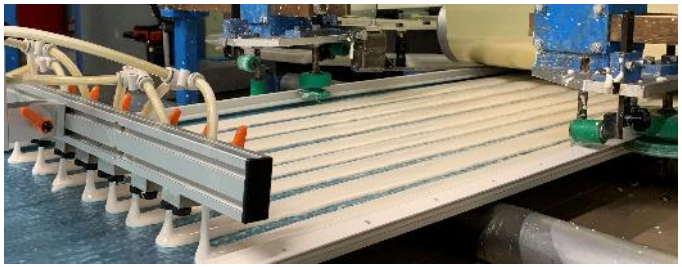
Independent expert in polyurethane dosing and manufacturing

Established in 2006, POFI-Engineering is a company specialized in the design of custom machinery, dosing, temperature regulation, and static mixing of liquid, solid, and gas components.

The primary objective of the company is to assemble experts to support you in areas such as research, calculations, defining, and providing the necessary elements for your production needs. With a global network and extensive knowledge of production processes and methods, we are ready to assist you in all your efforts to enhance your production processes.



Most of our clients have become friends because POFI-Engineering provides the most suitable service, high-quality work, extensive industry knowledge, and years of experience.

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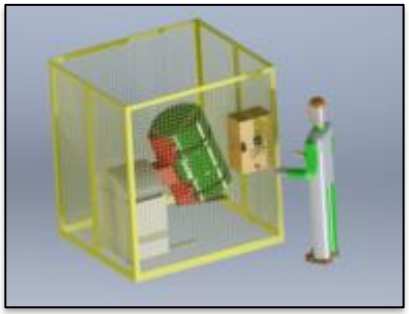
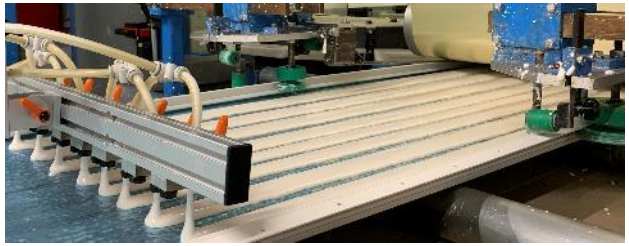
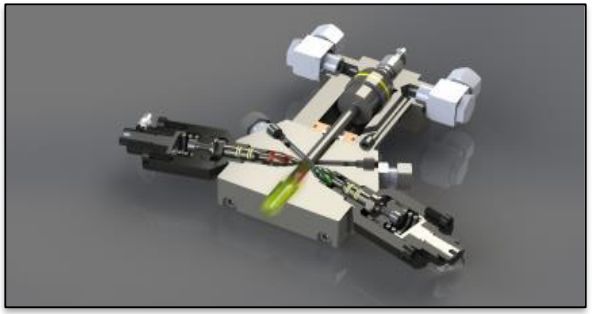
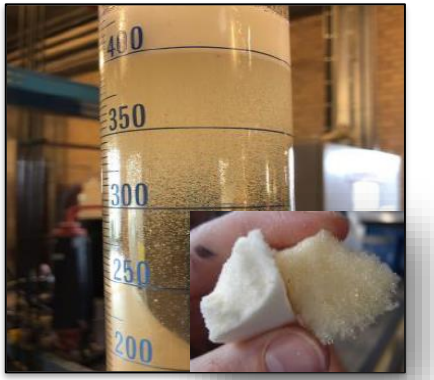
Specific developments to improve the daily life of producers.









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training

After visiting and inspecting over fifty sandwich panel production lines worldwide, we have observed significant gaps in terms of training. Leveraging our extensive experience in this field, we offer a two-part training program at your production site. The training covers the fundamentals of polyurethane chemistry and the production line.

This highly detailed training takes place in a conference room with video projection, supplemented by on-site visits to the production line. The aim is to establish a connection between your actual process and the ideal theoretical process.

Alongside the training, you will receive a comprehensive 108-page guide that will serve as a valuable reference throughout your career.

