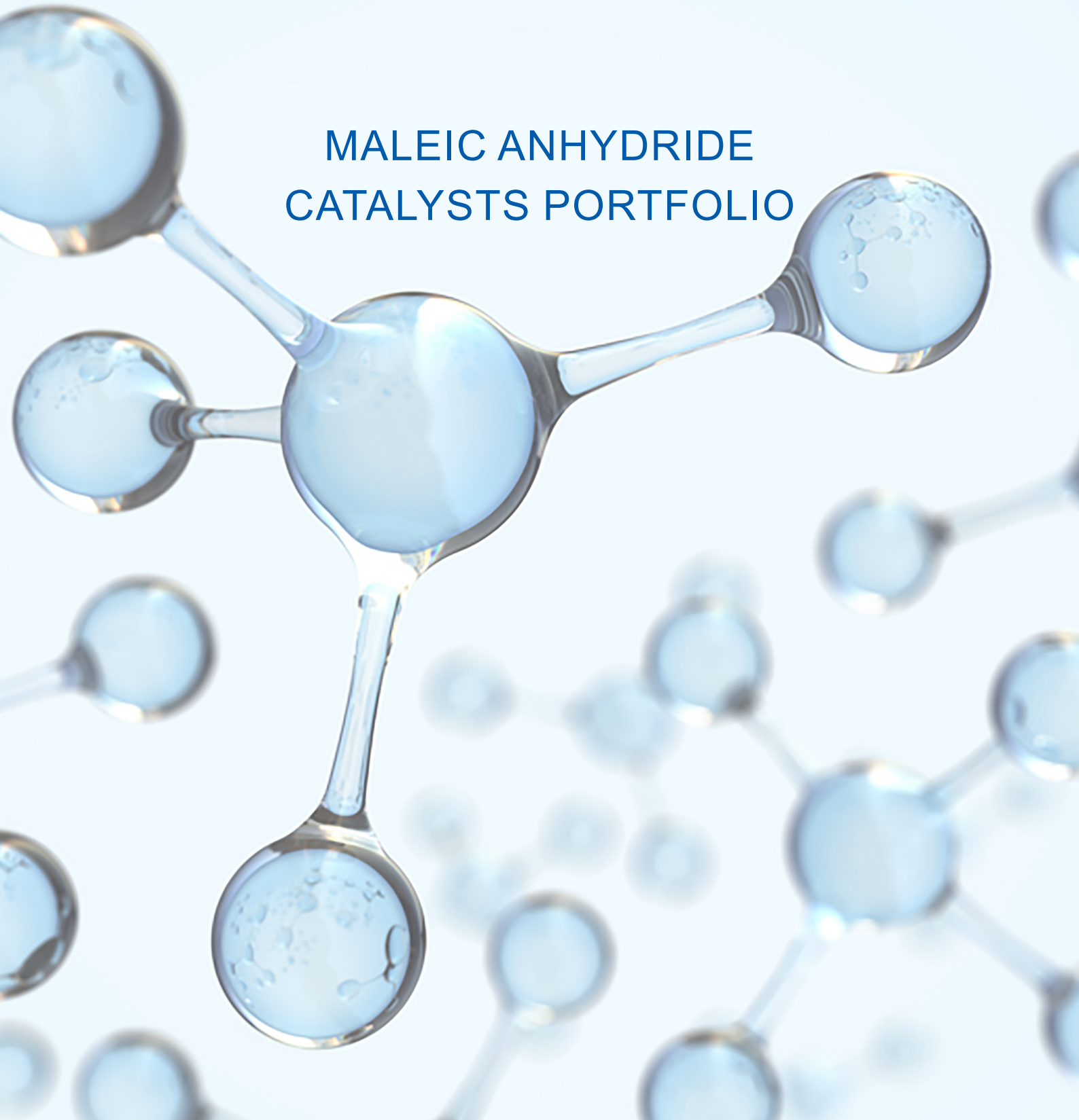
MALEIC ANHYDRIDE CATALYSTS PORTFOLIO



MALEIC ANHYDRIDE CATALYSTS PORTFOLIO

Production Sites

Polynt S.p.A. - Italy (Scanzorosciate)

