



Covestro Elastomers SAS
46 avenue des Allobroges - BP 116
26103 Romans cedex - FRANCE
TEL +33 4 75 72 72 75
FAX +33 4 75 02 11 73
info.elastomers@covestro.com

elastomers.covestro.com



Cast Polyurethane industrial processing The scalable low pressure dispensing machines

Baulé®

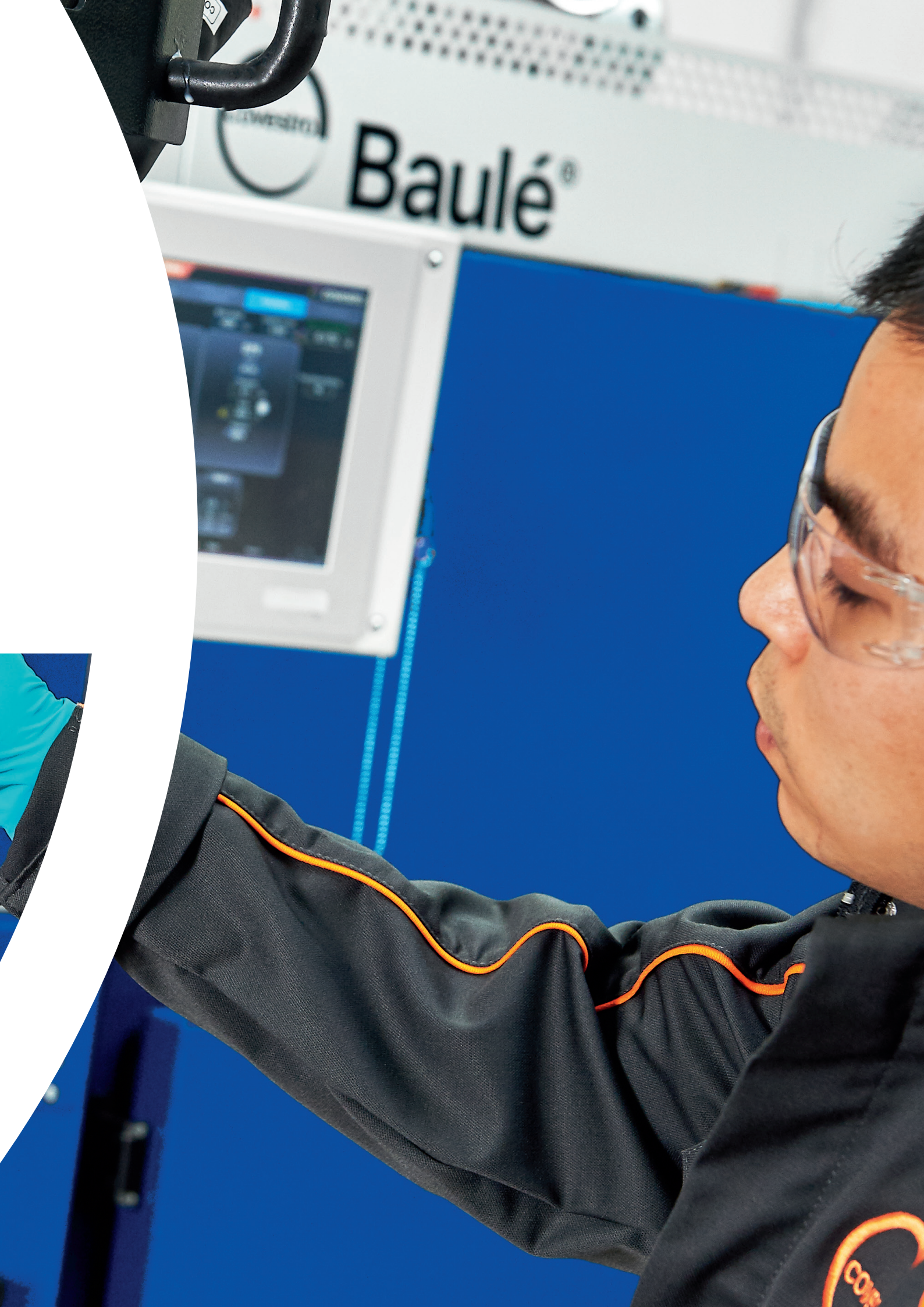




Designing the right processing machine

Cast elastomer processing is a relatively young industry which has considerably evolved over the last years. The expectations in terms of accuracy, flexibility but also equipment availability and reliability are rising. Therefore the use of the right low-pressure casting machine will play a decisive part in securing optimized production and will be a potential game-changer for molders.

With a multi decade background and know-how of chemistry and processing, Covestro Elastomers continuously put efforts into innovation and industrialization of its machine technology. Our goal is to keep a leading position and offer to the molders the ultimate, scalable metering and mixing equipment, performing machines for special processes as well as associated on line services.



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 circumstances in the best possible way. In a perpetually evolving industry where reactivity is key, Baulé scalable 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 was 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 have been designed to allow for 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 constraints are requested, then under the omega product line we are able to design highly customized equipment which may also integrate alpha concept sub-assemblies. We are recognized as experts for designing special machines able to fulfil 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 decision to promote three component quasi-systems was an incentive to design more accurate machines. It is the flexibility allowed by MDI chemistry that pushed the engineers to develop

