ProTec Polymer Processing

SOMOS® PERFOAMER –
The innovative manufacturing solution for physical foaming

SOMOS®
PERFOAMER

Physical foaming with SOMOS® PERFOAMER

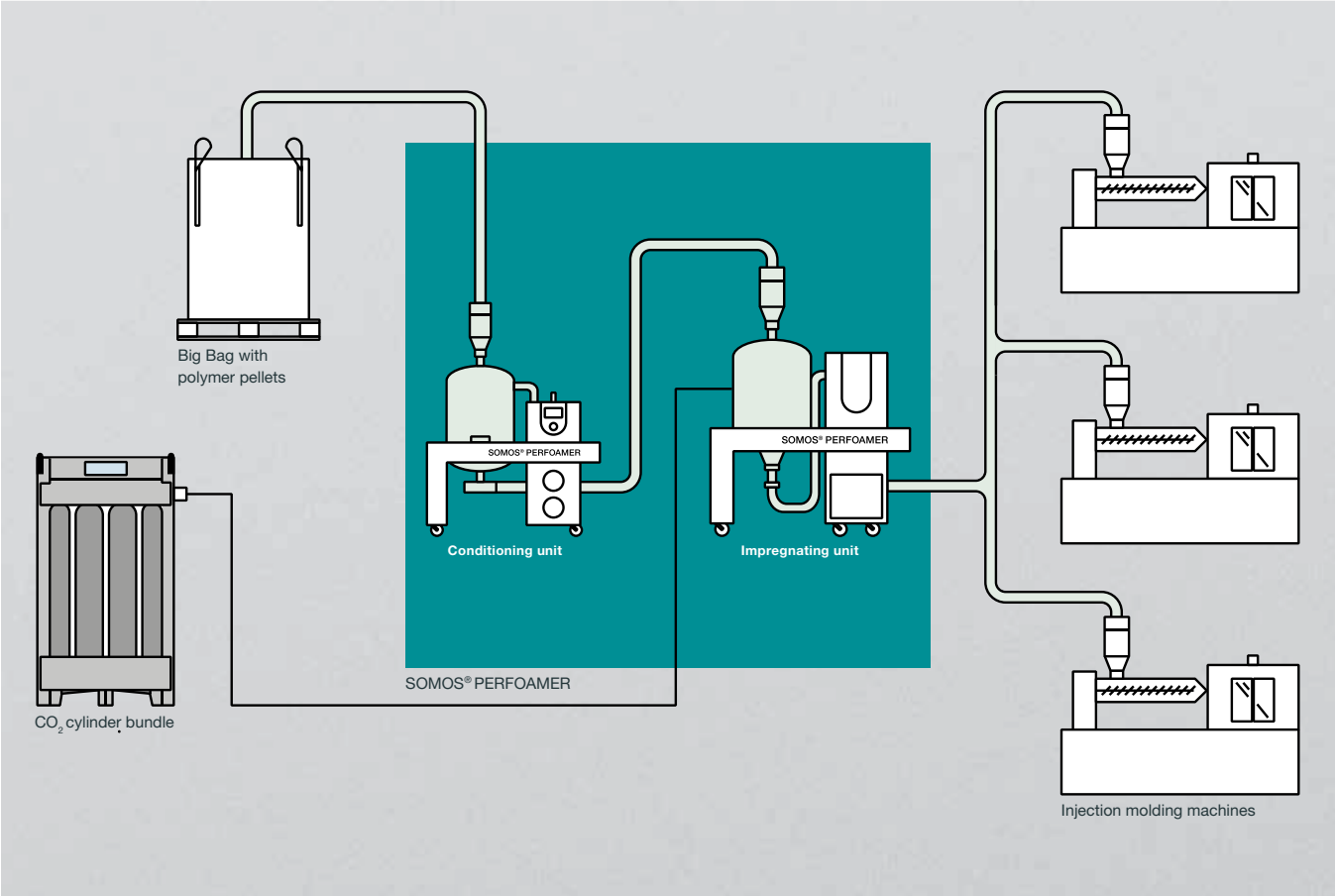


Figure: The PLASTINUM® Foam Injection Moulding process combines the advantages of chemical and physical foaming processes in injection molding

Foamed plastics parts save weight and material

There is demand for lightweight and simultaneously robust components in ever more applications. Foamed components also save materials and so help to cut production costs. These are vital advantages for many sectors, such as the automotive and electrical industries, medical technology and for manufacturers of domestic appliances and leisure articles.

