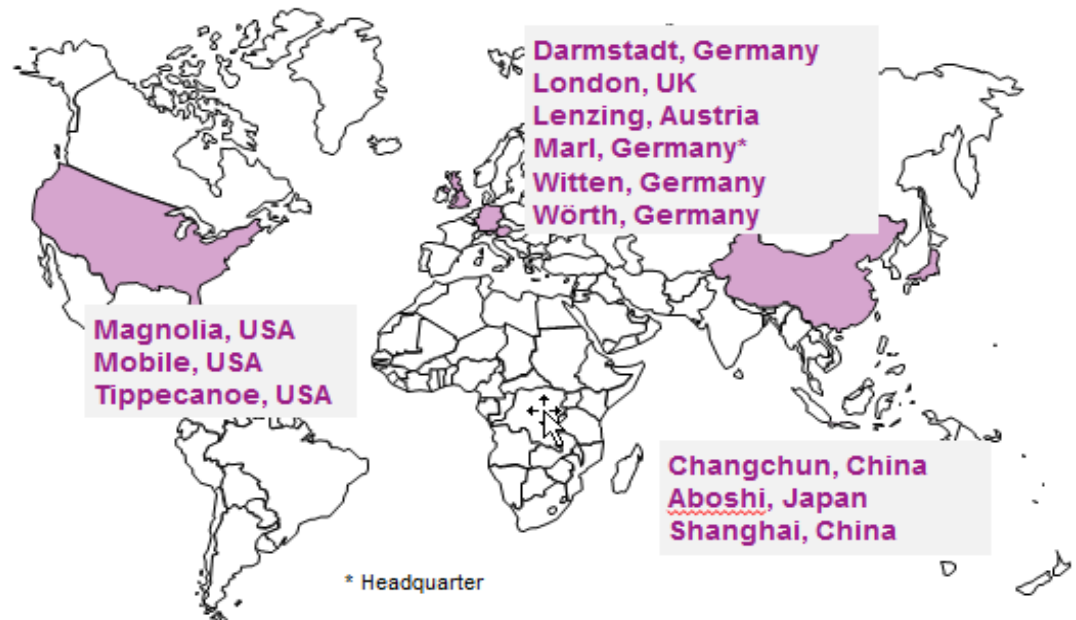
1	Organisation
2	Products
3	Competencies

BL High Performance Polymers

Key Facts

- Sales: ~ €475 m
- 1330 employees worldwide
- R&D ratio: ≈ 5 %
- 7 research facilities
- Focus on growth megatrends resource efficiency, e.g. lightweight applications
- Leading manufacturer of high-performance polymers as PA12, PEEK and PI
- Specialist for customized solutions with compounds as well semi-finished goods, e.g. high-performance foams, fibers and filtration modules