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EXPERTISE

We offer you a complete expertise of your production line and the follow-up of your production for 3 days with all the solutions to optimize the whole at low cost.
Advice and assistance to increase productivity or reduce the production costs of your lines.
Advice and assistance with the purchase and commissioning of new production lines, the search for subcontractors and suppliers, the follow-up of the assembly of the installations, the commissioning of the installations, training and follow-up from production.
Advice and assistance in the development of new products.
Assistance in solving problems on products and production lines.
Finding suppliers to optimize your purchases

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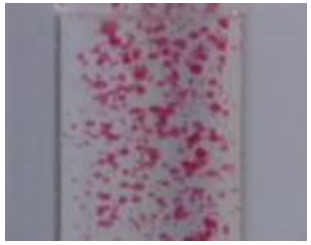
DISPERGATOR

Due to changes in additive regulations and the complexity of formulations, the components to be mixed into the polyol have significantly different viscosities, making them very difficult to blend or even non-miscible. Consequently, the resulting foam becomes challenging to process, often leading to surfaces in contact with the sheet filled with bubbles, adhesion issues, shrinkage problems, and other related concerns.

To address the issue of component miscibility, we have developed two elements that allow for the dispersion of additives and gases into very small particles, evenly distributed within the polyol. As a result, when the polyol is mixed with the isocyanate in the mixing head, the additives become much more reactive, and there are no concentrations of random gases or foaming agents that create surfaces full of bubbles or "potato fields."

Dispersion has become a crucial aspect of polyurethane foam production units and has shown excellent results with PIR (Polyisocyanurate) foams. It is available in low pressure (air-nucleation mix) arranged after the dynamic mixer and the high-pressure version (pentane and additive mix) placed closest to the mixing head.

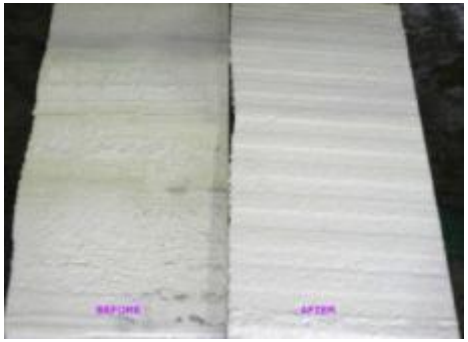


Normal Mixing

Entry into the dispergator

Exit from the dispergator

Homogenization of the mixture



Very easy to install
Improved mixing
Better foam quality
Enhanced reactivity
Improved results in mechanical tests
Reduces activator consumption

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Fixed foam deposition head for continuous lines

Designed with the latest fluid calculation software, our fixed foam deposition system is undoubtedly the best low-cost solution to enhance the performance of your production line.

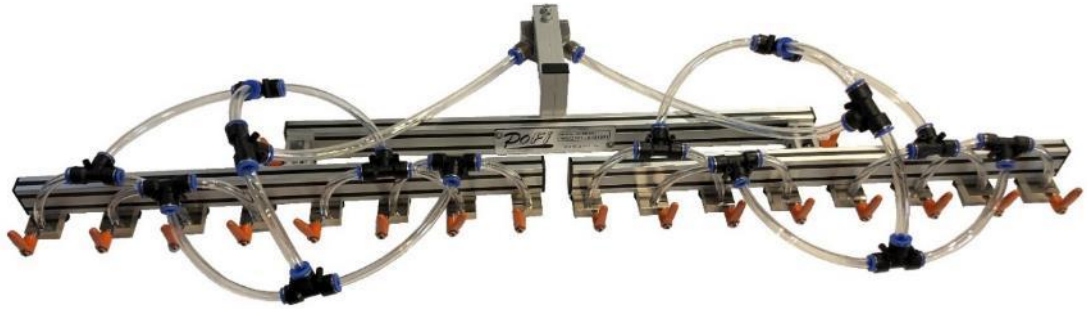
The primary spreading system currently used in most production lines is the "Poker," a rake that oscillates at different speeds from left to right and right to left. We typically set an overlap of about 60% on the rake's return.

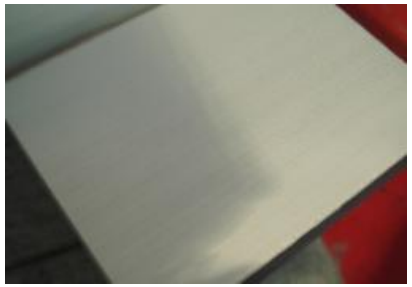
However, this system has several disadvantages: it is challenging to achieve a uniform distribution, the foam overlap tends to crush the forming cells on the first pass, and the wave is not consistent, making it difficult to adjust.

