



Cast Polyurethane industrial processing
The alpha and the omega of the low pressure machines

Baulé®





Designing the right processing machine

Cast elastomer processing is a relatively new industry which has evolved over the past years. Expectations in terms of accuracy, flexibility, equipment availability and reliability are rising. Therefore the use of the right low-pressure casting machine plays a key role in securing optimized production and is a potential game-changer for moulders.

With decades of experience and detailed knowledge in chemistry and processing, Covestro Elastomers continuously improves the innovation and industrialization of its machine technology. Our goal is to provide moulders with the perfect metering and processing equipment to meet their needs at anytime. In this aim we create superior and scalable casting machines for standard or special processes as well as associated on-line support services.



Baulé®

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Creating your perfect match

A flexible approach for custom-made machinery

Throughout its history, Covestro Elastomers has proven itself to be the answer to its clients' needs and requirements in the best possible way. In a perpetually evolving industry where reactivity is key, Baulé® scalable & tailor-made concept will allow our customers to access a machine that will meet their current and future requirements.

It will give to our customers a significant advantage in their market by ensuring the constant perfect match between their machine's capabilities and their needs.

What if your machine is able to flexibly evolve with your needs?

With the Baulé® alpha model, Covestro Elastomers offers its industrialized scalable concept. Every module of the Baulé® alpha machines has been designed to allow a large panel of options and variants. This huge industrial design effort

allows our customers to choose which features they want on their machine, and to keep on adjusting it to their needs as their circumstances evolve.

What if your machine is perfectly tailor-made to your needs even for a specific requirement?

When very specific capabilities are required, Covestro Elastomers offers its highly customized concept: the Baulé® omega model which may also integrate alpha concept sub-assemblies. We are recognized as experts in designing special machines capable of fulfilling demanding requirements, such as extra-large and variable outputs, reactive rotation molding equipment, casting in fully automatized production cells...

Pioneering industrial cast polyurethane processing

Our machine activity began in the mid 80's when the company was mainly a large French molding company. The available low pressure dispensing machines were at that time mostly two component units, often not very accurate and always very difficult to adjust and maintain.

The development of the three component MDI quasi-systems due to their performances and production flexibility was an incentive to design more accurate machines with multi-formulation

capability. The aim was to design a low pressure dispensing machine with the ability to meter a couple of percent of a liquid alcohol based curative with accuracy, thus allowing to achieve multiple hardnesses from a single machine.

The continuous search for accuracy and flexibility led to the introduction of innovative processing concepts: electrical heating, pressure regulation, additive injection into the mixhead, ergonomic interface with industrial PC running proprietary software ...

Baulé[®] machines principles

The concepts that shape our machine designs

Baulé[®] machines are designed to fit molders' requirements regardless of the chemicals processed, the working environment or the application field. Their design is based on the following key principles:

Flexible machinery for fast-moving industry

- Scalable concept
- Custom design
- Versatile formulation processing

Optimized processing

- Accurate metering & efficient mixing
- Consistent process quality
- Process parameter mastering

Enhanced productivity

- Low maintenance & remote assistance
- Full shift efficiency
- Reduced material loss

User-friendly design for effortless handling

- Intuitive and smart interface
- Digital preventive maintenance reminders
- Ergonomic access to machine elements

These key principles are embedded into the core characteristics of our Baulé[®] machines.



Baulé[®] machines workshop back in the early eighties

Thanks to these innovative technologies, Baulé[®] machines have rapidly been successful and praised by a growing number of molders worldwide.

Today, there are more than 1,500 Baulé[®] machines operated worldwide as the industry standard for molders who want accurate, flexible and easy to maintain equipment. A strong technical team is working with the same passion on specific demands and innovation to keep the Baulé[®] brand as the standard in the cast polyurethane world.