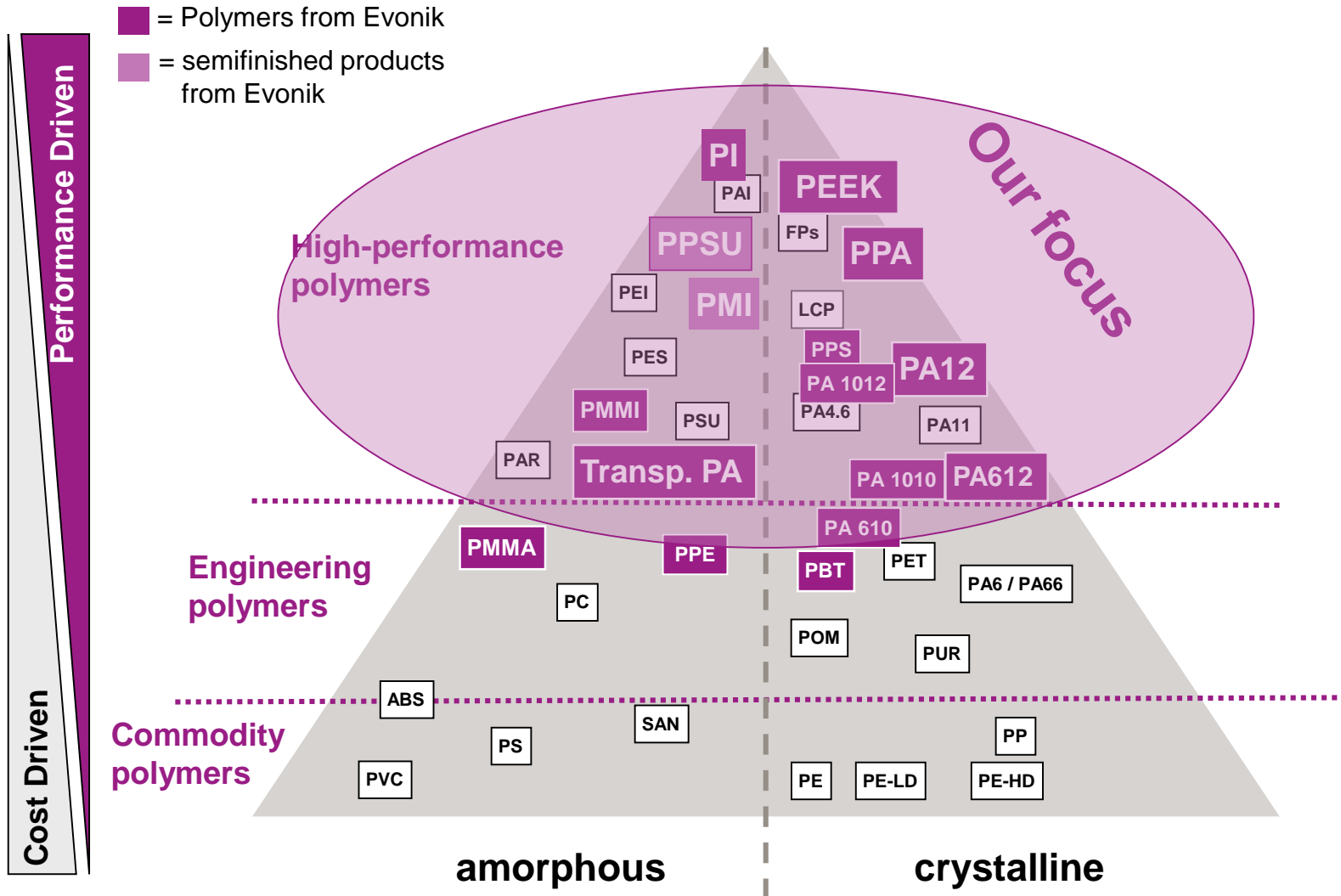
Production site



Agenda

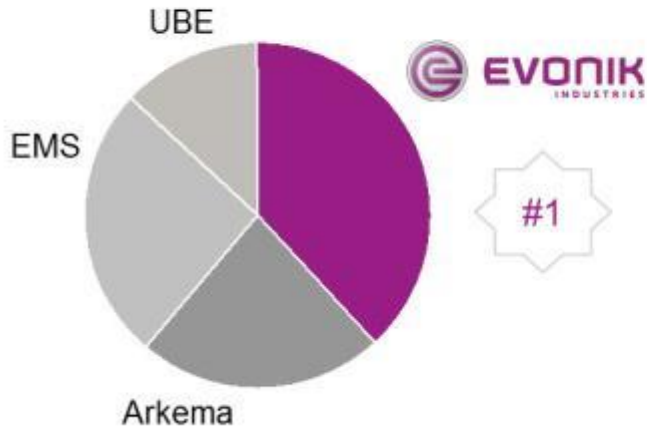


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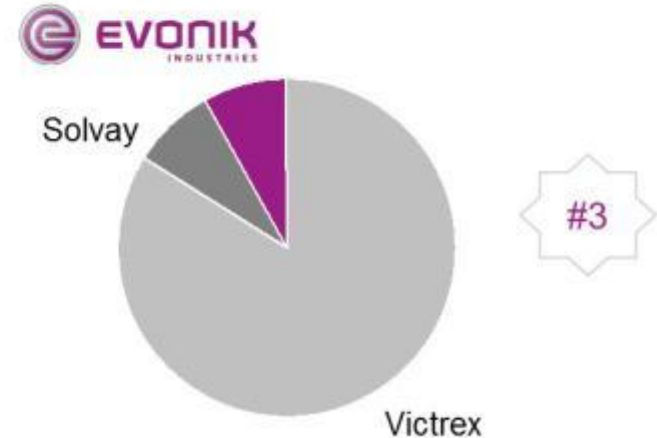


PA12 and PEEK : markets with growth potential

Market shares in PA 12 market



Market shares in PEEK markets



- PA12 as specialty market , annual growth far above that of engineering polymers
- Only back-integrated supplier of PA12 with continuous investments in supply chain
- No 1 in PA12 market for many years
- Evonik HP as solution provider based on polymer design, processing and application technologies
- Essential supplier to growth markets as automotive, oil & gas, photovoltaic and others

- VESTAKEEP® - a key enabler for industry trends in HP's growth focus areas oil & gas, medical and aerospace
- Continued double digit growth in focus markets
- Development of new polymer systems based on PEEK for industrial & medical implant applications
- Providing value beyond the polymer by being a solution provider to customers.

Solution overview High Performance Polymers



Product portfolio



**Building
Blocks**

PA12

PA612

PEBA



**Resins,
Blends and
Compounds**

VESTAMID

TROGAMID

VESTAKEEP

VESTENAMER

CoPA

PEEK

TOR



Powders

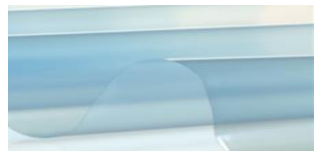
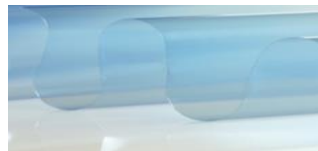
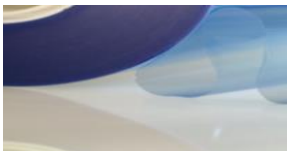
VESTOSINT