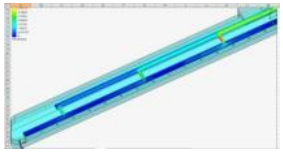
The innovation lies in the fixed foam deposition head, which eliminates all these issues. The foam is uniformly laid on the lower facing, allowing it to expand freely. This results in a homogeneous mixture, even foam distribution, and a consistent and uniform wave. The wave becomes easier to control in positioning, significantly improving the overall panel quality.

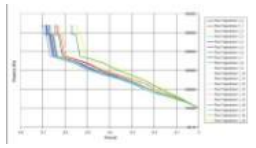
As this system doesn't require any movements, it is maintenance-free. Each deposition point's position can be adjusted both in width and angle to ensure consistent panel filling.

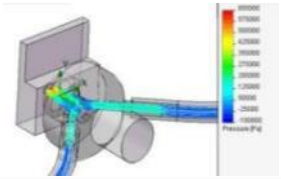
Furthermore, this system is compatible with all existing production lines.

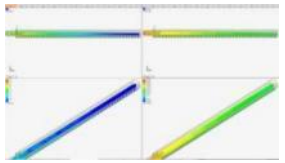












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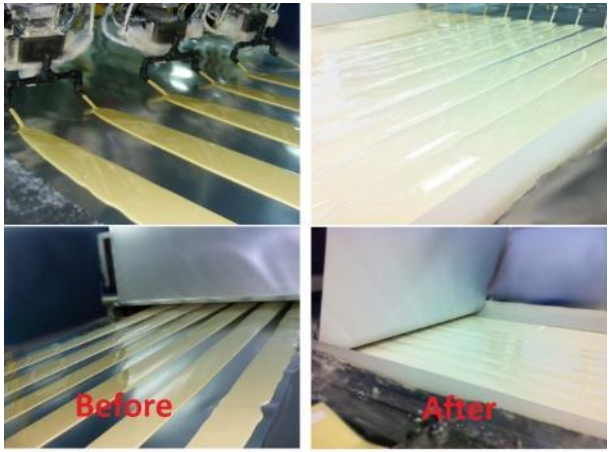
Fixed deposition heads for flexible facings

Designed with the latest flow calculation software, our fixed foam deposition head is undoubtedly the best low-cost solution to enhance your production line.
Most production lines for panels with flexible facings have a foam deposition system with 2 outputs per mixing head. The impact velocity on the lower facing is high, and the flow output is very turbulent, causing some of the blowing agent to immediately turn into gas, losing its effect on foam expansion. This fluid velocity also creates bubbles at the point of impact.
With this new POFI-Engineering patent, we reduce this effect and improve foam quality through non-turbulent deposition. The impact velocity is lower, and the angle given to the distribution system reduces bubble formation. The uniform arrangement of distribution points allows for optimal cell orientation, resulting in better mechanical properties of the panel.
Each output from the mixing head is divided into 4 equal streams to ensure better distribution on the lower facing and, consequently, improved density homogeneity.



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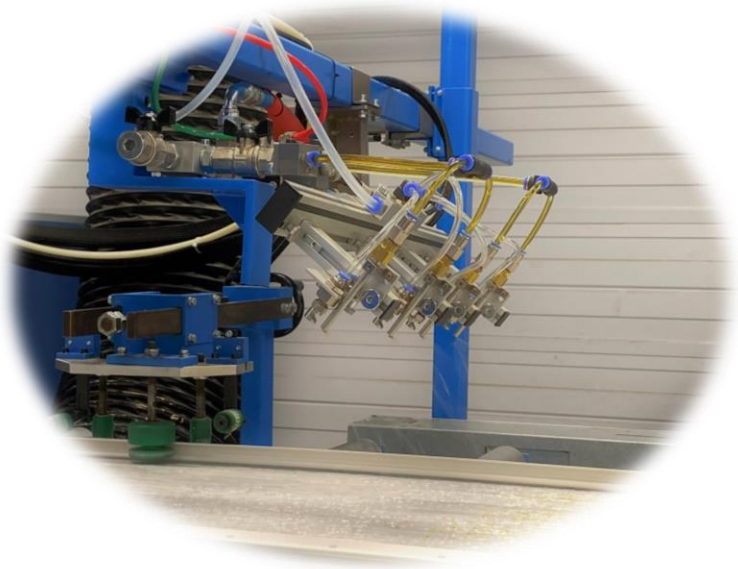
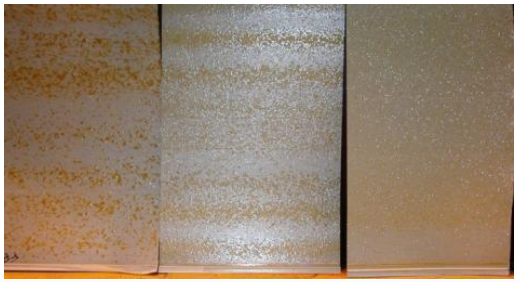
Primer Application System for PIR