machines with multi-formulation capability. The aim was to design a low pressure dispensing machine able 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 permanent search for accuracy and flexibility led to introduce innovative processing concepts: electrical heating, pressure regulation, additives injection into the mixhead, ergonomic interface with industrial PC running proprietary software ...

Covestro machines key principles

The concepts that shape our machine designs

Covestro 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
- Minimized loss of material

Enhanced productivity

- Low maintenance
- Full shift efficiency
- Process parameter mastering

User-friendly design for effortless handling

- Intuitive and smart interface
- Simple daily operations
- 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 a thousand Baulé® machines operated worldwide as a reference technology 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 reference in the cast polyurethane world.

Processing machine core characteristics

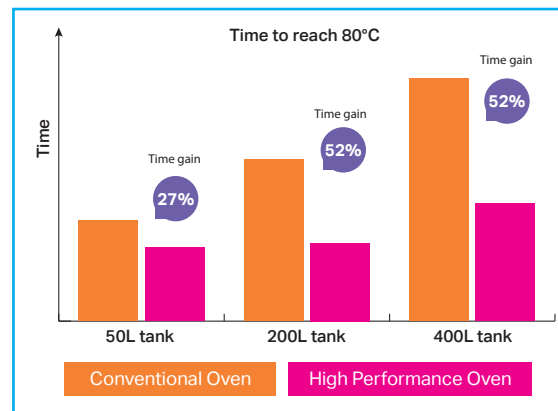
Designed to ease and secure your production thanks to highly engineered features

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

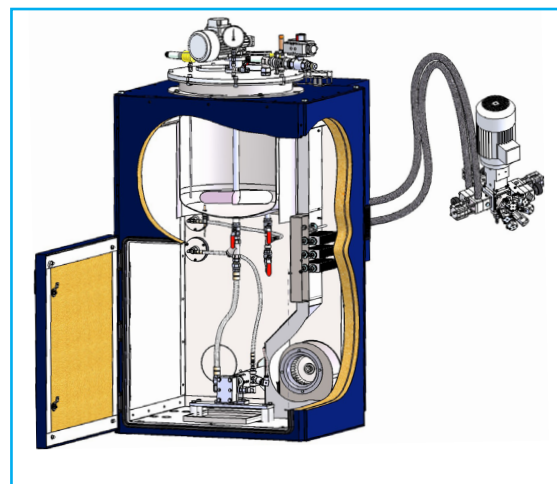
Baulé® machines are based on a powerful electrical heating system. The independent regulation for ovens, hoses and valves ensures easy adjustments and constant temperature of the products. It gives several advantages compared to fluid heating systems circulation : maintenance and reliability.

