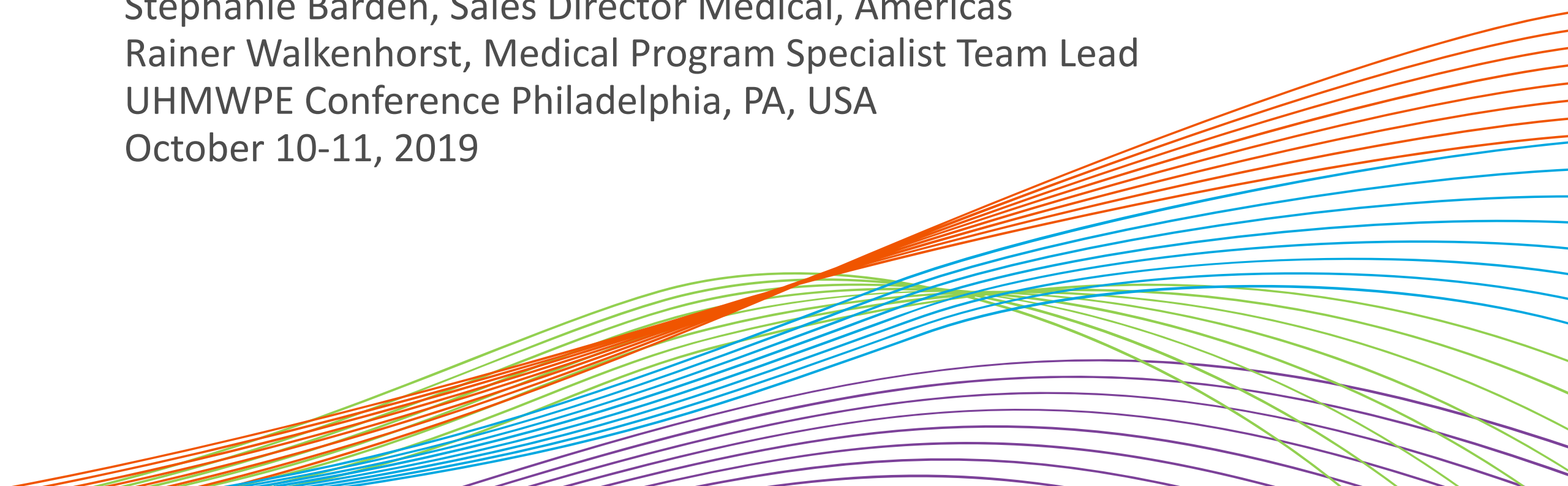


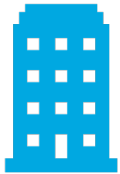
Celanese Stewardship of Medical Grade Materials and Technologies: Past, Present, and Future

Stephanie Barden, Sales Director Medical, Americas
Rainer Walkenhorst, Medical Program Specialist Team Lead
UHMWPE Conference Philadelphia, PA, USA
October 10-11, 2019



- ▶ On behalf of Celanese Corporation, a warm welcome to all the delegates and participants at the 9th UHMWPE Conference
- ▶ Celanese continues to be committed to supporting the industry. We are pleased to be a key sponsor at this important event
- ▶ We developed and started to supply GUR® UHMWPE to the Industry in the early 1960's
- ▶ Over the decades we have continued to improve product hygiene and optimized grades and formulations (including GUR® UHMWPE Vitamin E grades)
- ▶ We look forward to a productive conference and dialogue this week

Celanese Corporation is a global specialty materials leader in the production of differentiated chemistry solutions and specialty materials used in most major industries and consumer applications.



Based in
Dallas, Texas USA



Global network of
42 Manufacturing Sites



~7,700 Employees
worldwide



2018 Net Sales of
\$7.2 Billion

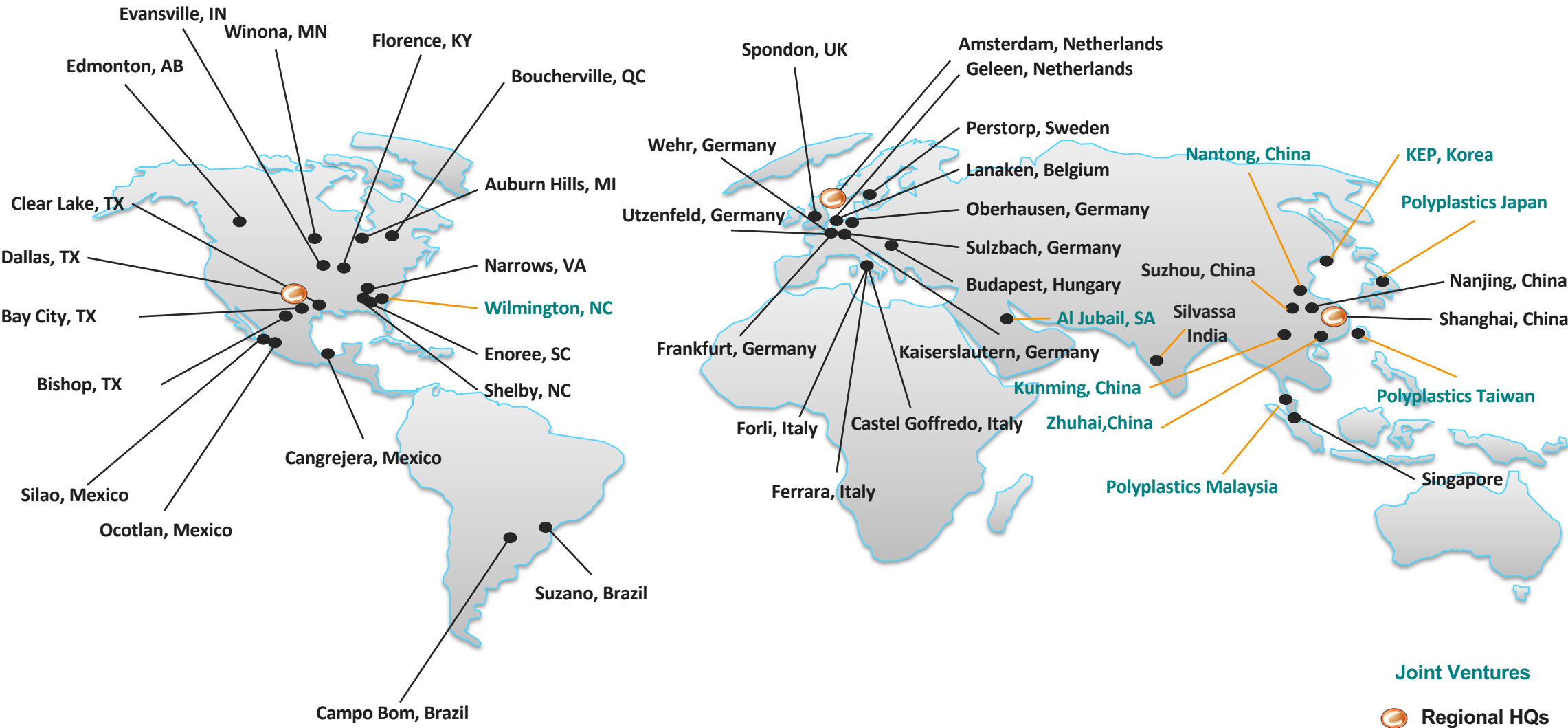
Our materials and chemicals products hold leading positions in the industries we serve worldwide and are complemented by a large, global production capacity, operating efficiencies, proprietary production technology and competitive cost structures.