Processing machine core characteristics

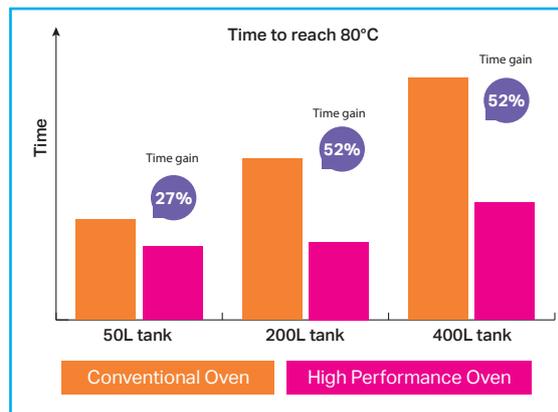
Designed to ease and secure your production thanks to highly engineered features

In-depth molding experience combined with our knowledge of polyurethane chemistry and our in-house engineering make Baulé® machines the most efficient tools for the successful production of cast polyurethane parts. This expertise drove us to the identification and optimization of the core characteristics of our machines.

Powerful electrical heating

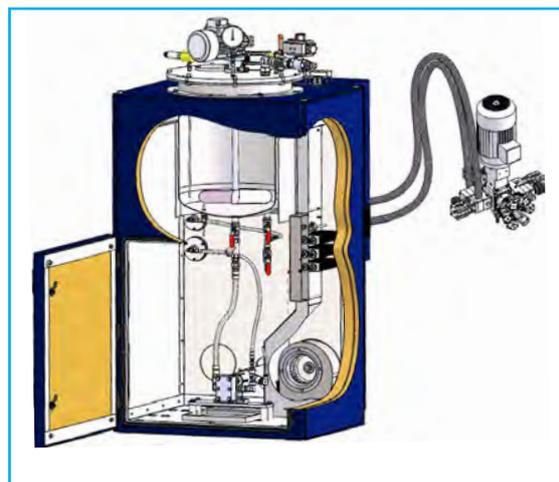
Baulé® machines are based on an efficient electrical heating system. The independent regulation for ovens, hoses and valves ensures easy adjustments and constant temperature of the products. It gives several advantages compared to fluid heating systems circulation in terms of maintenance and reliability.

As time saving is a key parameter, Covestro has integrated an innovative electrical heating system for its ovens named High Performance Oven (HPO). The HPO relies on a powerful heating system based on an innovative way to manage the heated air flow which allows for a very efficient heating time with an optimized electricity consumption.



Raw material recirculation

Baulé® machines are equipped with material recirculation circuits for each component. Combined with the electrical heating system, it guarantees an uniform temperature and consequently an even viscosity of the products. The recirculation ensures the right pumps speed from the beginning of the casting reducing pre-shot time and material loss.



Accurate metering

Cast polyurethane processing is not a simple blending operation. It is a complex reaction process. Missing accuracy over the metering process leads to performance failure.

Thanks to our technical and chemical expertise, Covestro select the most suitable pumps with the right closed loop speed regulation to deliver a constant quantity at a constant speed when pressure and viscosity remain unvarying.



Pressure regulation

The specific and original design of the Baulé® mixing head allows the use of all kinds of casting techniques to fit any part's size and geometry. The pressure adjustment device easily and efficiently maintains constant mixing ratios regardless of the pressure created by the casting method.



Efficient mixing

Baulé® machines are equipped with an adapted dispensing head: mixing chamber, turbine profile, and mixing speed are shaped to ensure efficient and consistent mixing whatever the product characteristics are, optimizing the mixing chamber volume to minimize the material loss.



User-friendly Human Machine Interface (HMI)

As mechanical and electrical design, automation and software are in-house skills at Covestro. This full integration enables us to continuously build our own expertise and to provide the customer with long-term support. Baulé® machines feature a highly perfected digital interface to ensure an easier handling of the machine. This Human-Machine Interface (HMI) enables a dynamic, intuitive and an interactive asset for operators.

As well as the common features, our HMI offers to select easily in several languages :

- Quick link: tool to easily and efficiently jump to commonly used screen menus
- Integrated driving of any peripherals including carousels, robots, conveyors, etc.
- Predictive preventive maintenance operations
- Production-data recording with casting reports



Additional solutions are offered for data processing allowing to cross, compare or compile chosen figures that can also be translated into dynamic curves, control panels, or flow sheets. (refer to the Baulé® easy services paragraph).