Furthermore, as time saving is a key parameter in the industry, Covestro developed for its ovens an electrical heating system 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 allow a very efficient heating time with an optimized electricity consumption.



Raw material recirculation

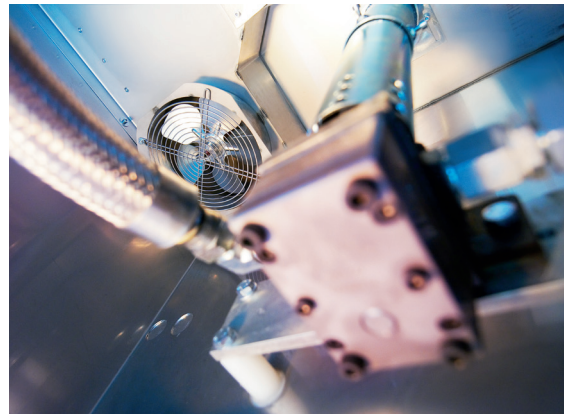
Baulé® machines are equipped with material recirculation circuits for each component. Combined with the electrical heating system, it guarantees a uniform temperature and consequently an even viscosity of the products. Recirculation reduces pre-shot time before casting and thus limits raw material loss.



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 molding failure. Baulé® machines ensure high ratio accuracy thanks to precision gear pumps with closed loop speed regulation, an efficient control of the processing temperature and the material pressure.

Thanks to our mechanical and chemical expertise, Covestro select the most suitable pumps to deliver a constant quantity at a constant speed when pressure and viscosity remain unvarying.



Pressure regulation

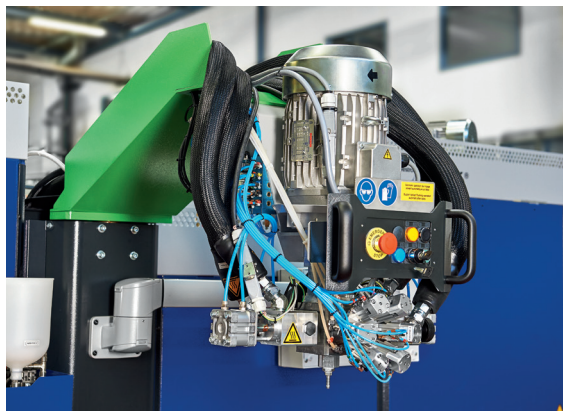
The specific and original design of the Baulé® mixing head allows the use of all kinds of casting techniques to fit any part's size and geometry. The proprietary pressure adjustment device easily and efficiently maintains constant mixing ratios regardless of the pressure created by the casting method.



Mixing: fulfill all kinds of production environment

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 may be..

Our mixing systems are designed to get the suitable residual time to optimize the mixing of materials and minimizing 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 secure the customers' 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 in several languages easy to select at any time:

- 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 history 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 Easy Services paragraph).

A versatile casting tool designed to operate your production with our technologies, whatever the processing techniques

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

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

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®
- Thermoplastic polyurethanes (TPU)

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

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



A comprehensive portfolio of machines and peripherals

A concept to broaden the horizon whatever is the molder's chosen process

Covestro Elastomers offers solutions to industrialize all types of cast PU part production. The accomplished experience in moulding aligned with chemistry know-how are key advantages allowing Baulé® machines to be the most efficient tools for cast polyurethane part production. In that purpose, we build a comprehensive range of machines and peripherals. All together, they are able to match any technical and/or process requirements and to enlarge flexibility and production capacities.

Machines to produce cast PU parts at scale

Baulé® alpha machines

Industrialized design always upgradable

The alpha approach allows to pick from a wide range of configurations in order to end-up with the machine you need at the moment of the purchase, with the possibility of easily upgrading the model according to 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.

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 is the solution for our ever-changing production.



Thorarin NaChientung
AUT Managing Director

Baulé® omega machines

Designed to your specifications

The omega's tailor-made approach consists in 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.