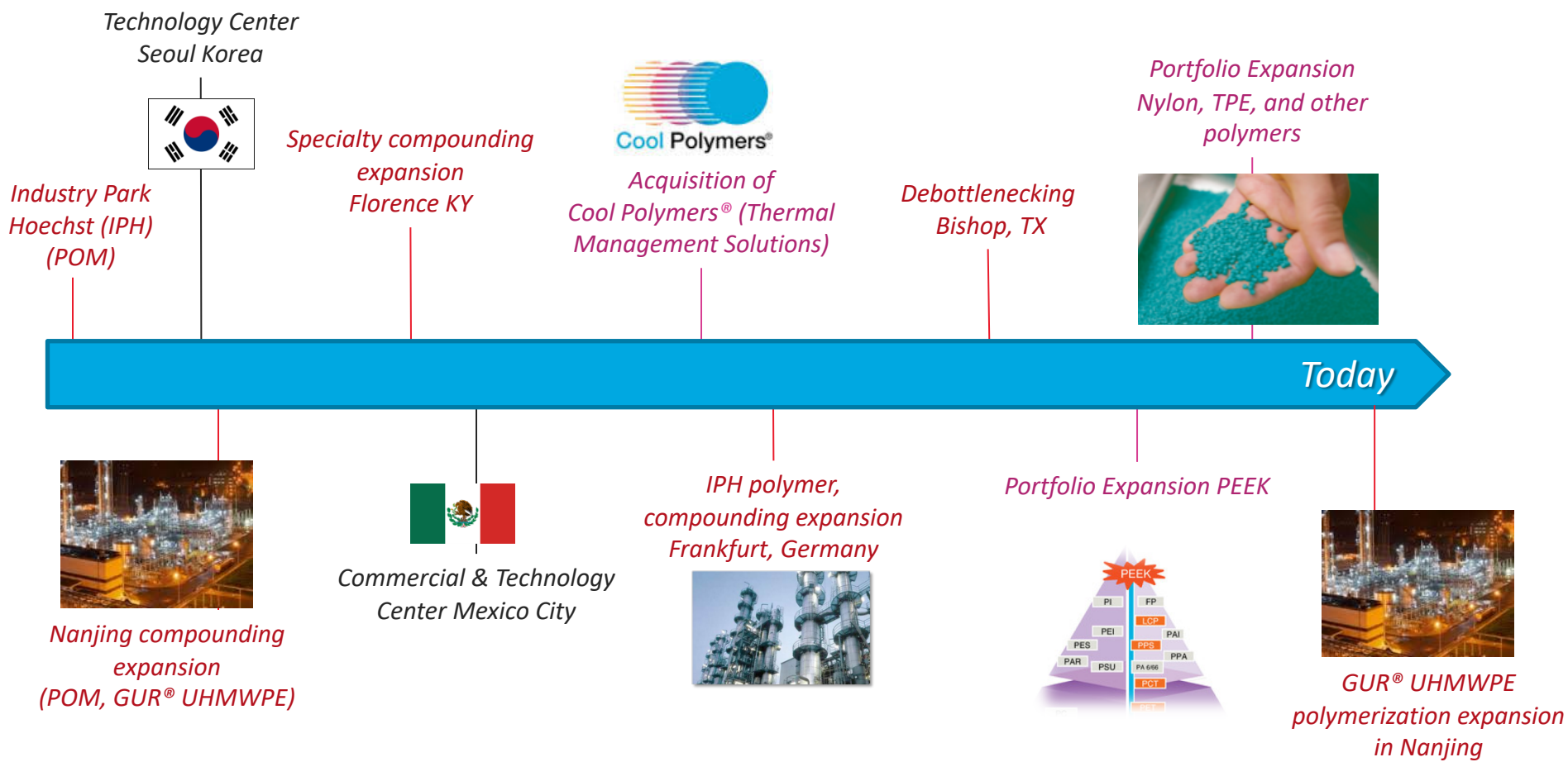
Celanese is a company of world-class chemists, material & polymer scientists, engineers, operators and professionals across the globe.

Celanese is represented by diverse backgrounds, cultures, capabilities and expertise.

We engage with customers to help them address a problem, accelerate product development or deliver a new solution for their customers.

Global Manufacturing Locations

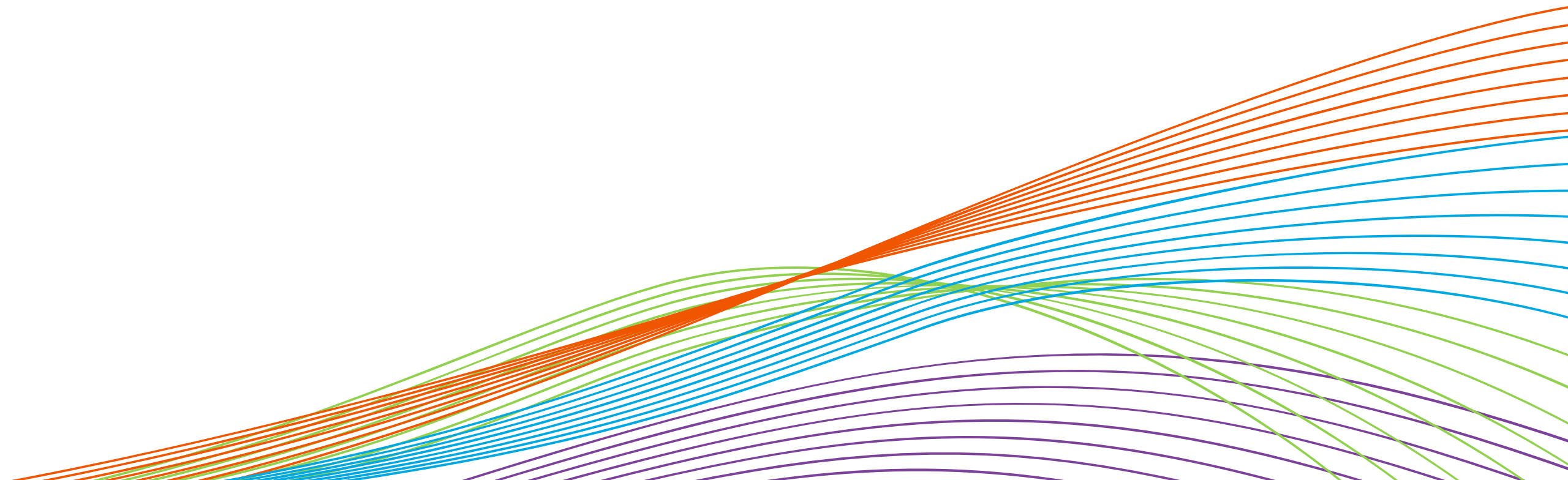




More than \$1 billion invested in polymer, specialty compounding, application & technical centers globally over the past 5 years

