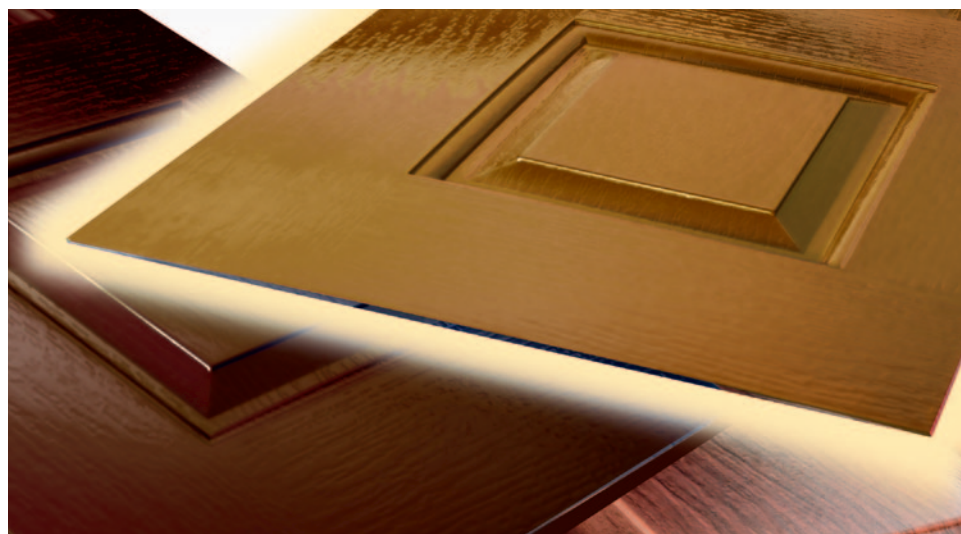


SIMONA® SIMOSHIELD

Plastic Sheets for Door Fabrication

Specifications within the area of door production have become increasingly exacting. Not only do manufacturers want a wide range of decors to choose from, they also demand exceptional UV stability and outstanding adhesive properties. Together with plastic foil and film manufacturer RENOLIT, SIMONA has developed a material that meets the full range of requirements.

In view of the fact that panels made of SIMONA® SIMOSHIELD are primarily used for outdoor applications, they have to be able to withstand extreme conditions in terms of temperature fluctuations as well as exposure to sunlight (UV/IR) and moisture. In the past, manufacturers tended to apply the so-called hot-stamping method (see "Plastics Expertise") when it came to bonding the wood decor finish to the base material. As a result of extensive research and development on the part of major decorative film and foil manufacturers, the quality of products offered within the area of door fabrication has increased considerably in recent years. The new types of foil and film, such as those engineered by RENOLIT, are much thicker (up to 280 µm) than conventional solutions. What is more, they have a multilayer structure and incorporate IR reflective properties. As regards appearance, the decorative foil has a visi-



SIMONA® SIMOSHIELD – UV stability, weather resistance and cost-effectiveness

ble and palpable woodgrain finish. The quality of these materials is far superior to that offered by standard hot-stamping foils.

Product development

Once the evaluation phase had been completed on the basis of VDI Directive 2222, initial test runs were performed. Within this context, the special lamination method developed for this field of application was best suited to meeting the two key requirements of bonding strength and superior surface finish. The risk of delamination is significantly reduced by the integral, adhe-

sive-free bond between the foil and the base material. Bonding strength was assessed by means of peel tests conducted in cooperation with RENOLIT and was adjudged to be fully compliant with RAL GZ 716/1. The relief structure of the foil has been modified in such a way as to ensure that it remains highly visible and palpable after the thermoforming process. Thus, the much sought-after decorative properties of RENOLIT foils have been incorporated fully within SIMONA® SIMOSHIELD. In order to achieve the best possible performance, SIMONA® SIMOSHIELD only uses RENOLIT

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Development Engineer,
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Andreas Altmayer holds a degree (University of Applied Sciences) in Process Engineering. Working within the Technical Service Center at SIMONA AG, he is responsible for maintaining and optimising PVC formulas as well as overseeing PVC product development.

Andreas Altmayer initially trained as a physics laboratory technician. After his vocational training, he spent a year at SCHOTT AG, Mainz, where he worked within the development department. This was followed by a degree course at the University of Applied Sciences Trier, Birkenfeld Campus. He wrote his practical thesis on automotive engineering at Robert Bosch GmbH in Reutlingen. Andreas Altmayer joined SIMONA AG, Kirn, in December 2008, and is currently assigned to the PVC development unit headed by Dr. Wolfgang Frings.