Thanks to our senior engineering team, any viable combination of features is possible. This customized approach is designed to answer to the most demanding and specific requests in order to meet our customers' requirements.

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

Thanks to our senior engineering team, any viable combination of features is possible. This customized approach has been designed to meet molders requirements.

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 to give an indication, other requests can be studied

**Additive injectors depend on the machine complexity

Options to boost the machines capabilities

Baulé® Additive Injection Device

Our Baulé® Additive Injection device allows to inject additives (pigments, catalysts, UV stabilizer...) directly in the mixing chamber. Thanks to this equipment, 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.

In case of catalyst injection, it allows to adjust reactivity of a chemical system and adapt its percentage according to the hardness and part size, in order to get optimal pot life and demolding time.



In case of color injection, it allows to cast successfully two parts one after the other with different colors.

Auto-calibration

Calibration is an essential step which, through accuracy, guarantees a regular 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 this equipment is to have a step-by-step guidance, error-free and highly accurate calibration method. Thanks to the connected scale and the dedicated software functions, the auto-calibration allows a full recording and analysis of the machine's calibration data, while giving the operator the appropriate recommendations for optimal adjustments.



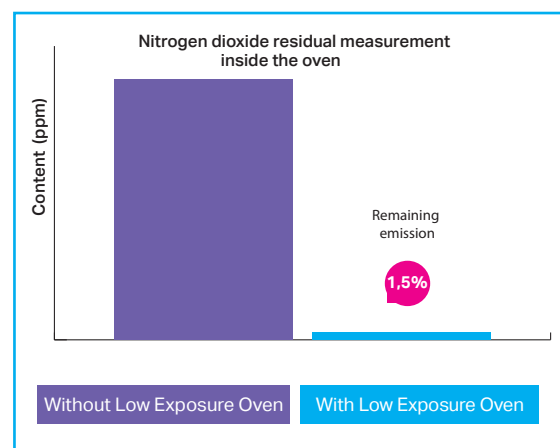
Altogether, this option brings several benefits:

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

Low Exposure Oven

Through constant analysis and assessment, Covestro Elastomers came up with a solution to further perfect the design machine's ovens and ensure our clients safety and well-being while handling chemical products. Covestro's Low Exposure Oven (LEO) allows 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



On top of the above options Covestro is also offering a large range of additional options, among which:

- Mass flowmeters
- Different 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 (with different length, or vertical and/or horizontal electrical / pneumatic movement assistance)
- High temperature capabilities for specific product requirements (up to 150°C)
- Deported HMI
- Specific software functions dedicated to match with the processing of specific chemistry (NDI, RC, TPU,...)
- Easy services (refer to the Easy Services paragraph)
- Bare code or RFID 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
- Cooling system for the mixing chamber and the sleeve
- Additives lines with different tank capacities, agitation and heating functions



Auto-calibration has made this daily task much easier for our operators. For one thing, it shortens the operation, as the operator only has to supervise the action. On the other hand, it improves accuracy because the machine automatically corrects any weight fluctuation, thus avoiding any human error.



Ib Frederiksen
DANSK GUMMI INDUSTRY
Product & Process Developer

Peripherals to enhance the machines capabilities

In order to enhance the capabilities of our machinery, Covestro Elastomers provides many peripherals. They expand the flexibility and increase the production capabilities of Baulé® machines. They make the machines capable of overcoming the frequent barriers of industrial production and offer the possibility to cast excellent parts despite chemical or processing challenges.

Baulé® Continuous Disc Degasser

Several 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 large 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 up to 10Kg/min.



Baulé® Amine feeding device

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

The Glove box secures all critical working and maintenance operations. It allows to open the amine pellets drums and pour the granules into a hopper without any direct contact between the product and the operator. 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 any kind of amines at a low melting temperature (120°C) and to deliver a continuous output of material.



Two models are available in our range with an output up to 0.5kg/min or up to 1kg/min.

