

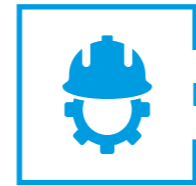


EPC GROUP

WHO WE ARE



TECHNOLOGY LICENSING



ENGINEERING SERVICES



PLANT CONSTRUCTION



>1000
Projects



> 300
Engineers & Specialists



> 140 years
of Experience

✓ As a general contractor we offer you all the necessary services required for the successful delivery of your project. We are experts in the fields of polymers & fibers, as well as in chemical plant construction.

✓ Plant revamping, optimization, maintenance work and staff training are integral parts of our extensive services.

A Member of **EPC** GROUP



- Chemistry
- Pharmaceuticals & Fine Chemistry
- Polymers & Fibers
- Renewable Energies
- Biotechnologies
- Engineering Services & Infrastructure



- Cryogenic Systems
- Systems for Compression & Liquefaction of Gases
- Small Scale LNG Systems
- Air Separation Systems
- CO₂ Technologies
- Special Applications for Technical Gases



- Construction Engineering
- Infrastructure
- Building & Civil Engineering
- Project Management
- Technical Building Equipment

A MEMBER OF
EPC GROUP

IDEAS INSIDE ^{EPC}



EPC
ENGINEERING & TECHNOLOGIES

Polycarbonate Production Plants

Cutting-Edge Technology for Producing Polycarbonate



CONTACT

EPC Engineering & Technologies GmbH

Siemensstrasse 24 - 26
63755 Alzenau
Germany

Phone: + 49 6023 5017 - 2110
Fax: + 49 6023 5017 - 2117
Email: alzenau@epc.com
Web: www.epc.com



EPC Group is certified per DIN EN ISO 9001



Highest Plant Productivity – Highest Product Purity

For more than 50 years polycarbonate has demonstrated an inexhaustible potential for innovative applications - and the success story of this polymer material continues. Its market demand is growing and new markets are developing.

We EPC cannot imagine today's world without polycarbonate and that's why we developed the state-of-the-art non-phosgene technology. Our PC technology coupled with our most modern design of a turnkey production plant – ensures highest plant flexibility and productivity as well as polycarbonate purity.

In addition, EPC ensures smooth integration with upstream technology providers to achieve an optimally integrated overall plant design providing economical and environmental feasibility and satisfying the highest safety standards.

IDEAS INSIDE ^{EPC}



Polycarbonate production plants.
EPC: Your German polycarbonate technology provider

Polycarbonate and its modified copolymers are thermoplastic polymers. Due to their interesting physical properties such as light weight, temperature resistance and high impact resistance as well as outstanding optical properties, polycarbonates are widely used for high-tech products.

Melt polycondensation

EPC's process technology VARIPLANT allows the flexible and economic production of polycarbonate resin, using the non-phosgene melt process based on bisphenol A (BPA) and diphenyl carbonate (DPC) as raw materials.

VARIPLANT Process description:

BPA and DPC melt are taken over from the raw material production plants are fed into the raw material melt mixing tank. To achieve the high-purity monomer required for the production of high-quality polycarbonate, suitable purification steps such as filtration and stripping of impurities are considered.

Then the pre-heated raw materials are fed in liquid form in a defined molar ratio into the transesterification reactor. On its way towards the first reaction stage the raw material melt is mixed with catalysts and heated up to the desired transesterification temperature while adjusting a certain pre-conversion rate.

During the formation of monomer and polymer chains phenol begins to split-off. After the transesterification has been completed the formed oligomers are continuously discharged and fed into the prepolycondensation I reactor for the

next reaction step. Using higher temperatures and a lower vacuum, molecules of mid-size chain length are built-up.

After prepolycondensation I reactor (PP I) – depending on the design production rate- the plant will be designed with one, two or three polycondensation lines in parallel, which allows the production of up to three different product grades at a time.

The PP I product is then transferred to the prepolycondensation II reactor for further chain growth and subsequently to the final polycondensation reactors. The final polycondensation reactor is used to achieve the desired polymer chain length and hence the desired properties of the Polycarbonate. Both the horizontal prepolycondensation II stage and final reactor are equipped with a type of disc-ring agitator that provides a high surface area to ensure easy mass transfer and chemical reaction.