A versatile equipment designed to operate your production, whatever the casting techniques

Our machines are designed for the process of cast polyurethane in all kinds of casting techniques:

- Open mold
- Bottom filling
- Continuous casting
- Shot by shot
- Rotational Casting
- Under vacuum
- Infusion
- Under pressure

The proven technology of Baulé® machines enables them to process many kinds of reactive systems:

- Hot cast polyurethane elastomers
- Cold cast polyurethane elastomers
- Vulkollan® elastomers
- Cellular Vulkollan® elastomers
- PU formulations for TPU

Based on a specific assesment other reactive products can be successfully processed:

- Cellular polyurethane elastomers
- And other thermoset materials (epoxy, liquid PVC, silicones, ...)



covestro Baulé®

Baulé ADVANCED COULEE

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A comprehensive portfolio of machines and peripherals

A concept for every molder's process

Decades of activities and solutions building in the cast polyurethane field lead to a unique range of machines with multiple configurations, options and peripherals. All together they are able to answer to any process requirements, often enlarging flexibility and capacities.

Custom machines for the production of cast PU parts

Baulé® alpha machines

Industrialized design always scalable

The alpha concept allows you to choose from a wide range of configurations in order to end-up with the exact machine you need at the moment of the purchase, with the possibility of easily upgrading the model according to your evolving needs. In a precisely elaborated frame, a great number of combinations can be made to suit both the means and needs of every customer.

For example, from the initial configuration it will be possible to increase the number of components from 2 to 4 as each component is designed independently and can be assembled at any time



during the machine life time. Due to this industrial concept, the machine upgrades and spare parts availability are optimized.



As a custom molder, we are faced with the challenge of producing a wide variety of cast polyurethane parts. In order to achieve the quality expected by our customers, we process several systems from different chemistries and with different processing parameters. Our production means must therefore to be the most versatile possible.

In this respect, we trust the Baulé® machines from Covestro for decades. We value their flexibility and their accuracy for successful production. With our most recent Baulé® alpha machine, we can go one step further: its scalability ensures that we have a solution whatever the processing requirements.



Thorarin NaChiangtung
Managing Director
AUT

Baulé® omega machines

Designed to your specifications

The omega’s taylor-made concept consists of building the Baulé® machine according to the customer specifications. Efficient and creative solutions to answer customer needs are proposed thanks to our wide experience and technology accumulated over several decades.

Our senior engineering team makes possible any viable combination of features.

Our Baulé® omega machines can be based on industrialized Baulé® alpha machine elements with one or several specific options.

However, they can also have a unique design according to the requirements (micro dosing machines, machine embedded on rails, large output machine, machine with robots, machine driving a turnkey unit...).



Features guide for Baulé® machines

Capacity range of the alpha and omega concepts:

Baulé® machine	alpha	omega*
Number of components	from 2 to 4	from 2 to 6
Output range (kg/min)	from 1 to 50	from 0.01 to 2000
Tank size (litres)	50 - 100 - 200 - 300 - 400	from 10 to 5000
Additive injectors	up to 7	unlimited**

* data on omega machines are just given as indication, other requests can be studied

**Additive injectors depend on the machine design

Options to boost the machines capabilities

Baulé® Additive Injection Device

Our Baulé® Additive Injection Device enables injection of additives (pigments, catalysts, UV stabilizer...) directly in the mixing chamber. Covestro is an inventor and pioneer of mastering the crucial transitory phase at the first instant of the shot. Thanks to this feature, it is not necessary to pre-mix additives in the drum or in the machine tank before casting. It is very easy to adjust the additives ratios according to your needs or switch from one additive to another one in a few seconds.



Catalyst injection adjusts reactivity of a chemical system and adapts its percentage according to the hardness and part size, in order to get optimal pot

life and demoulding time. In case of color injection, it allows to cast successfully various parts with different colors.

Auto-calibration

Calibration is an essential step which, through accuracy, guarantees consistent and perfected production. As a manual process, it does require a daily investment of time, effort and precision. Although helpful and effective, this method requires an advanced mastery of the various steps in order to obtain accurate results.