Celanese Medical Portfolio & Capabilities Overview

Portfolio & Materials for Healthcare Applications



Celanese History of Serving Key Medical Applications



Insulin pens
(POM, PBT,
LCP)



Dry powder inhalers
(POM, PBT,
LCP, PPS)



Artificial hip joints
(UHMW-PE)



Advanced Surgical
instruments
(PPS, LCP)



Safety Syringes
(POM)



Filtration
(PBT, PBT, UHMW-PE)



Cannula disposal
unit
(POM, PBT)



Diagnostics
(POM, PBT,
LCP)



Surgical Stapler
cartridges
(LCP)



Orthotic
component
(UHMW-PE)

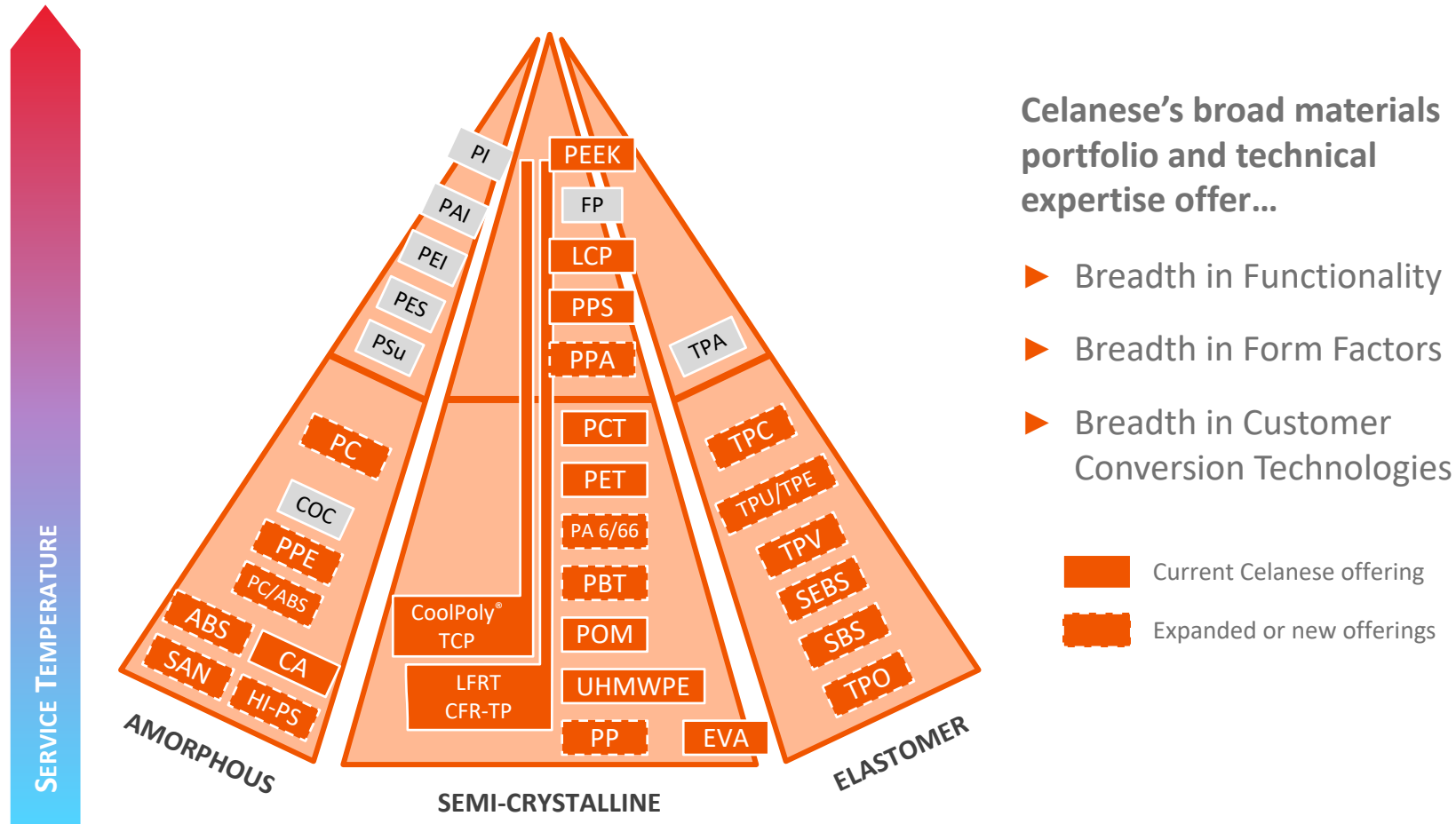


Connected
Devices
(LCP, PBT)




Microelectronic
Devices
(LCP)


40+ years of innovation history in approved medical applications



Celanese's broad materials portfolio and technical expertise offer...

- ▶ Breadth in Functionality
- ▶ Breadth in Form Factors
- ▶ Breadth in Customer Conversion Technologies

 Current Celanese offering

 Expanded or new offerings

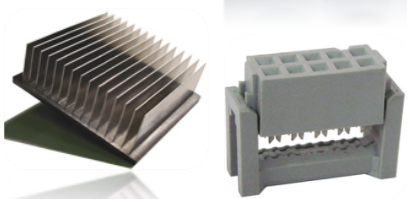
Celanese has one of the *broadest portfolios* spanning all thermoplastic classes

Overview of selected Celanese Capabilities in Healthcare



Wear and Implants

Hostaform® POM and GUR® UHMW-PE for friction, wear and medical implant technologies



Electronics and Heat Management

Vectra® LCP for high flow, thin walled designs. CoolPoly® TCP for heat dissipation and molded-in thermal management



Color and Aesthetics

Molded-in color and special effects available in most brands including medical extrusion grades



Controlled Release of Actives

VitalDose® EVA for controlled release for better drug utilization, safety profile, and product design

Leading Supplier to Medical Industry for Decades | Drug Delivery (e.g., inhalers, insulin pens) & Orthopedic Implants

VitalDose® Controlled Release Excipient EVA

Regulator-approved,
Easy-processing,
Controlled-release drug
delivery



**Hostaform® MT®
SlideX® POM**

Exceptional low friction
and noise in drug
delivery devices



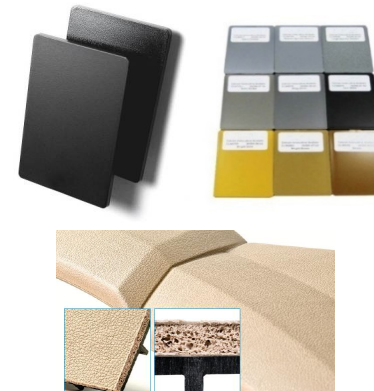
**Vectra® LCP
for Laser Direct
Structuring**