The concept of this system is to enable the uniform diffusion of fine adhesive droplets onto the lower facing of the panel. Eight adjustable nozzles create an air cushion parallel to the facing, and each nozzle has an injector that generates fine droplets randomly deposited on the panel. There is no spraying of the droplets, thus no mist is created.
The dosing device is equipped with a flow meter for each component, and the pump is controlled by a closed-loop variable frequency drive to precisely control the deposited volume.
Cleaning is straightforward as there are no mechanical contacts with the adhesive. You can rinse the plastic distribution tubes or replace them if needed.
You have the option to use a pressurized reservoir (for high viscosities) or a transfer pump to work directly from the container (drum or barrel).
This system is available for both two-component adhesives and one-component adhesives.





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Continuous line mixing heads

CONCEPT:

The mixing heads for continuous lines are the result of many years of experience in the field of sandwich panels.
The rearward-slanted injectors increase turbulence and thereby improve mixing.
The set is made of noble steels and treated for a long life.
Production costs are optimized so that we can offer you this mixing head at a very good price.

Produced in Korea, we have all spare parts in stock at our premises.

Patented technology with double opposite angles.

Improved mixing.

Better foam quality.

Competitive pricing.

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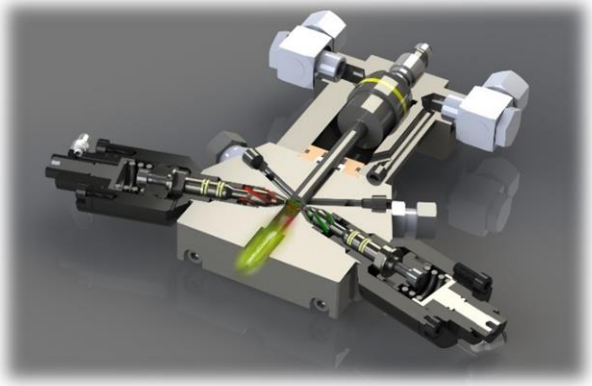
Self-cleaning mixing heads for continuous lines

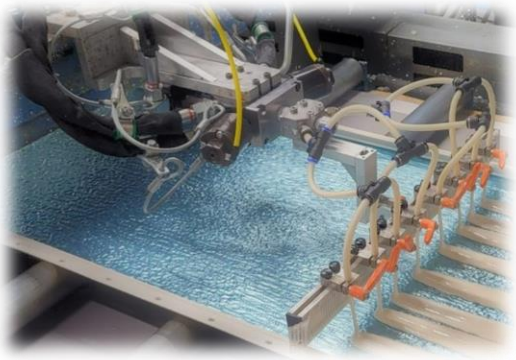
CONCEPT:

These continuous line mixing heads are the result of many years of experience in the sandwich panel industry. We designed this special concept in response to numerous customer requests for improved mixing efficiency, particularly for PIR foam production. Specially developed injectors allow each fluid to rotate in opposite directions, increasing the mixing energy. The injectors are backward-inclined to enhance turbulence and, consequently, improve the overall mixing process.
The entire equipment is designed for long-lasting performance. We have optimized production costs to offer this mixing head at a competitive price.
Manufactured in Luxembourg, we keep all the spare parts readily available in our local inventory.