Foaming processes are particularly effective in cutting the weight of injection moldings. At the same time, foamed materials are quicker and easier to process thanks to their low viscosity.

In addition, for many plastics better shape reproduction is achieved than in conventional injection molding because the foaming reduces anisotropic shrinkage. The result is low-stress, dimensionally accurate components with good acoustic and thermal insulation properties.

The innovative SOMOS® PERFOAMER – the simple, multipurpose solution

SOMOS® PERFOAMER enables plastics processors to enjoy the benefits of the innovative "PLASTINUM® Foam Injection Moulding" process for the first time in industrial injection molding. Jointly developed in 2017 by Linde AG and Kunststoff-Institut Lüdenscheid, this process combines the advantages of physical and chemical foaming.

SOMOS PERFOAMER® is a universally applicable, easy to operate manufacturing solution. It is quick and straightforward to install which makes it ideally suitable both for new machines and for retrofitting to existing injection molding machines.

Considerable material savings

Using SOMOS® PERFOAMER, good foaming results can be achieved even with thin-walled components so enabling considerable material savings. As a result, it has proven possible to cut polycarbonate consumption by up to 60 per cent, polyamide GF30 consumption by up to 16 per cent and mineral reinforced polypropylene consumption by up to 37 per cent (see table, "Weight reduction for selected polymers").

Higher productivity

In addition, the pellets' CO_2 content reduces the viscosity of the polymer being processed, so improving melt fluidity. As a result, the material can be injected faster, so accelerating production and shortening cycle times.

Low capital costs

In comparison with compact injection molding, a lower mold filling pressure is required and a substantially lower holding pressure can also be used. As a result, it is often possible to use smaller injection molding machines and molds.

Suitable for any injection molding machine

The customer benefits from the simple handling and versatility of SOMOS® PERFOAMER for injection molding machines of any kind. While costly conversion is normally required, in this case there is no need for either a new screw or a new injection molding unit or back pressure controller. The only requirement is a shut-off nozzle and a screw position controller is advisable.

Usable for many materials

Virtually all usual polymers can be used, including bio-based and engineering materials and shear-sensitive thermoplastics and composites. If particularly high surface quality is desired, this can be achieved by additional steps such as gas counter-pressure.

Weight reduction for selected polymers

The new technology allows weight reductions of up to 60 % with conventional commercial polymers.

Weight reduction for selected polymers*

Polymer	Compact [g]	Foamed [g]	Reduction [%]
PC	25,6	10,2	**60**
ABS	24,8	19,2	**23**
PA GF30	31,9	26,9	**16**
PP	22,8	14,4	**37**
TPE	28,5	20,9	**26**
PLA	35,4	30,6	**14**
PTT GF15	33,6	30,7	**9**

* Production optimized for maximum weight reduction (weight reductions can vary)

Source: Kunststoff-Institut Lüdenscheid

SOMOS® PERFOAMER: modular and Industry 4.0 capable

The innovative SOMOS® PERFOAMER manufacturing solution dries and adjusts polymer pellets to temperature, impregnates them with CO_2 and stores them to supply one or more connected injection molding machines. Once impregnated, the pellets remain processable for a number of hours depending on the material involved.

The SOMOS® PERFOAMER system consists of a conditioning unit and an impregnating unit, the autoclave. The conditioning unit prepares the unprocessed pellets so that they can be optimally loaded with CO_2 in the impregnating unit. This process proceeds under defined conditions with the assistance of an Industry 4.0 capable PLC controller which ensures consistent process quality. The system is operated using a generously dimensioned touch display. SOMOS® PERFOAMER can also be incorporated into a higher-level control system.