Baulé® granulate processing unit

Cast PU manufacturers strive for efficient processes that reduce the amount of waste (non-saleable scrap) generated in production. Furthermore, generating polyurethane scrap during the production or after usage, is unsustainable. It wastes material and labor resources, is expensive to landfill, and is often restricted through environmental regulations.

The Baulé® granulate processing unit is a dedicated

device able to process granular materials (solid fillers for polymers such as rubber, TPU, cast PU, etc.) and can be added to many existing Baulé® machines. This unit allows the mixing and metering of filled components into cast polyurethane production. Fillers are incorporated into the chosen material (usually a polyol). The materials are thoroughly blended in order to obtain a homogenous mixture. Once degassed, the blend is ready to be processed through a special metering device.

Rotational casting

Rotational Casting is a processing technique which allows to eliminate the costs associated with the molds 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 by limiting their investment and reduce their loss of the material during the production.

Upon 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:

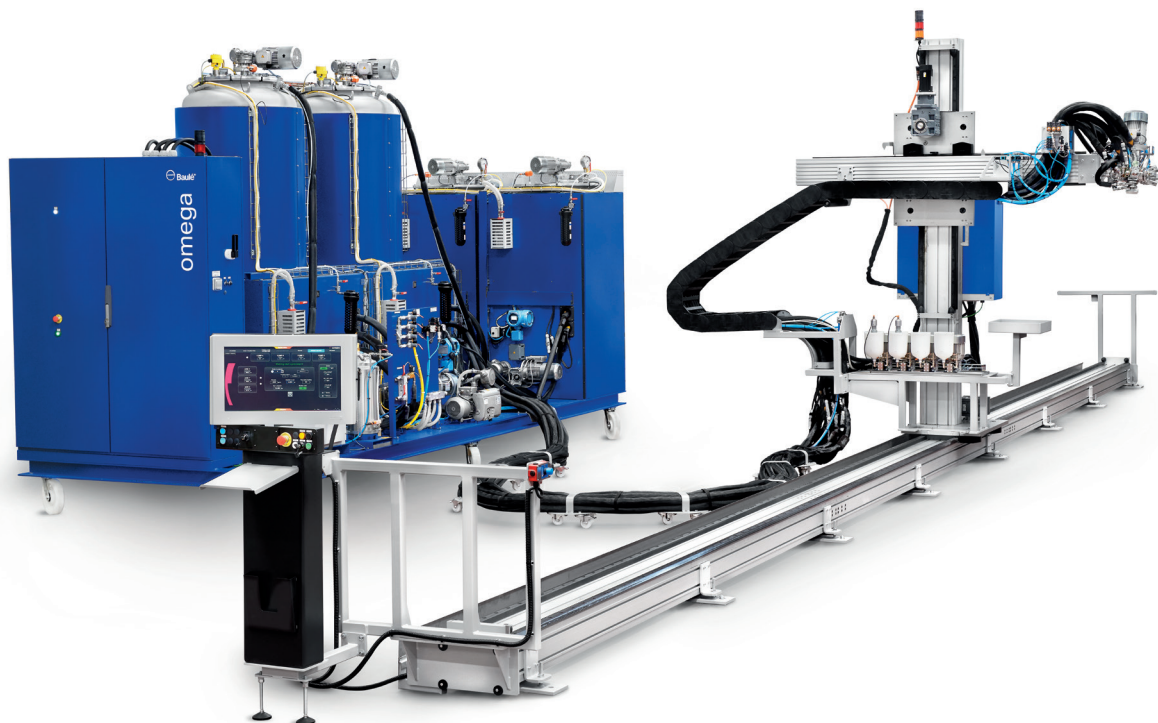
- Rotational casting dedicated software
- Deported mixing head
- Cooling device on the mixing head
- Specific turbine profile
- Automated driving of the turning lathe

Additional option available :

- Rotational casting dedicated software
- 2 or 3 axes robot for the mixing head movement
- Flat nozzle technology
- Reactive mixture temperature monitoring