The purpose of the auto-calibration is to have a step-by-step guided, error-free and highly accurate calibration method. Thanks to the connected scale and the dedicated software functions, the auto-calibration allows an automatic multi-point correction of the pump speed in order to get an accurate flowrate on the full output spectrum.

Altogether, this option brings several benefits:

- Complete and adapted calibration of the machine without time-loss
- Reduce manual operations and possible mistakes
- Superior accuracy over single point daily calibration



Auto-calibration has made this daily task much easier for our operators as they only have to supervise the action. On top of that, it improves accuracy because the machine automatically corrects any fluctuation, thus avoiding any human error.

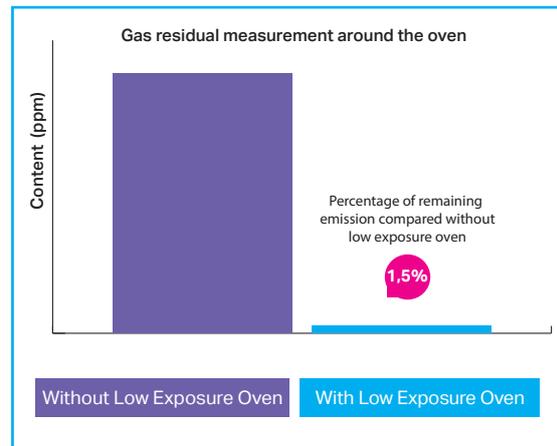


Ib Frederiksen
Product & Process Developer
DANSK GUMMI INDUSTRI

Low Exposure Oven

Thanks to a constant analysis and assessment, Covestro Elastomers came up with a solution to further perfect the design machine's ovens and ensure our users safety and well-being while handling chemical products. Covestro's Low Exposure Oven (LEO) allows the operator to open the machine's oven following a quick, predefined routine:

- Request from the operator to open the oven door on the machine's interface
- Draining and evacuation of the air inside the oven
- Automatic unlocking of the oven door



In addition to the above features Covestro also offers a large range of additional options, which include:

- Mass flowmeters
- Agitators design according to the product specificity
- Analog sensors
- Fluid heating or temperature regulation system
- Output ramp up or ramp down function during casting while keeping the ratios constant
- Vacuum pump
- Boom design: lengths, movement assistance (x,y and/or z axis)
- High temperature heating capabilities for specific product requirements (up to 150°C)
- Deported HMI
- Dedicated software functions to match with the processing of specific chemistry (NDI, Rotational Casting, TPU,...)
- Easy services (refer to the paragraph page 18)
- Bare code or RFID mould recognition
- Filling / transfer pump
- Loading cells
- Mixing head away from machine frame
- Possibility to move the machine with motorized frame
- Catwalk to ease the access to the key machine elements
- Temperature regulation for the mixing chamber and the sleeve
- Additives lines with different tank capacities, agitation and heating functions
- ... and many others

Peripherals for a continuous production

In order to support a continuous production, Covestro Elastomers provides peripherals which enable the feeding of the machinery whenever required. They make the machines capable to run continuously even large quantities of material thanks to the automatic feeding of the raw materials.

Baulé® Continuous Disc Degasser

Hundreds of degassers are daily used over the world and its reliability is well known. This equipment enables continuous feeding of the machine with degassed material. It is fully adaptable to any Baulé® machine and avoids production stoppage during material preparation. Furthermore, it automatically delivers required amounts of material and minimizes heat degradation while there is no material stagnation. Two models are available in our range with an output up to 5kg/min or 10kg/min.



Baulé® Amine feeding devices

Covestro developed specific devices for a safer processing of amines. It is composed of a feeding system and a melting device.

The Glove box secures all critical working and maintenance operations. It allows the operator to open the amine pellets drums and pour the granules into a hopper without any direct contact between the product and the operator, avoiding the exposure to the amines dust. Our vacuum based technology allows to transfer all kinds and sizes of amine pellets into the melting device in the most secure way.