Integrate structure and
electronics in a single
component for smart
medical devices



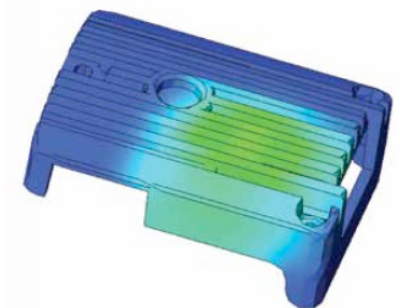
**Celanese Appearance
Polymers and SO.F.TER.
Elastomers**










Improved haptics and
appearance for medical
devices



**CoolPoly®
Conductive
thermoplastic materials**

Thermally and
electrically conductive
materials enabling
control of temperature
and electrical
management

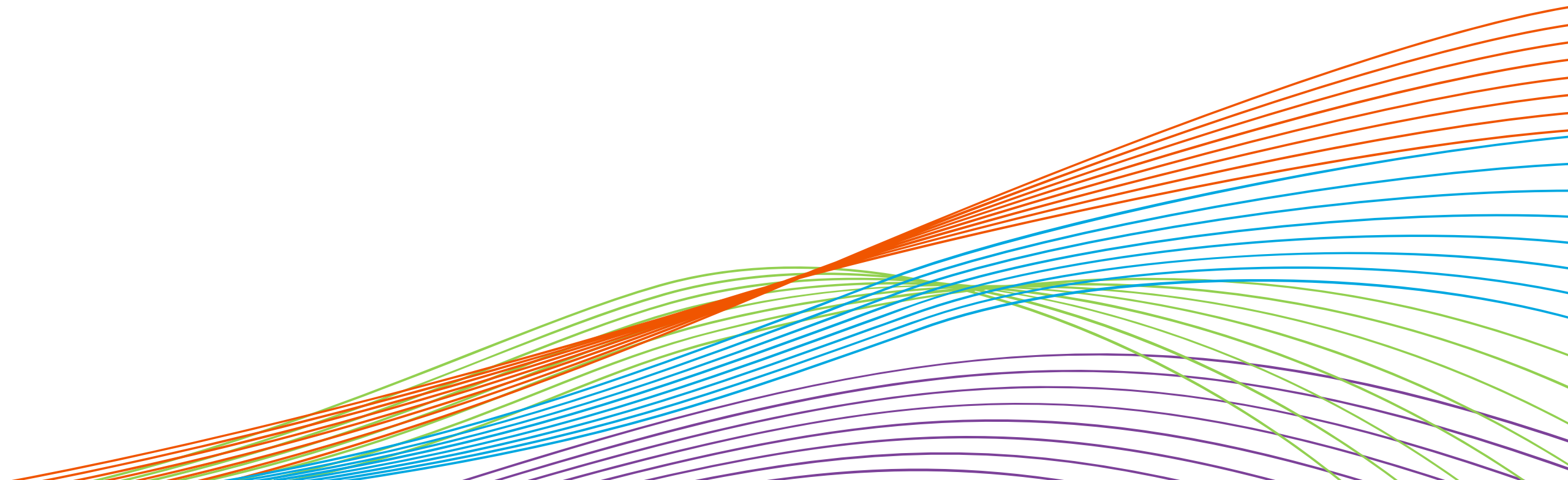


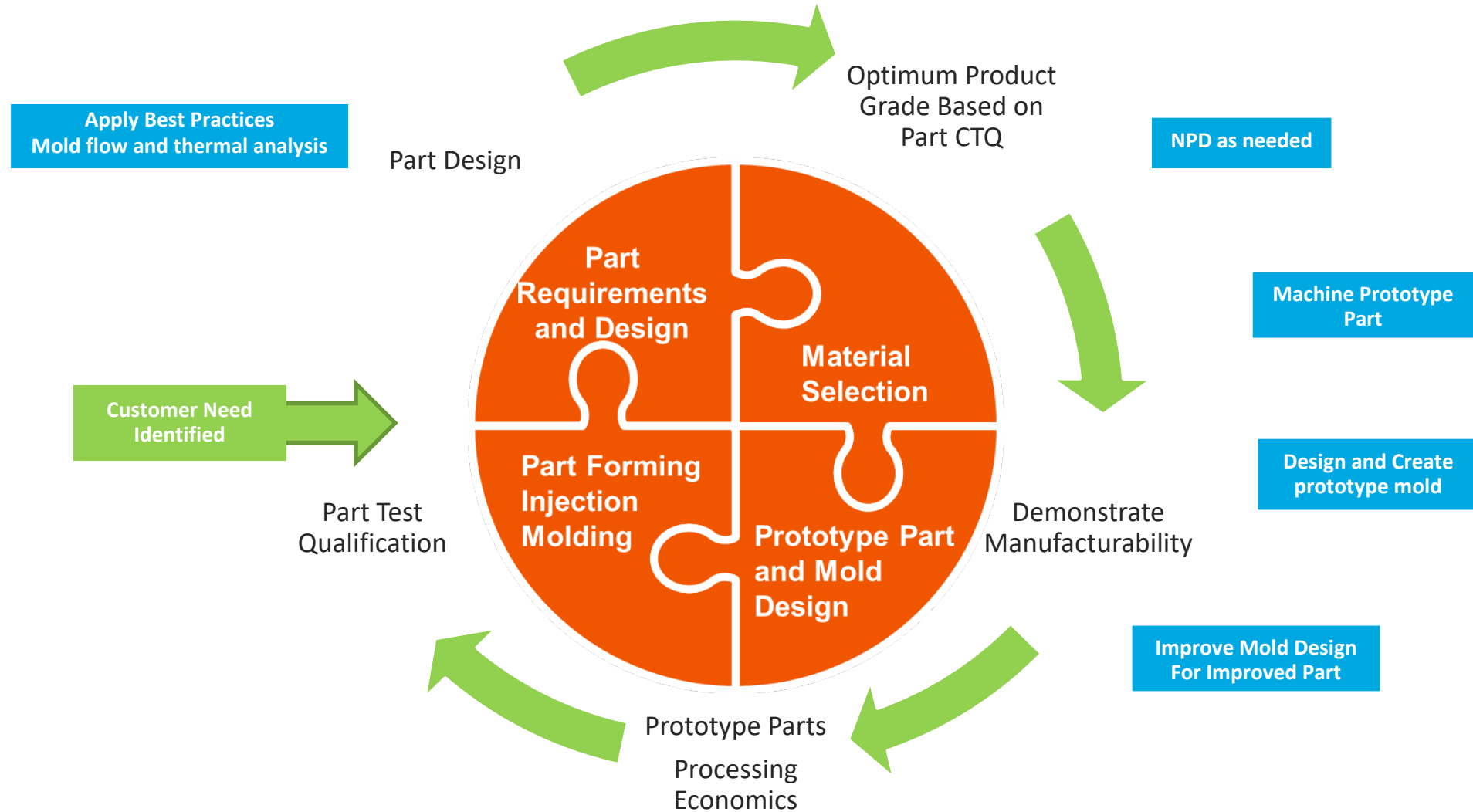
- ▶ Material compliance to FDA and EU requirements 
- ▶ Long-term supply assurance without change of formulation 
- ▶ Animal- and latex-free formulations 
- ▶ Certified biocompatibility (USP 23 Class VI / ISO 10993, etc.) 
- ▶ FDA Drug & Device Master Files 
- ▶ Individual analytical tests per lot / delivery (purity control) where appropriate 
- ▶ Expanded certificate of inspection 
- ▶ Change management to GMP-principles 
- ▶ Support in Regulatory Approval 