Polynt Group

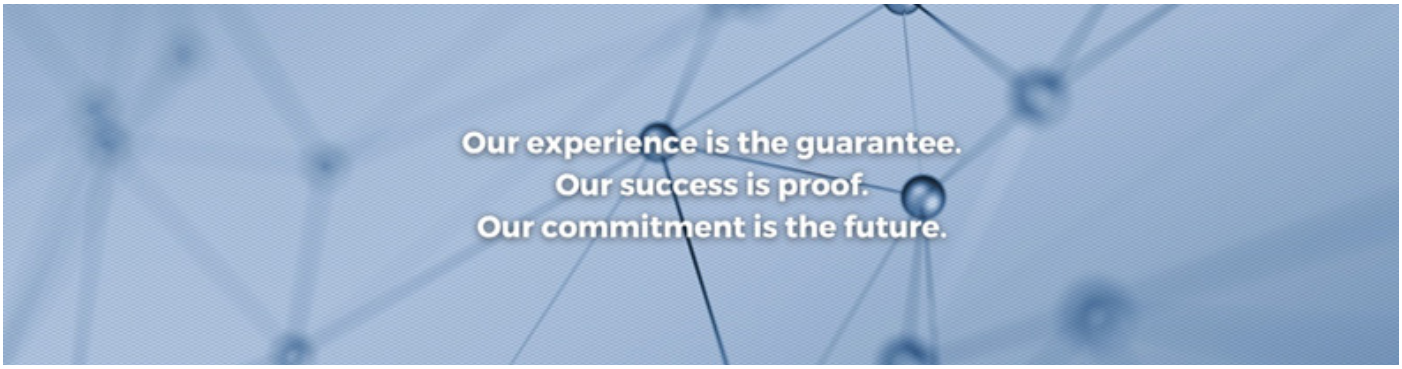
After the merger with Reichhold on May 2017 the new Polynt Group is a global Company in the Intermediates, Coating and Composite Resins, Thermoset Compounds, Gel-coats and niche Specialties.

This combination enhances the Group's leading position as a global vertically integrated specialty chemicals player, with significant global presence in Europe, North America and Asia, a strategy initiated by Polynt with the successful integration of PCCR and CCP in the last years and now further reinforced by Reichhold's global scale, extensive product portfolio and R&D competencies.

Polynt Group is known for its superior quality and impressive range of products and with its excellent distribution network it can provide first-class service to customers whatever their market. Customer Service and Technical Service teams are renowned for their customer focus, offering the best service even after products have left manufacturing.
The Group strives to keep customers satisfied, assisting them in producing premium quality products every time they use its products.Product innovation is important for the Group's business and it is the reason for which it constantly works with customers to find solutions to problems.
Introducing new or improved products ensures that Polynt Group continue not only to deliver what the market wants and needs, but also when it is wanted and needed.

Table of contents

POLYNT CATALYSTS: Innovation and Quality



PEOPLE ORIENTED CHEMICAL INDUSTRY

Polynt is a leader in the production of Composites, Intermediates, and Coatings. We provide a wide range of products designed for key sectors like agro-food, biomedical, construction, electronics, logistics, and maritime industries.

Through specific production technologies and custom design solutions, Polynt continues to benefit from a growing network of loyal customers. We pay special attention to R&D activities, technology implementation, and process control to meet the increasing demand for safety and quality as required by current markets. Polynt invests in research, innovation, and development to provide advanced, sustainable, and responsible solutions.

Polynt is present in Four Continents with 37 production and commercial sites that contribute to the creation of thousands of items that improve quality of life, while respectfully sustaining the ecosystem balance.

OUR VALUES AND SKILLS

CATALYSTS IN POLYNT

Polynt is a strategic player in the production of selective oxidation catalysts due to our substantial experience and extensive knowledge in the field. Polynt catalysts are mostly used in the production of maleic anhydride from n-butane/benzene and phthalic anhydride from o-xylene. However, Polynt also offers custom and exclusive solutions for our Clients.

Maleic Anhydride from n-butane

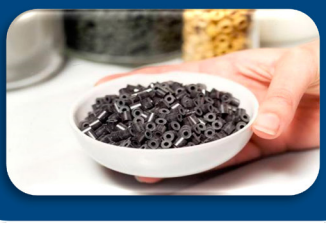
Fluid bed

Maleic Anhydride from benzene

Fixed bed

Maleic Anhydride from n-butane

Fixed bed



Phthalic Anhydride from o-xylene

Pyromellitic Dianhydride from durene

Custom Manufactured Catalysts (CMC)

The production site, as well as the Commercial and R&D Departments are located at our headquarters in Scanzorosciate (BG), Italy. At this location, catalysts are manufactured for internal use or sold and distributed globally to our customers. The centralization of all these functions ensures complete control of the process, from bench scale to commercialization.