SOMOS® PERFOAMER has a buffer tank with a capacity of 250 l for storage of the impregnated pellets. This generously sized storage unit ensures a continuous supply of conditioned and loaded pellets for parts production in the injection molding machine. The output volume from SOMOS® PERFOAMER can if desired be divided between a number of processing machines. Depending on the material, continuous output volumes of up to some 60 kg/h are possible (see table "Output volume as a function of material").

Output volume as a function of material

Polymer	Bulk density [kg/l]	Process time [h]	Output volume [kg/h]
PC	0,74	2,5	59
PA6*	0,70	5,0	28
PP	0,56	2,5	45
ABS	0,70	2,5	52
PLA (cryst.)*	0,80	6,0	27
TPE	0,72	2,5	58

* If need be, output volumes can be significantly increased by predrying.

Source: ProTec Polymer Processing

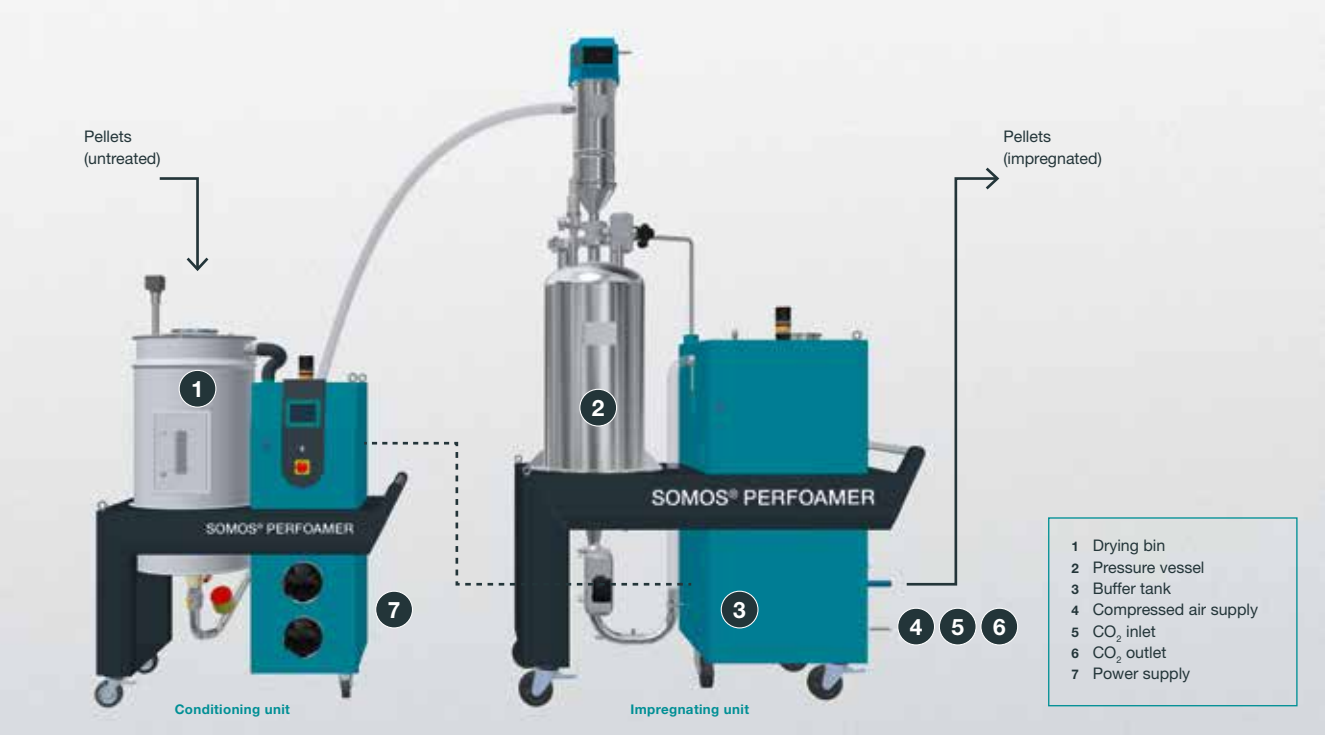
Left: Pressure conveying shut-off valve on the impregnating unit
Center left: Exhaust elbow on conditioning unit
Center right: Electrical connection for impregnating/conditioning unit
Right: CO_2 supply to impregnating unit

How SOMOS® PERFOAMER works

SOMOS® PERFOAMER consists of two interconnected subsystems: a conditioning unit and a impregnating unit. Being mounted on mobile trolleys, the units can be flexibly relocated.