Reduce the Barriers to Register Your Device | Achieve a New Level of Proven Material Quality

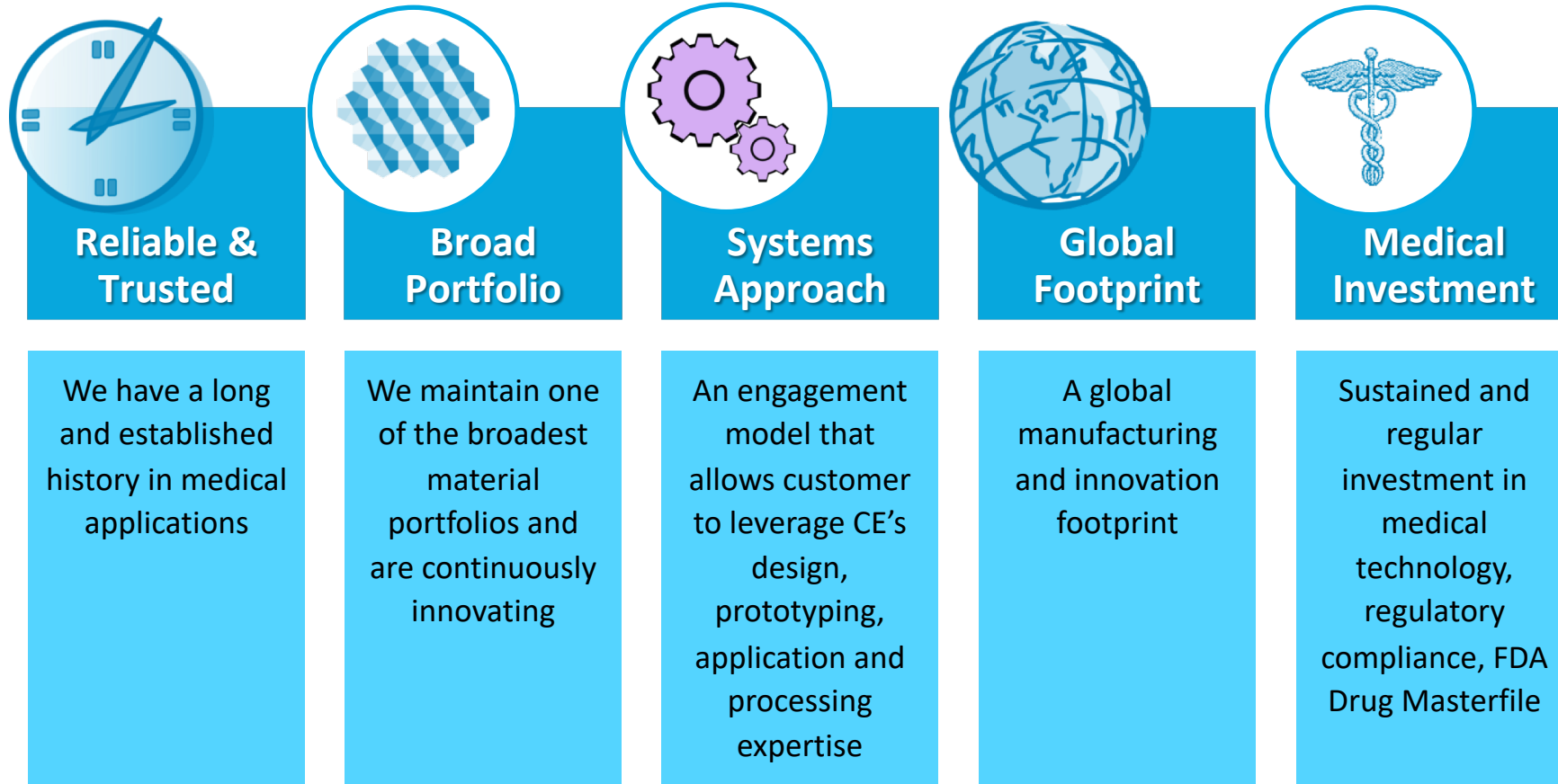
Celanese Medical Portfolio & Capabilities Overview

Leveraging Our Design & Application Expertise





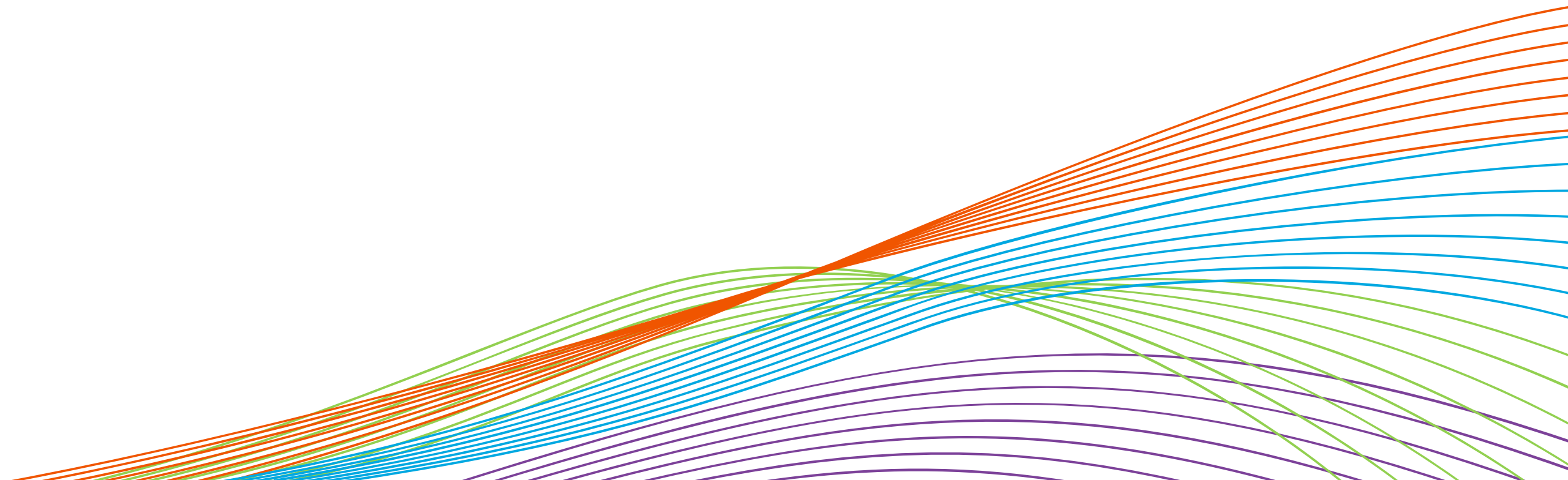
Partnering with Celanese offers you the opportunity to leverage...