Available sizes:

FF10A débits de 80 à 400 g/s
FF12A débits de 120 à 560 g/s
FF14A débits de 200 à 780 g/s





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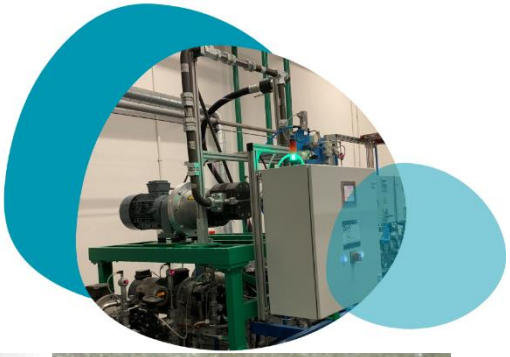
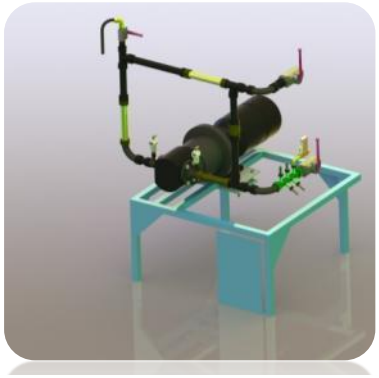
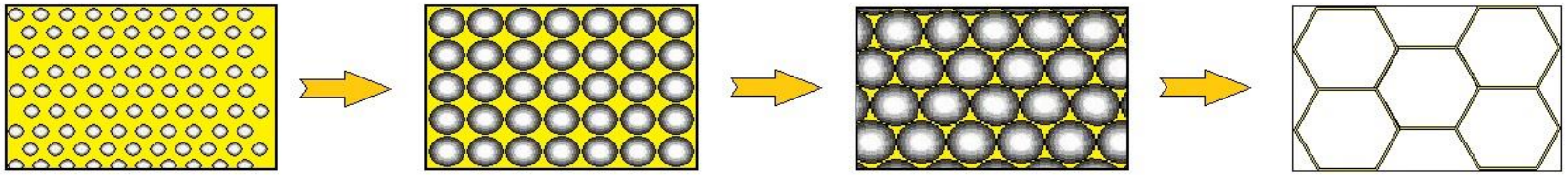
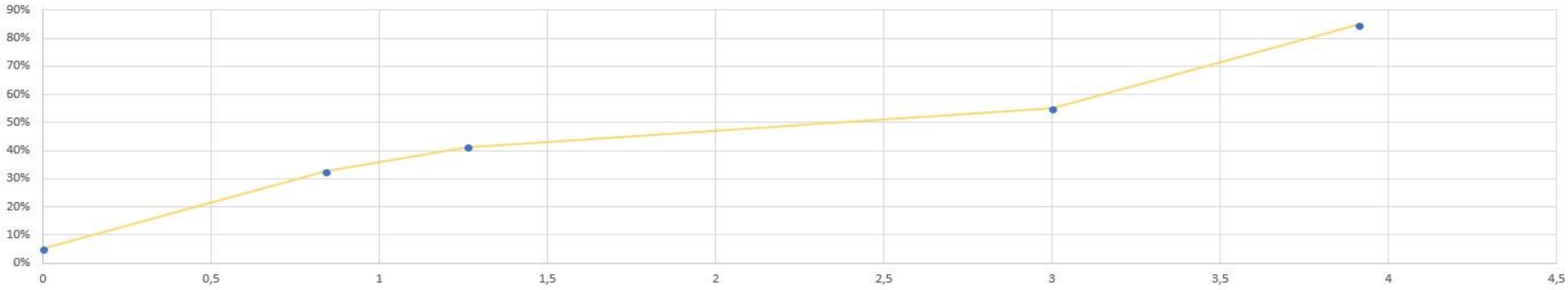
Nucleation unit

for continuous production lines of sandwich panels.

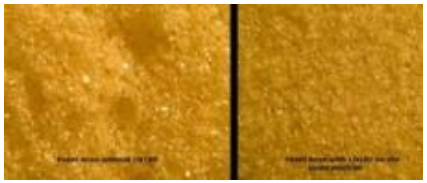


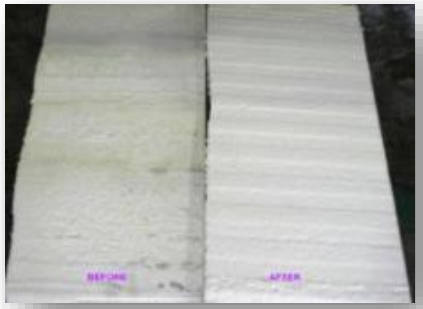


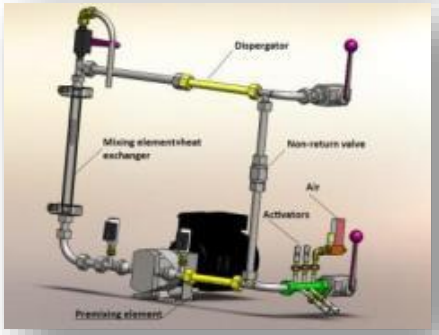




Nucleation unit for continuous production lines of sandwich panels.