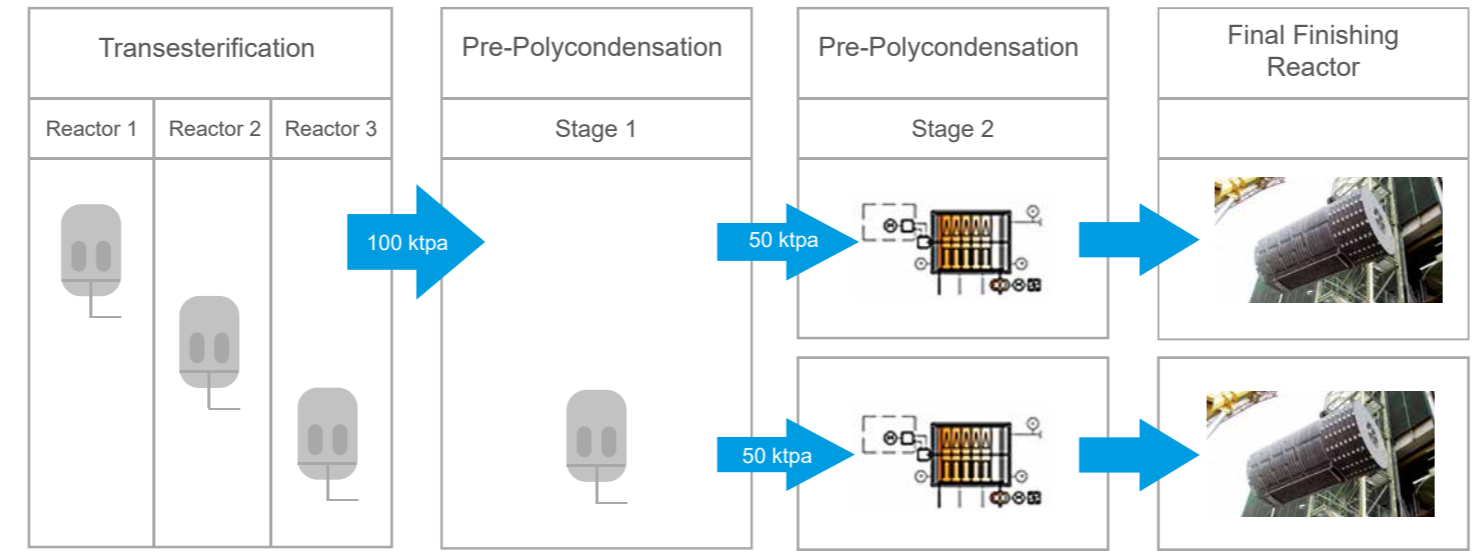
In-line additives compounding:

The product melt finally passes an in-line additive compounding extruder system where special additive agents like thermal stabilizer, color toner, mold release agent, UV light stabilizer and others can be continuously added to the final polymer melt stream. The final melt stream then is transferred to the pelletizing system where the PC chips are produced.

Down-stream compounding:

EPC can also offer a down-stream polymer compounding process technology and recipe formulation assistance as part of the offer. In particular the market of copolymers and flame-resistant polycarbonate (FR-PC) is growing i.e. for LED lighting and other markets. EPC's plant design includes all necessary utility systems, for example heating medium circulation, vacuum generation, chips cutting after final reactor and chips bagging system.