Our vision is to be your “first-choice chemistry solution provider”

Celanese GUR® UHMWPE in Orthopedics

Clinical History, Responsibility and Commitment



In the Beginning - the First 30 Years of TJR...

Birth of UHMWPE (RCH 1000)

First pilot **GUR® UHMWPE** unit in Oberhausen, Germany
Ziegler polymerization

1955



First **GUR® UHMWPE** production unit in Oberhausen, Germany 1960

Hifax 1900 started (Hercules, later Himont, later Montell in different plants) started in the 60s until 2002

Trade name Chirulen® was created
Compression molding only Type 1 dedicated press
Early 70s

GUR® UHMWPE 412 and 415 as Type 1 and Type 2 grades in US (Bayport plant)
Early to Mid 80s



Ruhrchemie Oberhausen completely taken over by Hoechst AG
1984

GUR® UHMWPE production unit in Oberhausen, Germany increased to 10kt/y
1982

1955

1960

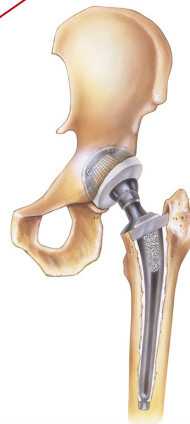
1970

1980

1985

Charnley started THR development with PTFE
1958

Charnley adopted UHMWPE for THR
1962



General commercial release of the Charnley LFA
1969

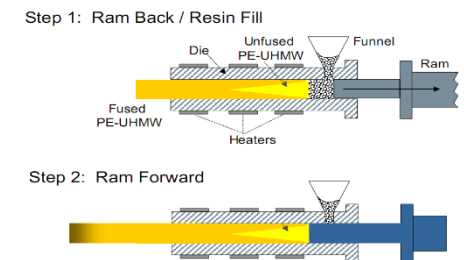
Poly II™
Carbon fiber reinforced UHMWPE
Mid 70s



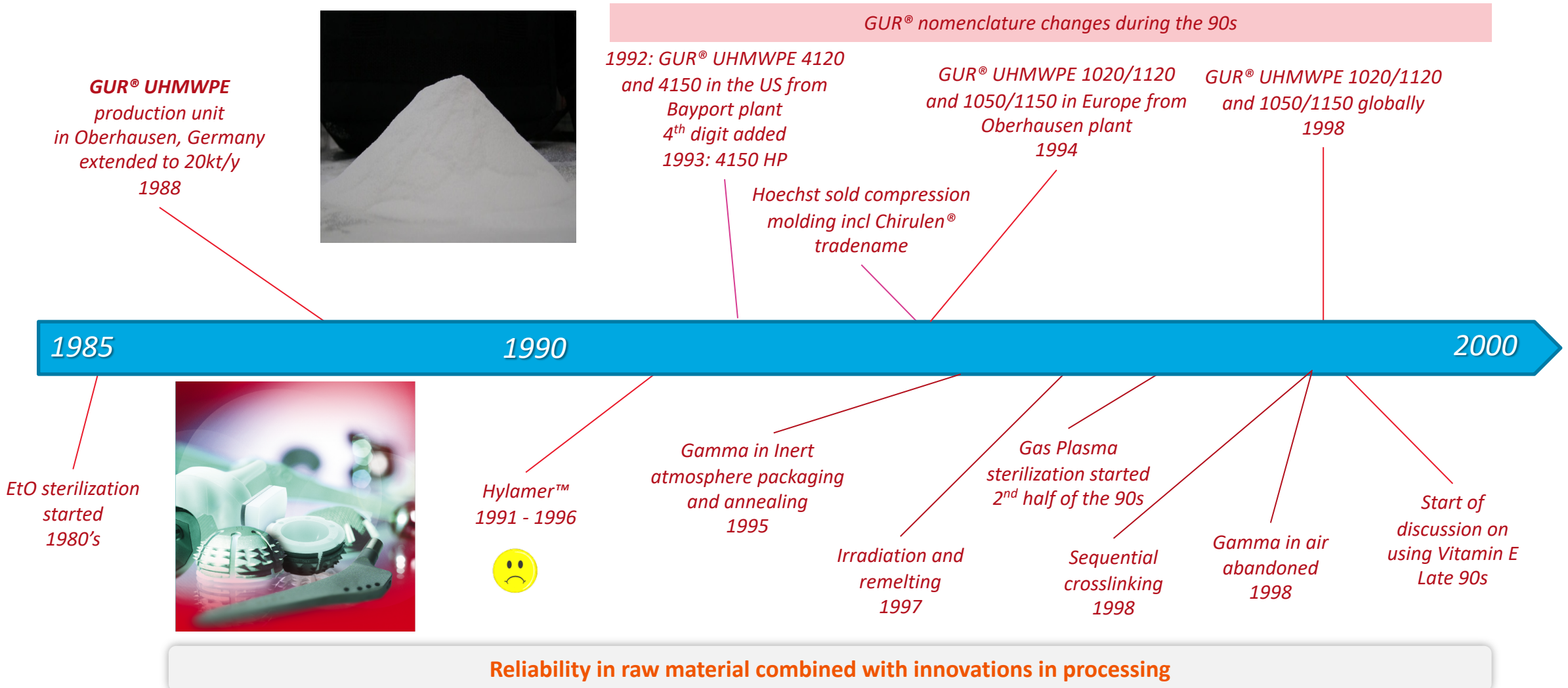
Direct compression molding started
mid 70s

