Eco-friendly CO₂ foaming technology for XPS insulation boards

PLASTINUM® Foam E
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Extrusion foaming with carbon dioxide

Carbon dioxide is an excellent environmentally friendly alternative to conventional foaming agents.

Building on our CO$_2$ gas offering, we deliver PLASTINUM® Foam E CO$_2$ solutions engineered for outstanding and efficient extrusion foaming results.

**Our complete package** – including dedicated equipment both for **pressure boosting** and **precise high-pressure metering** – enables customers to enhance their extrusion foaming processes by increasing productivity and product quality.
Advantages of inert gas (mainly CO$_2$) as blowing agent

**Legislation is a strong driving force**
- Ozone-depleting substances (HCFCs, e.g. HCFC-22, HCFC-142b) are being phased out (Montreal Protocol) as well as substances with high global warming potential
- Inert gases are the best choice because they are environmentally friendly
  - No Ozone Depletion Potential (ODP)
  - Nearly no Global Warming Potential (GWP)

**Economical reasons**
- CO$_2$ is much cheaper than other blowing agents
- Prices for HCFCs or HFCs for instance will continue to rise
- Payback on investments in new equipment or modifications is rapid

**Not flammable, non-toxic**
- No effort required to protect health or prevent explosions

**Factors to take into consideration**
- Initial cost and effort to switch from current blowing agents to inert gases
- Extruders with high mixing and cooling abilities required
- Suitable for specific types of foams
PLASTINUM® Foam E
One-stop Supply and Metering of liquid CO₂

Schematic of one-stop CO₂ foaming solution

- **Bulk supply**
  - Liquid CO₂

- **PRESUS® C pump system**
  - First stage pressure boosting

- **DSD metering unit**
  - High-pressure mass flow metering unit

**Diagram Components:**
- Low-pressure CO₂ tank, 20 bar, -20 °C
- PRESUS C
- CO₂ bundle supply, 57 bar, +20 °C
- Dosing station
- Example 60 bar, 0 °C 5–80 kg/h
- Extruder 1
- Extruder 2
Customer benefits

— **Complete solution from one supplier**
  — no need to integrate several pieces of equipment from several suppliers
  — no risk of not defined interfaces and delivery limits
— **Highly reliable equipment**, proven at many reference customers all over the world
— **Very precise metering** independent of ambient temperature and climate
— **Easy and inexpensive installation**
First stage
PRESUS® C – Pressure boosting system for liquid CO₂

Used to increase liquid CO₂ pressure from a low-pressure tank (approx. 20 bar) up to 100 bar
PRESUS® C delivers absolutely bubble-free liquid CO₂.
How it works - Properties

— The CO₂ is pressurized with compressed air-driven boosters
— High supply safety / reliability due to redundancy (2 boosters)
— Flexible alignment of pressure and output with changing demand

Advantages PRESUS C System

— Low investment costs
  Only a low-pressure tank in combination with the LIC compressor station is necessary

— Low installation costs
  No circulation piping, no high-quality insulation and no cooling device required

— The liquid CO₂ is supplied at a temperature significantly below its boiling point and free of bubbles

— Absolute supply reliability, also during filling of the tank
— The output of CO₂ adjusts automatically in synch with demand (even with strong fluctuations)
Both the DSD 400 and DSD 500 units offer highly precise metering of inert gases (mainly liquid CO\textsubscript{2}) under high and fluctuating pressures into an extruder.

Depending on the application and requirements customers can select between the DSD 500 and the DSD 400.

Advantages compared with alternative metering pumps

- **Maximum tolerance** regarding gas bubbles in the liquid CO\textsubscript{2}
  - High process stability
  - High metering accuracy even at high ambient temperatures
  - No cooling devices required upstream even in hot climates
  - Quick start up
- Can be easily supplied with CO\textsubscript{2} from cylinders/bundles
- It is also suitable for the metering of gaseous blowing agents (e.g. nitrogen)
Second stage – High pressure metering
DSD 500

The DSD 500 is suitable for
— continuous (Extrusion foaming)
— discontinuous (discontinuous PUR foaming) operations.

— Wide dosing and pressure range: Metering of liquid CO₂ up to 60 kg/h and 400 bar
— Patented metering concept allows fast reaction on variations of counter pressure and keeps the flow rate constant
— Automatic and fast adjustment to the extruder pressure saves time during start-up or product change
— Integrated ready-to-go solution with full ability for remote control
Second stage – High pressure metering
DSD 400

- Developed for **Extrusion Foaming** and especially **XPS boards**
- Cost improved unit with less standard features than DSD 500
- Metering of liquid CO₂ up to 30 kg/h and 400 bar
- Dosing range adjustable with minor modifications
- Several options available
Reference customers (Extract)
XPS insulation boards
Other thermoplastics foamed with CO$_2$ (or nitrogen)

The PLASTINUM® Foam E technology is also used to produce other thermoplastic foams

**Polystyrene (PS)**
- Profiles
- Food packaging (trays)

**Polyethylene (PE)**
- Films/sheets with higher densities (> 250 kg/m$^3$)
- Cable insulation

**Polypropylene (PP)**
- Sheets

**PET**
- Boards with higher densities (> 200 kg/m$^3$)
- Sheets
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