Thanks to an high thermal efficiency coil, the melting device is able to melt several kind of amines at the lowest and uniform melting



temperature and to deliver a continuous output of material. Two models are available in our range with an output up to 0.5kg/min or 1kg/min.

Peripherals to enhance the machines capabilities

Specific processing techniques require dedicated equipment. To allow such processings, our machinery are equipped with customized peripherals. They expand the flexibility and increase the production capabilities of Baulé® machines.

Baulé® granules processing unit

In terms of sustainability, Covestro has developed equipment which allows processing of granular materials (polymers solid fillers such as rubber, TPU, cast PU, etc) coming from worn parts (recycling of used parts) or from production waste (non-saleable parts or casting scraps). After reducing these parts into granules, they can be reused and integrated into new cast PU parts thanks to the Baulé® granules processing unit.

This equipment is developed for the mixing and metering of these granules into PU parts production. Upstream work is to incorporate the fillers into the chosen material (usually a polyol), then the materials are thoroughly blended in order to obtain a homogeneous mixture. Once degassed, the blend is ready to be processed through a special metering device. The Baulé® granules processing unit can be added to many existing Baulé® machines.

Cartesian robot

In response to requests for automatic casting process and consistency expectations, Covestro developed a Cartesian robot equipment to move the casting mixing head on three axes. Thanks to a dedicated and intuitive program on the machine HMI, it is possible to set, control and record the robot movement according to the production requirements. Dispensing in a fix point or during a defined pattern is possible according to the part casting requirement.

Automatic mould recognition

Automatic mould recognition provides the ability to identify each mould and communicate the casting parameters (dedicated formulation, PU quantity to cast and robot movement,...) to the machine HMI.

Turntable and conveyor equipment

For series production requirements of PU parts, Covestro can offer completely automatic equipment with the ability to manage the following steps :

- Mould preparation (release agent applying, insert positioning,...)
- Casting (automatic mold recognition, PU casting, flaming...)
- Curing cycle (under ovens or with heating moulds)
- Demoulding (mould opening, removing of the parts, ...)
- Storage of the finished parts

For this type of equipment, each project is studied on request according to the chemistry, parts designed, production requirements and custom designed.

Rotational casting

Rotational Casting is a processing technique which eliminates the costs associated with the moulds and ovens by casting PU mixture directly on a rotating roll's core. Thanks to that technique our customers can easily manage the casting of rolls with different diameters and increase their productivity while limiting their investment and reducing their loss of the material during the production.

Depending on the needs, the Rotational Casting equipment can vary from a very simple and basic dispensing machine integrating only few dedicated options to fit with this technology or can also be much more sophisticated and automated with precise integrated systems.

Standard Rotational Casting includes:

- Rotational casting dedicated software
- Deported mixing head
- Mixing head temperature regulation
- Specific turbine profile
- Automated driving of the turning lathe

Additional options available :

- 2 or 3 axes robot for the mixing head movement
- Flat nozzle technology
- Reactive mixture temperature management

Rotational Casting offers several benefits:

- Energy savings: no preheating of the core
- No mould required
- Less waste
- Flexibility on rollers length, diameter and thickness
- No contamination of the core by release agent
- Coverage up to 40 mm on a single pass through our flat nozzle technology