Development of irradiation crosslinking starts
mid 70s

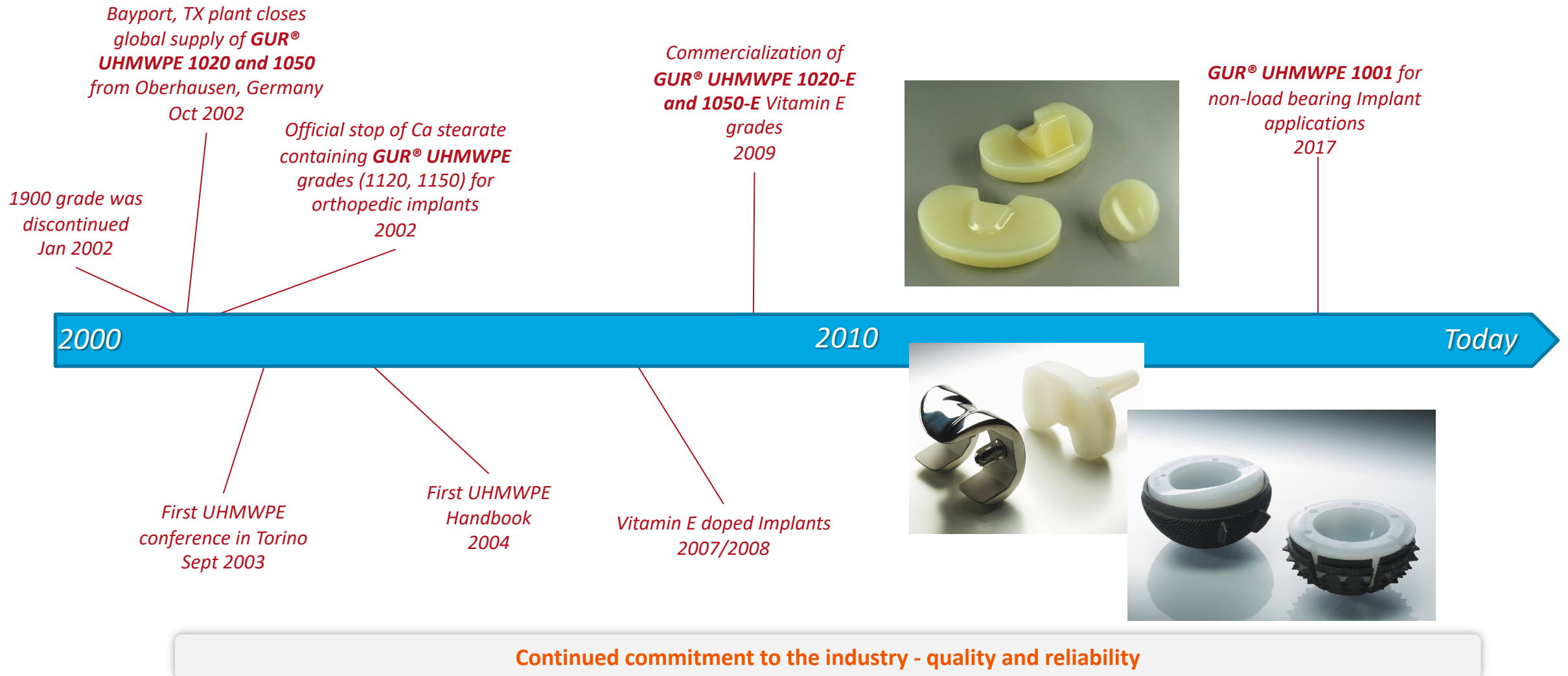
Ram extrusion of **GUR® UHMWPE 415** started



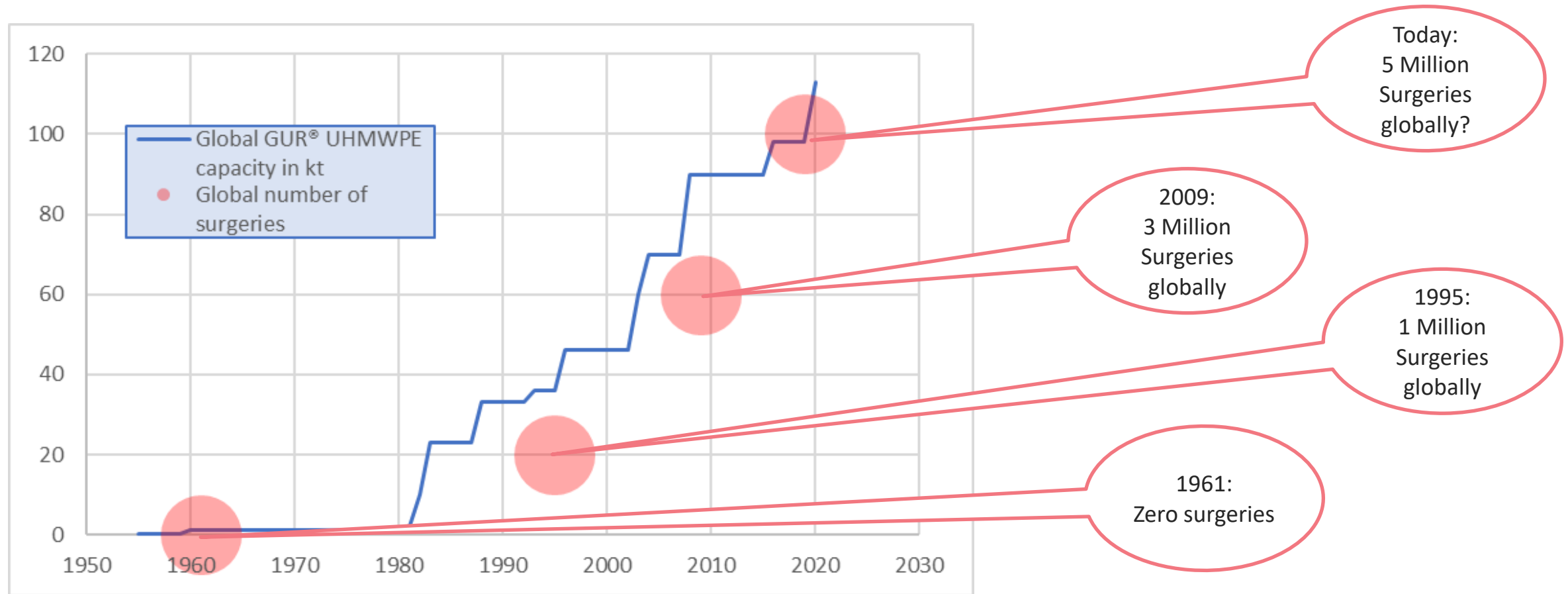
GUR® UHMWPE has been in integral part of orthopedics right from the beginning