In a drying bin 1, the polymer pellets are adjusted to the ideal degree of dryness and the correct temperature for subsequent loading with gas (CO_2), which takes place over a predefined period in a pressure vessel 2. Depending on material, loading time, temperature and pressure, the polymer absorbs a specific volume of gas. The impregnated pellets are stored in an integral buffer tank 3 and can then be dispensed to the processing machine as required.

The pellets are transported from station to station by suction conveyor units which are connected to a compressed air supply 4. Further SOMOS® PERFOAMER system interfaces include the inlet and outlet for CO_2 5 6 and the power supply 7.



Optimum CO_2 supply with Linde gas

The CO_2 supply to SOMOS® PERFOAMER can be optimally tailored to different requirements, with solutions ranging from an individual cylinder for testing purposes via mobile gas bundles with a number of gas cylinders to stationary systems involving gas tanks. In this latter case, Linde's smart "Gas Manifold" can continuously supply CO_2 to up to five SOMOS® PERFOAMER units by linking the manifold's integral controller to the SOMOS® PERFOAMER system controller.

This offers the following advantages:

- automated switching on and off of the gas supply by the SOMOS® PERFOAMER system controller
- uninterrupted production thanks to system assisted, automated changeover from an empty to an operational cylinder bundle
- transparent production process thanks to monitoring of filling level of the connected gas supply

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Technical data

Conditioning unit

Drying bin volume	l	200
Dimensions W x H x D	mm	1,430 x 1,800 x 820
Connected electrical load	kW	8.2
Coating	RAL	5018 and 7016
Weight (without contents)	kg	270

Impregnating unit

Pressure vessel effective volume	l	200
Buffer tank effective volume	l	250
Dimensions W x H x D	mm	1,920 x 2,530 x 970
Coating	RAL	5018 and 7016
Weight (without contents)	kg	700

Gas consumption/impregnation/batch	kg CO_2	~10
Service life of 12 gas cylinders (cylinder bundle)	days	~6
Continuous material output volume	kg/h	≤ 60

Advantages/benefits

As a manufacturer of lightweight components you benefit from:

- a system usable on any conventional commercial injection molding machines which can be quickly and easily installed on new machines and retrofitted to existing ones
- lower production costs due to reduced clamping forces and more dimensionally stable products with less distortion, even for thin-walled parts
- higher productivity thanks to shorter cycle times
- reduced capital costs for the injection molding machine due to lower requirements in terms of clamping forces and internal pressures

Your customers benefit from:

- lower production costs and thus lower purchase prices for plastic injection moldings
- reduced component weights

Partner profiles

ProTec Polymer Processing GmbH is an international one-stop shop supplier to the plastics industry with a focus on injection molding, extrusion and blow molding. Its range of services covers components, solutions and turn-key systems for efficient materials handling, treatment and recycling of plastics and for manufacturing long fiber reinforced thermoplastics using LFT pultrusion lines.

Linde AG, one of the world's largest suppliers of industrial gases, provides a wide range of processes, systems and services for gas-based processes in the plastics industry under its PLASTINUM® brand. Industrial gases have numerous applications encompassing internal gas pressure technology, cooling, foaming or cleaning. Linde can offer mature technical solutions and know-how for any kind of processing.

Kunststoff-Institut Lüdenscheid (KIMW) has been assisting its customers for over 30 years with selecting, developing, optimizing and implementing products, tools and process sequences right across the plastics industry. With a testing laboratory accredited to DIN EN ISO/IEC 17025, the Institute's business groups provide technology services, research and development.

KIMW, one of the co-inventors with Linde AG of the PLASTINUM® Foam Injection Moulding process, advises customers about the implementation of this process. In the context of this partnership, ProTec developed SOMOS® PERFOAMER, so making this novel physical foaming process usable on an industrial scale for the first time.

Just contact us for any further information.

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