Flow Diagram – 100kta Polycarbonate



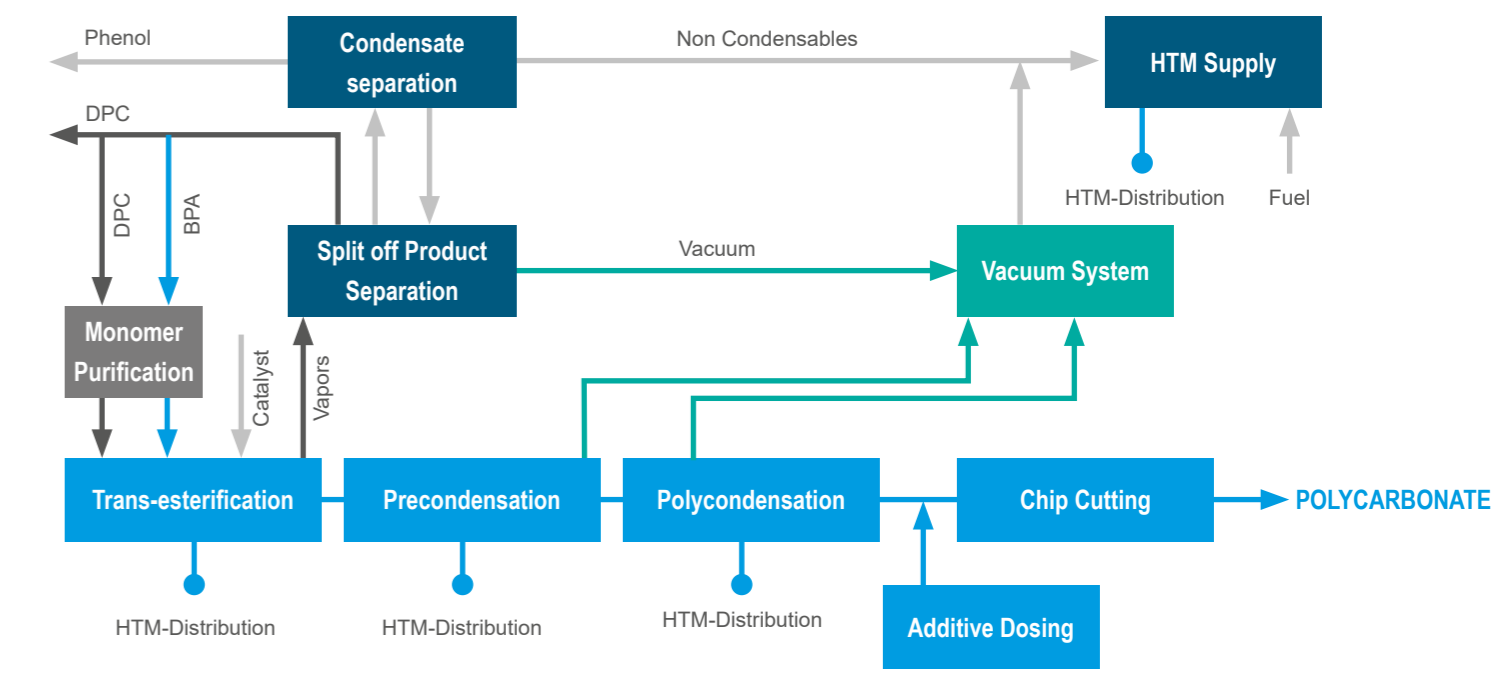
** Other Configurations and Capacities are Possible*

Technology Key Points



- Flexible & Reliable Design**
- ✓ Two independent finishing lines
 - ✓ Wide MFR range
 - ✓ Quick changewover between grades
 - ✓ Hermetically sealed system
 - ✓ Special material selection
 - ✓ High plant availability

Polycarbonate Process Overview



EPC Engineering & Technologies GmbH is your one-stop-shop for polycarbonate technology

- Process Technology Provider
- Supervision of Installation
- Supervision of Commissioning
- Extended PDP & Basic Engineering
- Supervision of Pre-Commissioning
- Recipe Development & Product Optimization
- Key Equipment Delivery
- Supervision of Plant Start-Up

YOU WOULD LIKE TO LEARN MORE ABOUT OUR TECHNOLOGIES?
 Let us know! We are looking forward to helping you.



Dipl.-Ing. / MBA
Michael Streng
 Member of the Managing Board
 Phone: +49 6023 5017 - 21 20
 Email: michael.streng@epc.com



Karol Kerrane
 Business Development Director
 Phone: +49 3628 66048 - 29 00
 Email: karol.kerrane@epc.com