Polyurethane foam is primarily a cellular plastic material. The properties of this matrix depend mainly on two factors: structure and composition. The cell structure is formed by the action of blowing agents. Finer and more homogeneous cell structures result in better mechanical characteristics of the polyurethane foam. The chemical composition also significantly influences its mechanical strength. A homogeneous stoichiometric mixture imparts optimal mechanical characteristics to the polyurethane foam. Nucleation (air, nitrogen, or CO_2) plays a role in the relatively less utilized aspect of mechanical expansion. When physical agents are used to form the cells, the gaseous phase of the cellular plastic is chemically identical to that of the blowing agent. Implementing this technique had challenges, but recently, they have been resolved by introducing gas miscibility in a liquid through variations in pressure associated with a high-performance mixing and homogenization system.

Direct effects of nucleation:

Impact on chemical composition:

The principle of nucleation is to refine the cell structure of the foam through a combination of actions applied to the Polymix (a mixture of polyol and additives). By achieving better blending of the polyol with its additives and incorporating air into very fine particles, its reactivity increases significantly. This enhancement improves the mixing quality of isocyanate/polyol and optimizes the stoichiometry of the reaction. As a result, it enables better cross-linking, leading to improved mechanical characteristics of the polyurethane foam. Consequently, it becomes possible to reduce the amount of catalyst required for the reaction.

Influence on cell structure:

The strength of the matrix structure also depends on the fineness of the bubbles and their even distribution. Nucleation, through its concept, combines various physical actions that cause the bursting of bubbles into very fine and precise particles, thus significantly enhancing the matrix structure.

Importance of air nucleation in rigid foam:

The production of rigid polyurethane foam requires two main liquid components, a poly-isocyanate and a POLYMIX (polyol and blowing agent). The blowing agent is typically added to the polyol along with other auxiliary components, such as reaction accelerators, foam stabilizers, and flame retardants.

The reaction takes place when the two components are mixed together. During the reaction, a considerable amount of heat is released and used to evaporate the blowing agents present in the polyol. This evaporation, combined with the chemical reaction, forms the foam. Various amounts of water are usually added to the polyol. Water reacts with the isocyanate to form polyurea and carbon dioxide, which serves as an additional expansion agent. As the primary expansion agent, some air is included in the Polymix.

In fact, the polymerization reaction produces solid polyurethane, and it is by forming gas bubbles in the polymerization mixture, often referred to as "blowing," that foam is created.

Individual cells in the foam are isolated from each other by thin polymer walls, which effectively prevent gas flow through the foam. These materials offer good structural strength relative to their weight, combined with excellent thermal insulation properties. The cells contain a mixture of gas, and depending on their nature, the dimensions and proportions of the foams have different thermal conductivities. To maintain long-term performance, low thermal conductivity gases must remain in the cells; therefore, over 90 percent of the cells must be closed.

This demonstrates that good foam results from two components: structure and composition. The composition is developed by the raw material supplier. We will focus on the mechanical part, the foam matrix.

There are several theories on foam development. Most are based on nucleation in the development phase. It appears that all cells present in the finished foam are already present in the early development phase when the raw materials are mixed in the mixing head; the reaction triggers the appearance of nucleation air bubbles present in the Polymix.

Dispersed gas bubbles grow due to the expansion of the blowing gas. This process continues until the spherical cells are more closely packed in the liquid matrix. When the spherical cells are in contact with each other, they convert into polyhedral cells. The foam reaches its final structure and a good mass distribution at the end of the fill time.

The more homogeneous and fine the structure, the better the mechanical and insulation characteristics of the polyurethane foam.

Today, the benefits of air nucleation are still relatively underutilized for mechanical expansion, comprising about 8 to 12% of air in the Polymix.

When physical agents are used to form the cells, the gaseous phase of the cellular plastic is chemically identical to that of the blowing agent. This technique had implementation difficulties, recently resolved by adding the function of gas miscibility in a liquid through a set of pressure variations associated with a high-performance mixing and homogenization system. With this system, we can add around 65% of air nucleation without cavitation of the high-pressure pump. The result is a more regular matrix and a more homogeneous foam.

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