Thanks to powerful R&D capabilities, partnered with state-of-the art equipment and efficient production facilities, Polynt offers innovative and strategic catalytic solutions to improve cost effectiveness and the environmental footprint of chemical processes.

R&D Catalyst and Technical Service

Our R&D Catalyst Department and Technical Service Team (TS) make Polynt one of the most competitive and reliable players in the catalyst market worldwide. The unprecedented expertise of our team members ensures comprehensive support from conception throughout the life of the catalyst. Polynt provides top-notch service in terms of customer care and satisfaction.

R&D CATALYST

Over more than 50 years, Polynt has developed a powerful R&D Catalyst Department that continuously strives to offer innovative and sustainable solutions, in accordance with our vision. We are driven to improve catalyst performance and develop new catalyst generations, surpassing customers' expectations.

Outstanding results are achieved by the R&D Department due to the highly educated and expert R&D team and the well-equipped facilities, which include:

- **Technological laboratory** where catalyst preparation (synthesis, shaping and thermal treatment) is conducted. Our team capabilities include:

CATALYST PREPARATION
SYNTHESIS
Reaction
Impregnation
Coating
SHAPING
Granulation
Milling
Tabletting
Spray-drying
THERMAL TREATMENT
Fixed-bed
Fluid-bed

- **Quality Control and Analysis laboratories**, well-equipped with advanced instrumentation which can fully characterize both inorganic and organic substances. Our analytical instrumentation includes:

ANALYTICAL INSTRUMENTATION

BULK PROPERTIES	
X-Ray Diffraction (XRD)	TG-DSC
IR (NIR and FTIR)	UV-Vis
Particle Size Distribution (PaSD)	

CHEMICAL COMPOSITION	
X-Ray Fluorescence (XRF)	ICP-OES & ICP-MS
HPLC & HPLC-MS	GC & GC-MS
S and C content	Ionic Chromatography

SURFACE PROPERTIES	
Nitrogen adsorption	Mercury intrusion
Scanning Electron Microscope (SEM)	Raman Spectroscopy

- Fully automated **Pilot Plant Reactors** that are ready and available for testing catalysts under a wide range of operating conditions.

PILOT PLANT REACTORS

INTERNAL DIAMETER
21 mm
25 mm

TUBE LENGTH
3600 mm
6000 mm
7000 mm

Our R&D Department collaborates with several external Partners and Universities, which have given us the opportunity to expand our catalyst knowledge and develop innovative catalyst formulations.

TECHNICAL SERVICE (TS)

Before catalyst loading, Polynt provides our Client with the catalyst Operating Manual (OM), containing all the safety information and details necessary to properly load the reactor, start-up the fresh catalyst, and optimize the oxidation yield.

Polynt will send specialists to the Client's location to over-see the steps involved in catalyst replacement and reactor commissioning, which include:

