PLASTRONFOAM

Blowing agents for applications like injection moulding, extrusion, rotation moulding, direct gassing of thermoplastic materials

1. General explanation:

   Blowing agents are chemical materials, which decompose by heat and mechanical stress to produce blowing gases, for dispersion into the polymer melt.

2. Function of blowing agents:

   Prerequisites for the use of blowing agents are appropriate processing equipment, with functional dosing devices suitable for the polymer being processed. The gases produced are dispersed into the polymer melt by the extruder screw rotation. The intensity of this physical mixing process depends upon the gas yield of the blowing agent, the gas “solubility” of the polymer used, the temperature of the polymer melt, the L/D ratio of the extruder screw and other processing parameters.
   These include injection speed, backpressure, holding pressure, etc.
   The surface quality, mould filling and density reduction are directly related to the gas diverting properties.
   Once the gassed polymer mass is injected into the mould the gas escapes spontaneously leaving the foam structure to stabilise by the tool cooling.
   After a period of time the inner blowing gas is interchanged with air.

3. Why using blowing agents?

   To reach specific properties and improving quality of plastic parts, blowing agents are used for the following reasons:

   - Achieving optical effects (wooden structure)
   - Density reduction (weight and cost savings)
   - Reduction of shrinkage and war page
   - Sink mark removal
   - Improving of flow properties to obtain faster mould filling
   - Better process ability of the finish plastic parts (drilling, fastening, etc.)
   - Enhancing stiffness of larger parts
   - Influencing insulation properties

4. Processes

a) SFM (Structure Foam Moulding)

- Classical process, targeting highest weight reduction, sinks mark reduction, improved stiffness, reduction of warpage and shrinkage. Visible sign of foamed parts are the swirls at the surface.
- Density reduction down to 35% is possible. In practice, most of the parts are painted

b) Gas counter pressure

- Targeting weight reduction by improving surface quality. Parts made with this process have smooth surfaces and must not be painted after demoulding.

c) Co-Injection

- Blowing agents used in the core component mainly to achieve higher stiffness, sink mark reduction, improved melt flow. Weight reduction is not so important but between 15% - 25% can be achieved.

d) Compact Injection Moulding

- Blowing agents are used here basically to remove sink marks.

e) Low pressure and direct gassing processes

- Seldom used in Europe, but much more popular in the United States. Advantage here is the possibility to produce over size parts, reducing the weight and improving the stiffness.
- In combination with a physical gas like nitrogen or air, the blowing agents are reacting like nucleating agents in order to achieve fine cell structured parts (pallets, slides, big boxes).

5. Types of blowing agents

a) Exothermic blowing agents
compounded into different carriers, based on azodicarbonamide and other hydrazine based chemicals.

- Gas yield (220 ml/g) for pure azodicarbonamide
- Low dosage levels
- Even gas distribution
- Less corrosion on mild steels
- Decomposition can be adjusted according to the polymers used
- Blowing agent master batches available in different concentrations and different carriers
- No tendency to blooming out
- Not applicable for food applications

b) Endothermic blowing agents

- Lower gas yield (130 ml/g)
- Higher dosage levels possible
- Might require moulds containing high Cr content for high citric derivate contents
- Blooming out possible with different types, important to select the right grade
- Narrow processing window
- Very fine cell structure
- Shorter cycle times
- Releases CO_2 and only a small amount of water
- Applicable for food applications

6. Dosage of blowing agents

a) Sink mark reduction:

- Low concentration blowing agents are recommended
- Like **PLASTRONFOAM B 20**, **C 20**, **D 20**. May be also 40% concentrated master batches if shot weight is higher than 200 g.
- Lower concentration master batches provide better distribution of the gas, quantities here 1,0 - 2,5 %
- In some cases customers prefer powdered material, please check the **PLASTRONFOAM** powder grades, like **PLASTRONFOAM BSH** or **COMPOUND**.

b) SFM, Gas counter pressure an Co-Injection:

- 1 - 3% depending on the concentration of the propellant and compatibility of the carrier
- **PLASTRONFOAM B 40** or **B 70**, **C 40** or **C 70**, **D 40** or **D 70**.

7. Processing

Different methods are possible:

- Premixing with the polymer in use (this is absolutely necessary when using a blowing agent powder)
- Dosing by volumetric or gravimetric feeders
- Predrying of the blowing agent master batches should be avoided

8. Machinery conditions

When using a blowing agent the following parameters should be considered:

- Reduction of the holding pressure down to 0
- Increase of the backpressure
- Fast injection speed
- Sufficient mould cooling should be provided
- Shut off nozzles (mechanic or hydraulic) should be installed to avoid the melted mass running out and to avoid loss of the blowing gases
- Sufficient mould degassing time must be allowed

9. General recommendations:

The wide number of blowing agents available can confuse processors.
Where information or service is required, please do not hesitate to contact us.

We will help you with advices and hints and tips from our wide experience.
We will also introduce the right blowing agent for your specific problem.
By arrangement we can visit you to test our materials on site with your operators.

PLASTRONFOAM blowing agents have been approved since many years in daily praxis.