Baulé® quikmix

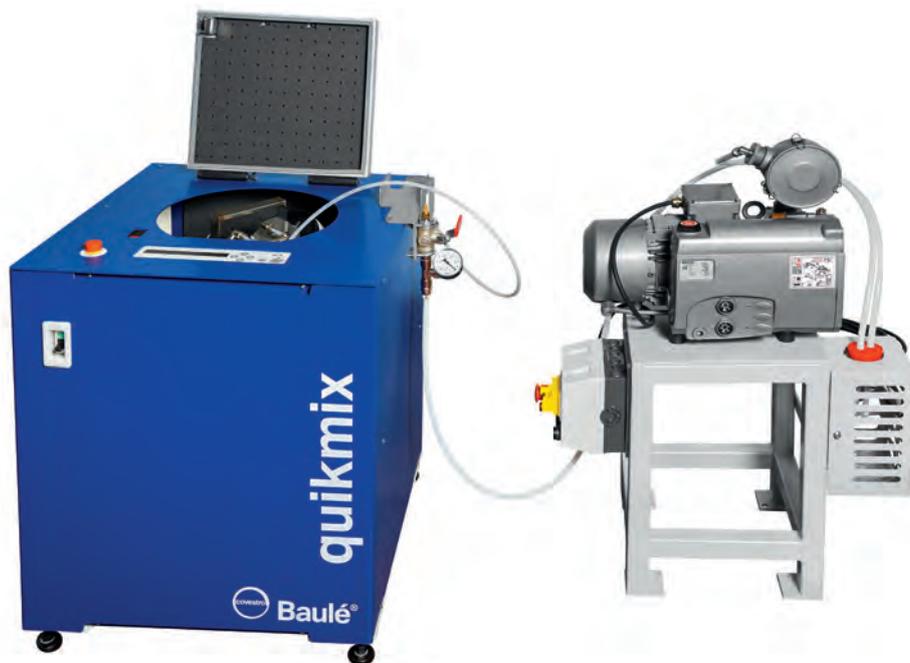
Besides continuous processing through dispensing machines, Covestro developed a unique batch processing equipment with vacuum and on the fly multiple mixing step capabilities.

Thanks to these functions, the Baulé® quikmix supports the processing of many reactive systems even the most challenging ones.

This equipment stores up to 70 programmable profiles and also includes 20 qualified and optimized pre-programmed profiles dedicated to Covestro systems.

Baulé® quikmix main characteristics

- Mixture capacity: up to 2kg
- Independant revolution and rotation speeds with on the fly changes
- Possibility to mix under vacuum
- High temperature & vacuum resistant containers
- 20 pre-programmed profiles
- 70 programmable profiles
- Up to 5 mixing steps over any profile
- Heavy duty gear drive design



Thanks to the Baulé® quikmix device, we successfully process our parts: we no longer experience bad mixing or degassing issues. As most of our parts are transparent, the slightest defect would be obvious. With the Baulé® quikmix device, there are no more defaults: our transparent parts remain always bubble-free.



José Antonio Galina
Business Director
MERCURY

Assistance network and customer services

Cast polyurethane experts for any challenges anywhere

Customer service is more than just providing answers, at Covestro Elastomers, the assistance we offer both before and after getting our products is an important part of the promise of our brand.

Easy services

Providing our customers with the best and closest service possible inspired us to create dedicated digital services. Designed around our Baulé® machines, the purpose of these Easy Services is to ensure that production lines remain perfectly functional and that every potential delay factor is resolved easily and effectively.

Baulé® easy assist: remote intervention for immediate solutions

Baulé® easy assist allows efficient and remote troubleshooting of your machine process by Covestro experts thanks to a secure connection to your machines. Our technicians can easily monitor, diagnose and provide assistance for various operations on the machine.

Baulé® easy parts: choose, click and order

Baulé® easy parts is an online platform enables to identify and order your spare parts in real time. You have direct access to your own data base of technical drawings, catalogue and machine documentation.

Baulé® easy data: turn your production data into manufacturing intelligence

Baulé® easy data provides a real time monitoring of the machine's activity for a full understanding and tracking of what unfolds in the production line. The data can be easily and instantly translated into a graphic giving the machine status and its performance. Furthermore an extensive quality control is also available thanks to an interactive display of production data. For production quality proofs, casting reports can be edited.



The Baulé® easy parts service is a real time saver for our company. With one click we can get our machine digital drawings or update the spare parts prices and delivery time. All in all, it improves our spare parts management and thus reduces machine downtime.