The recent past

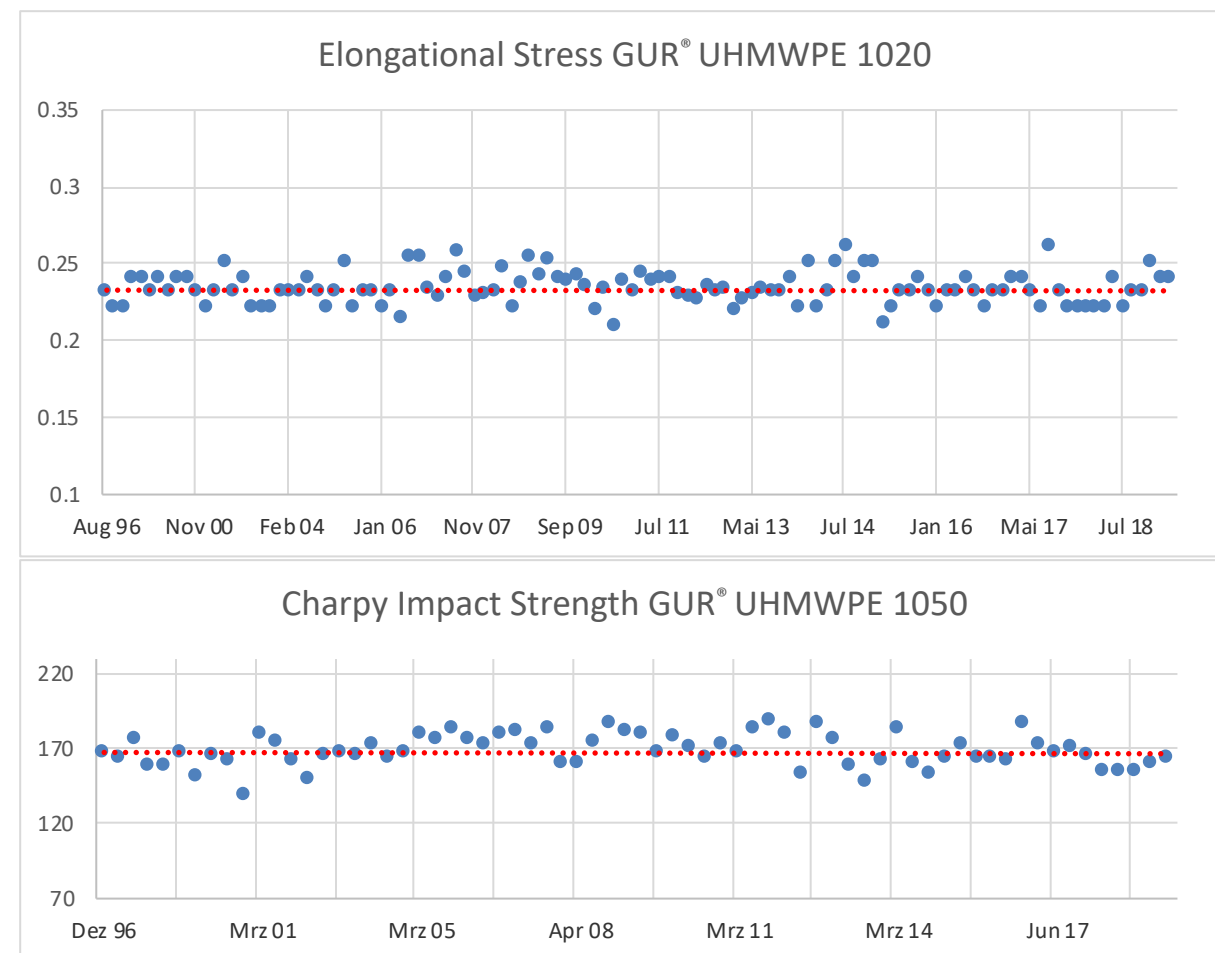
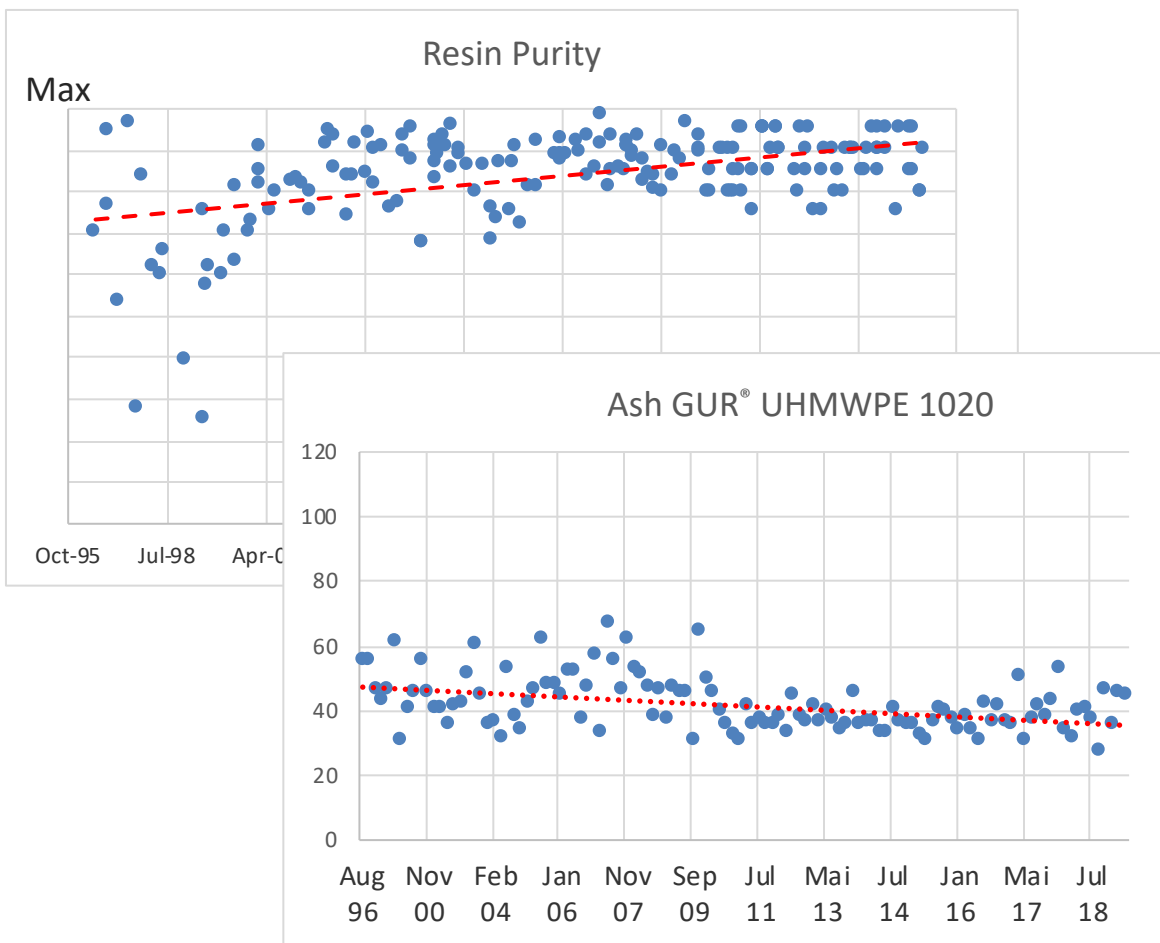


GUR® UHMWPE Capacity increase and Development of Orthopedic market



Capacity increase correlated with demand

GUR® UHMWPE Quality and consistency of performance



Celanese has served the orthopedic industry over almost 60 years with continuously improved purity and consistent quality



Disclaimer & Contact Information

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