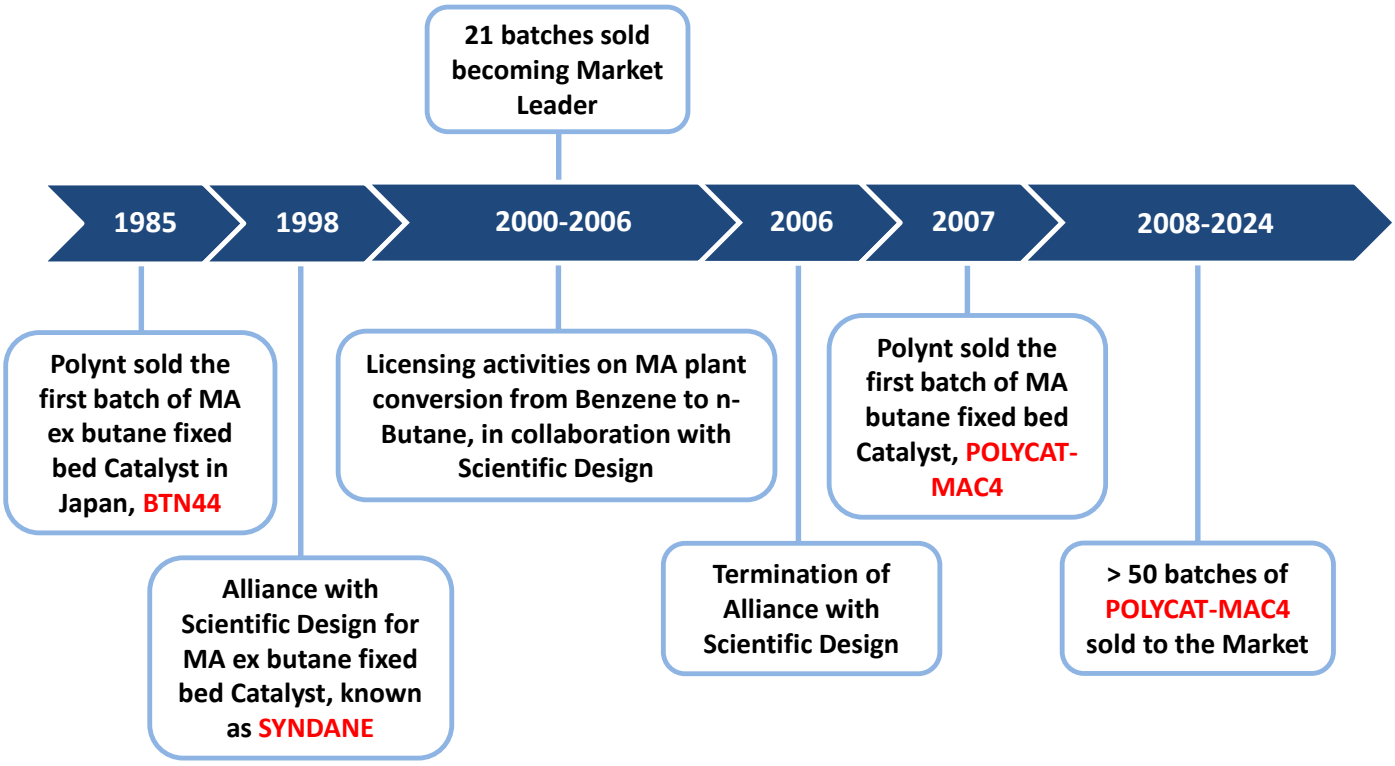
- Reactor inspection prior to catalyst loading
- Spring insertion
- Loading of catalyst and inert
- Reactor and catalyst heating, activation, and ramp-up
- Initial catalyst performance optimization

Throughout the life of the catalyst Polynt will provide our Clients with continuous and reliable Technical Service in order to optimize catalyst operating conditions and performances, ensuring the best customer experience possible.