VESTAMELT

VESTAKEEP

PMMA

PPSU



**Films
Foams**

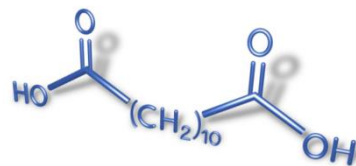
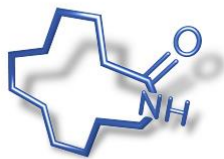
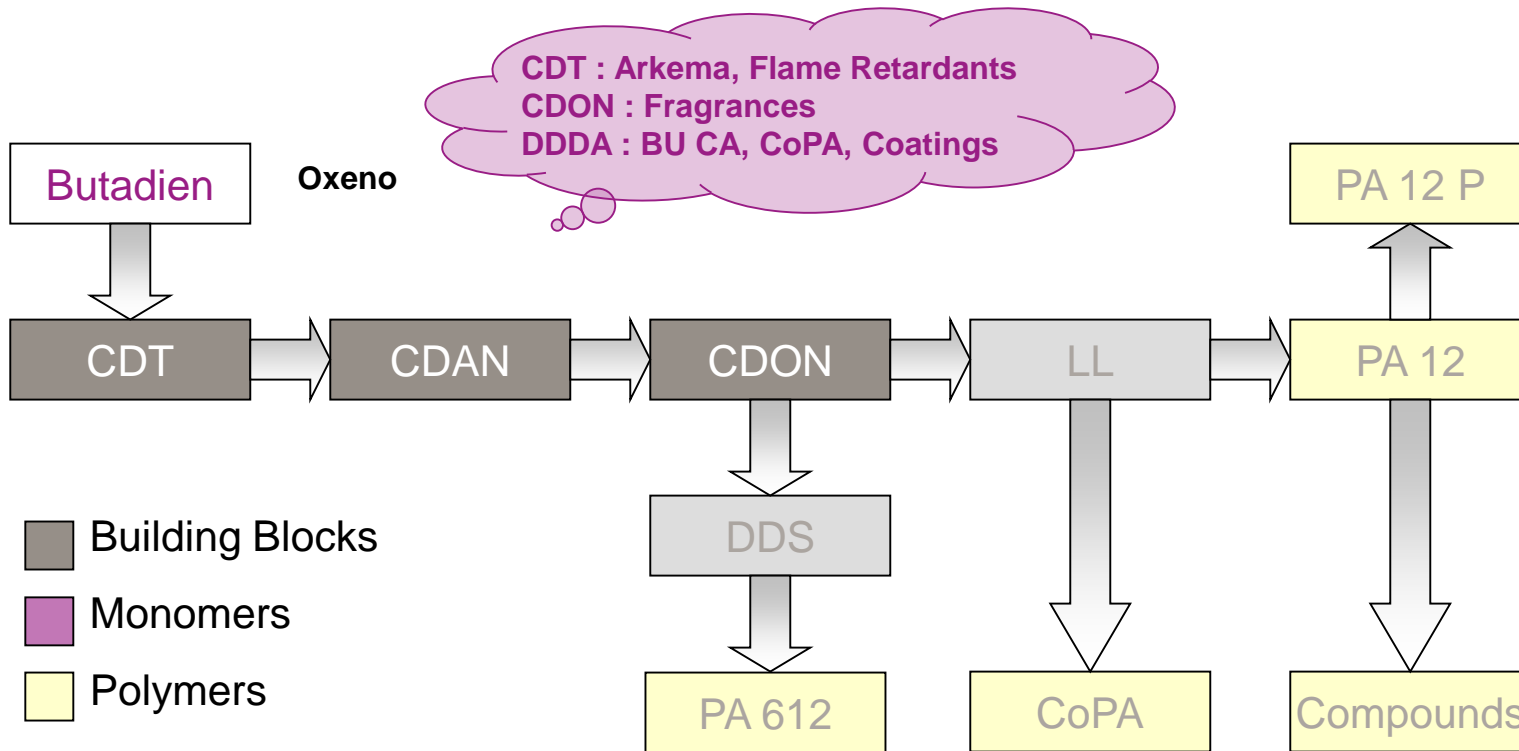
PLEXIGLAS

EUROPLEX

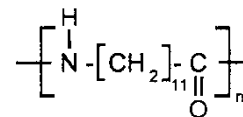
TROGAMID

ROHACELL

C12 chain



Polyamid 12 (PA 12)



VESTENAMER (TOR)
 VESTODUR (PBT)
 TROGAMID

High Performance Polymers located at Marl site



Agenda



1	Organisation
2	Products
3	Competencies

Innovation management Competencies and projects



Process Technology



Process technology for monomers and polymers
for C12- monomers & polymers
for high temperature polymers (PPA, PEEK, PI)
and new technologies for manufacturing of polymers
(continuous processes incl. extrusion)

Biobased Processes and Products
(monomers & polymers)



Application Technology



**Extrusion
Competence**

large pipes for Oil Exploration,
Encasement & Relining for
corrosion protection, Gas Pipes



**Bonding
Materials**

Hybrid technology for metal and
plastics bonding,
Hotmelt molding for electronics



**Compounding
& Molding**

Thinwalled Electronics,
Thermally conductive
compounds



**Add. Manufacturing
Technology**

Various materials
for Selective Lasersintering
(e.g. flexible material)



Films

Flex. Circuit Boards,
PV back sheet,
Flexible PV materials,
O2 barrier

(Semi) finished Goods



**Thermoplastic
Composites**



**High Performance
Foams**

Rohacell foam in Sandwich
Structures

Thermoplastic Composites:
UD-Tapes (Auto & Aircraft),
Organo Sheets (Electronics)