Mohammed Rehman
Maintenance Supervisor
BMP EUROPE

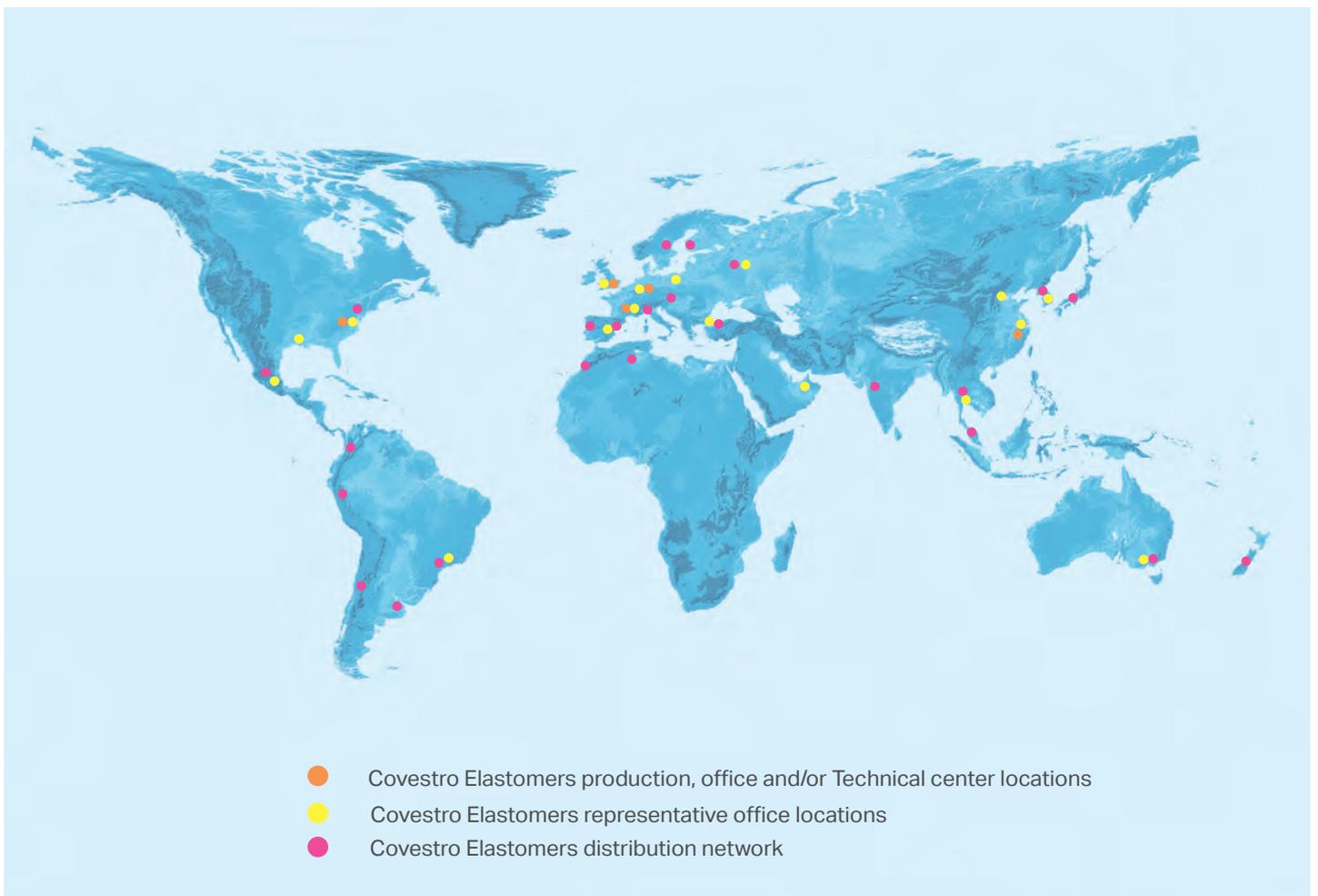
Worldwide support

In their production environment, moulders face multiple challenges. At Covestro, the cast polyurethane team has the experience and the know-how to handle all kinds of assistance.

Our technical experts have been intensively trained and are able to address a variety of situations involving the machinery, the chemistry and/or the process.

Thanks to regional technical centers in Europe and Asia and America, all equipped with casting machines, our customer service teams are able to offer worldwide:

- Industrial scale testing
- Process optimization
- Prototyping
- Customer training
- Repair services
- Preventive maintenance
- Spare parts delivery
- Retrofitting





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