POLYCAT-MAC4: Maleic Anhydride Catalyst

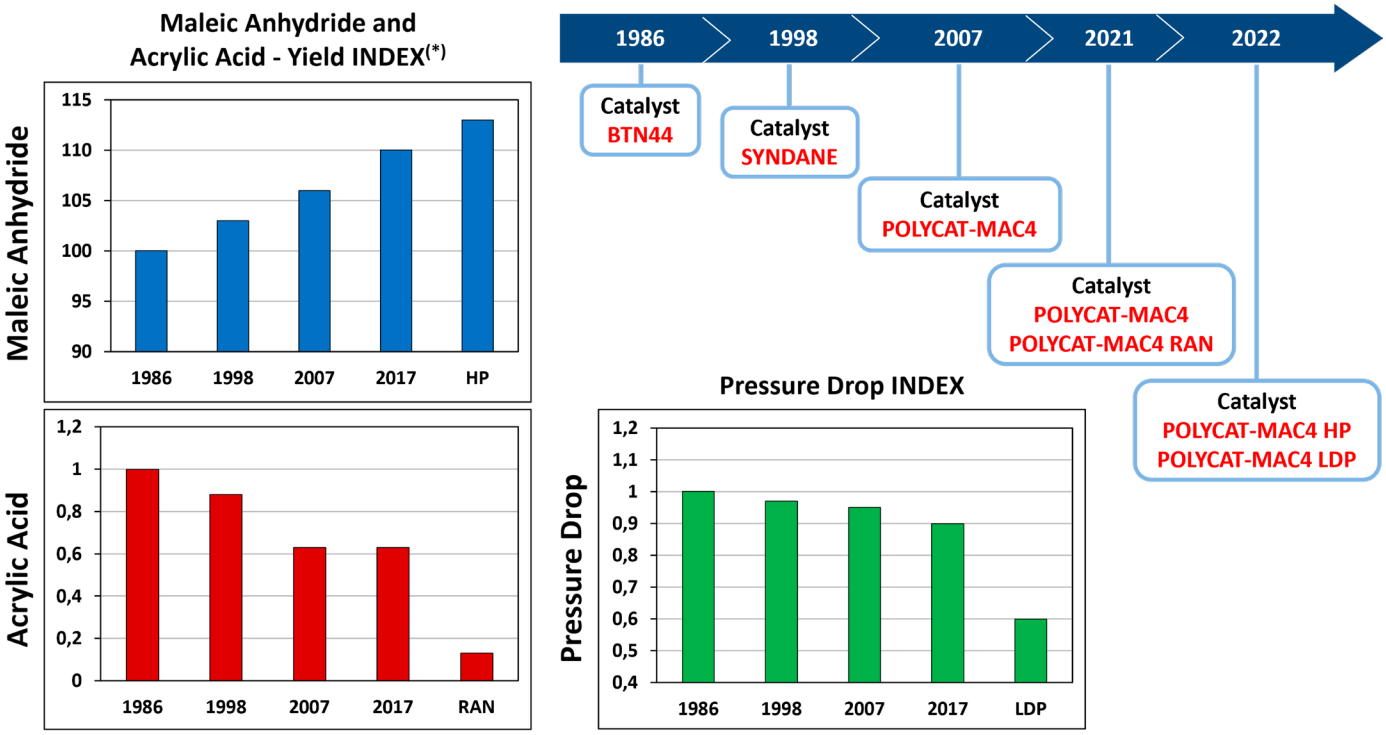
POLYCAT-MAC4 HISTORY

Polynt has almost 40 years' experience and expertise in the production of catalysts for the conversion of butane to maleic anhydride through fixed bed technology. The first batch of maleic anhydride catalyst (BTN44) was sold in 1985. A new generation of catalyst was developed in 1998, by collaboring with Scientific Design. Due to the 21 batches of catalyst sold in the early 2000s, Polynt became the market leader in the production of catalysts for the conversion of butane to maleic anhydride in fixed bed reactors. After the termination of alliance with SD, Polynt put all efforts into developing a new catalyst generation. The result is POLYCAT-MAC4, whose first batch was sold in 2007. Since then, more than 50 batches of POLYCAT-MAC4 have been sold worldwide.



POLYCAT-MAC4 CURRENT GENERATION

Since the first commercially successful catalyst batch in 1985, Polynt's R&D department has continuously worked to improve catalyst performances by properly designing the preparation method (i.e., formulation, shaping and/or thermal treatments). Catalyst yield to maleic anhydride has improved over the years, reaching outstanding values with the new MAC4 HP21 generation, developed in 2021. During that time, another generation of MAC4 catalyst, MAC4 RAN, was released. This new formulation reduces the formation of reaction by-products (mainly acrylic acid) by about 65%. The newest catalyst added to our portfolio is MAC4 LDP, which ensures low pressure drops even at severe operating conditions thanks to the shape design. More detailed information about the new generations of POLYCAT-MAC4 is available at page 10 of this document.



(*) Performance INDEX are calculated using as reference the BTN44 Catalyst Generation (1986)

MAC4: Catalyst Portfolio

	POLYCAT MAC4	POLYCAT MAC4 RAN	POLYCAT MAC4 HP21	POLYCAT MAC4 LDP
Application	Gas phase oxidation of n-butane to maleic anhydride for fixed bed technology			
Composition	Promoted Vanadyl-pyrophosphate $(VO)_2P_2O_7$			
Catalyst shape	Hollow cylinders			Properly de-signed shape to ensure low pressure drop
Catalyst size	Medium Loading (ML) O.D. = 4.7-4.9 mm L = 4.6-5.0 m		High Loading (HL) O.D. = 5.5-5.8 mm L = 5.4-5.8 mm	High Loading O.D. = 6.4 mm L = 5.8-6.0 mm
Catalyst configuration	Single layer	Double layer	Single layer	Single layer
Catalyst performance	Standard	Low Acrylic	High Yield	Low ΔP
Synthesis	Chloride free			
Delivery state	Activated			

Typical Operating Conditions

	POLYCAT MAC4	POLYCAT MAC4 RAN	POLYCAT MAC4 HP21	POLYCAT MAC4 LDP
n-butane inlet concentration	Up to 2.1 vol.%			
n-butane conversion	80-87%			
GHSV	Up to 2,400 h^{-1}			
Inlet pressure	Up to 2.0 barg			
Pressure drop	0.08-0.20 bar/m			
Salt Bath Temperature (SBT)	Start of Run: approx. 390-415 °C End of run: approx. 430-440 °C			
Hot Spot Temperature (HST)	420-450°C, or as agreed with POLYNT			
Promoter	As agreed with POLYNT in the range 0.5-10 ppm vol.			
Humidity	Adjusted with steam to 2.0-3.0 %			
Life	Up to 6 years			