Membranes for Nanofiltration
(OSN – organic nanofiltration)
and
Hollow Fibres Membranes for
Gas Separation/Biogas



Extrusion

Individual innovation for each situation

Specific extrusion adjustments for smooth production – from mono- to multilayer:

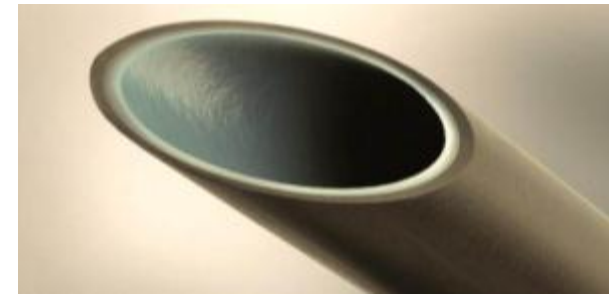
VESTAMID® has been the material of choice for the line systems of renowned automobile manufacturers for nearly 50 years, starting from monolayer tubing to multilayer tubing with several layers.

Polymer development capabilities to achieve required performance characteristics:

The latest developments comprise compounds suitable to extrude large thick walled pipes for offshore and onshore oil and gas generation and gas distribution.

Fibers and filaments, films and sheets - wherever extrusion competency is required.

From toothbrush bristles to fibers for smoke filters, from PEEK films to PPSU sheets



Bonding technology

Plastic/rubber composites

Usually components made from plastic and rubber have to be bonded by a process using solvents, primers and adhesion promoters. Molding compounds specially developed by Evonik allow strong and durable bonding to suitable rubber mixtures without any pretreatment.

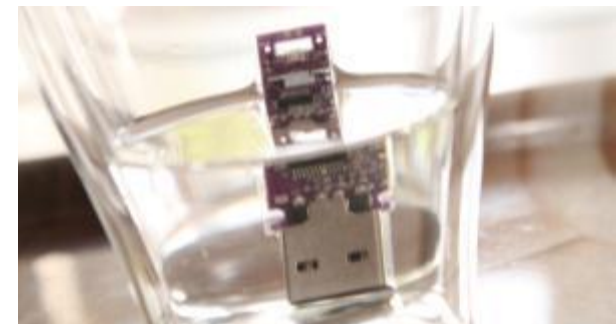
Hybrid technology

VESTAMELT® *HILINK* adhesion promoter system improves the performance of hybrid components and allows customers to use up to 25% less material.

Hotmelt molding

Water-proofing, transparent co-polyamide for low pressure molding shows superior sealing adhesion and excellent temperature and solvent resistance. It is ideal to protect electronics and for new designs in LED lighting.

Evonik multilayer tubing systems combine up to five layers



Powder technology

Powders for different purposes

VESTOSINT® polyamide 12 powders

protect the surface of metals, or improve as an additive the performance of coatings.

VESTOSINT® Protect

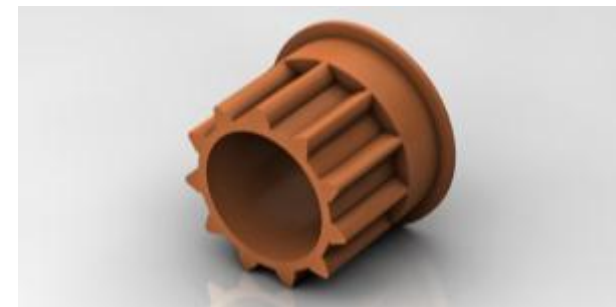
forms extremely tough antimicrobially active surfaces even against multi-resistant microorganisms.

High-temperature PA and PEEK powders

used as thermoplastic matrices are some of the most suitable products available for fast and efficient mass production.

P84® polyimide powder

can be manufactured using sinter technology into big semi-finished parts with best mechanical properties and high quantities of small accurate parts.



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