Rotational Casting offers several benefits:

- Energy savings: no preheating of the core
- No mold required
- Less waste
- Flexibility: rollers of various sizes and shapes
- No contamination of the core by release agent
- Coverage of more than 30 mm on a single pass through our flat nozzle technology



On top of these above peripherals Covestro is also offering other equipment dedicated for continuous and / or Automatic production, among which:

Cartesian robot

To answer requirements for automatic casting process and consistency expectations, Covestro propose 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. Casting in a fix point or under movement is possible to fulfill with any parts design.

Automatic mold recognition :

Automatic mold recognition gives the possibility to identify each mold and communicate directly the casting parameters (dedicated formulation, PU quantity to cast and robot movement,...) to the machine HMI.

Turnkey or conveyor equipment's

For massive production requirements of PU parts, Covestro can offer complete automatic equipment which can be able to manage the following steps :

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

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

Baulé® quikmix device

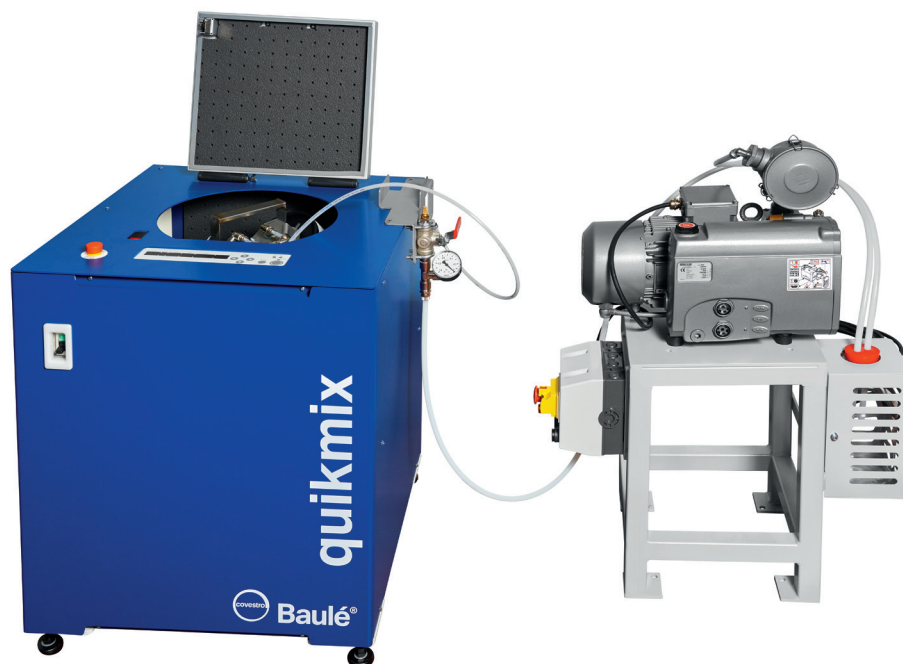
Besides continuous processing through dispensing machines, Covestro developed a unique batch processing equipment with vacuum and on the fly multiple mixing step capabilities.

Thanks to these functions, the Baulé® quikmix device allows to process many systems-even the most challenging ones.

This equipment allows to record 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
- 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



Assistance network and customer services

Cast polyurethane experts to address a variety of situations and challenges globally in one click

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 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 process by Covestro experts thanks to a secure connection to customer's machines. Our technicians can easily monitor, diagnose and provide assistance for various operations on the machine.

Baulé® easyparts: choose, click and order

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

Baulé® easydata: turn dormant data into manufacturing data

Baulé® easy data provides a close 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 be translated into a graphically explicit format which gives access to a clear picture of the current state of the machine, as well as to the evolution of its performance. An extensive quality control is also available thanks to an interactive display of production data.



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
BMP EUROPE
Maintenance Supervisor

Worldwide support

In their production environment, molders 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 both North and South 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