Typical Reactor Design

	POLYCAT MAC4	POLYCAT MAC4 RAN	POLYCAT MAC4 HP21	POLYCAT MAC4 LDP
Number of tubes	Up to 30,000			
Inner diameter of tubes	21-25 mm			
Tube Length	Up to 7,000 mm			

COMPANY ADDRESSES

EUROPE

ITALY

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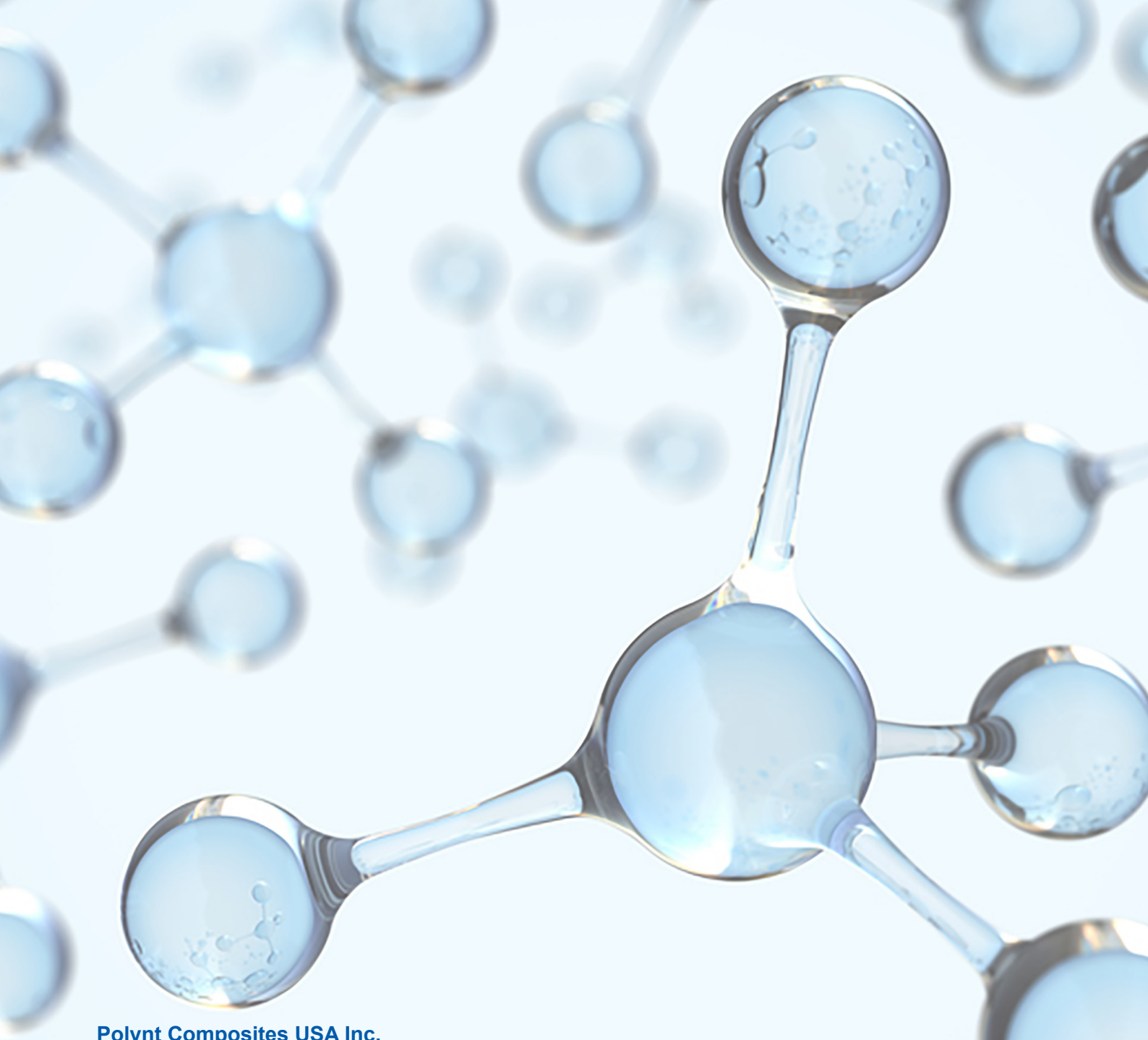

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