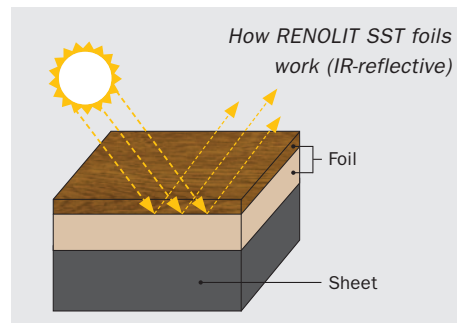
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Page 1 continued

foils with SST (Solar Shield Technology; see box to the right). The protective properties and overall quality of the special laminate are tested in the company's own lab by inspecting the structure of the individual layers. Additionally, RENOLIT regularly conducts microscopic testing to safeguard compliance. Benefiting from close collaboration between the development and product management units as well as the customer and supplier, SIMONA was able to roll out its new product within a very short time frame and in a premium quality. All mechanical and electrical components required for the project were developed and constructed by the company's Technical Service Center, Process Engineering and Production Units, which clearly illustrates the extensive technical resources and expertise available to SIMONA AG. In order to ensure consistent quality, specific test instructions were drawn up in coordination with the Quality Assurance Department, including quality measures tailored precisely to the new product.

Summary

The transparent flow of information during all development phases contributed to the



effective and productive collaboration between the staff members and the individual units involved in the project. Furthermore, RENOLIT proved to be an extremely reliable and competent partner. As a result, SIMONA was able to implement the requisite processes quickly and efficiently, thereby providing a solid basis for a product that combines sophisticated design with exceptional quality. Thanks to the decorative foils supplied by RENOLIT, SIMOSHIELD sheets are equipped with a protective shield against UV exposure and are highly heat resistant, making them the perfect choice for outdoor applications.

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Product Range

	SIMONA® SIMOSHIELD	SIMONA® PVC-T
Formats and thicknesses (in mm)		
2175 x 975 mm	1.5	1.4
2000 x 860 mm	1.5	–
2000 x 855 mm	–	1.4
Colours	golden oak, black cherry, mahogany, sapele, walnut	choice of white, caramel, brown

Other formats and thicknesses, as well as other RENOLIT decors, available on request. Please contact the SIMONA sales department for further details.

Plastics Expertise

Hot-stamping process

Hot stamping transfers prefabricated images to the substrate being decorated by applying pressure and heat. The hot-stamping foil consists of an adhesive layer matched to the substrate, a decorative coloured layer, a protective coating, a thin separating layer for detaching the colour system and a backing foil to transfer the layers to the moulded part. Owing to the effect of the parameters “pressure” and “temperature”, the coloured and protective layers become detached from the backing foil at the points of contact and are bound to the substrate. The principle is comparable with “ironing transfers” onto textiles.

(Source: www.kunststoff-institut.de)

Thermoforming

Thermoforming (also referred to as hot forming, vacuum forming or vacuum thermoforming) is a method used for forming thermoplastics. The key material properties are melt strength and melt draw-down, which determine product performance in the thermoforming process, e.g. material stretching and final forming.

In the thermoforming process foils or sheets are formed by applying heat. When the clamped substrate has softened, it is initially pre-stretched with compressed air. That is followed by shaping over a mould that has been moved into place.

Infrared and ultraviolet radiation

The radiation emitted by the sun is split up into various spectral ranges. Material properties are influenced by ultraviolet, visible and infrared radiation.

Infrared (IR) radiation is regarded as being the range of the solar spectrum with a wavelength of 780 nm upwards, following on from the red range of the optically visible spectrum. In the case of plastic doors it is infrared radiation that is mainly responsible for the rise in the temperature of the material when exposed to sunlight. Special constituents in the decorative foil used reflect the infrared radiation like a mirror and thus reduce the rise in temperature.

Ultraviolet (UV) radiation is the spectral range below a wavelength of 380 nm, following on from the optically visible violet range of the solar spectrum. Ultraviolet radiation possesses a higher level of energy on account of its short wavelength. In the case of most plastics ultraviolet radiation brings about material degradation if no protective measures are taken (e.g. applying additives). Specially modified polymethyl methacrylate (PMMA) used as the outer skin of SIMONA® SIMOSHIELD absorbs the ultraviolet radiation and thus provides a protective shield for the colour and decor.

Andreas Altmayer, Fred Walter

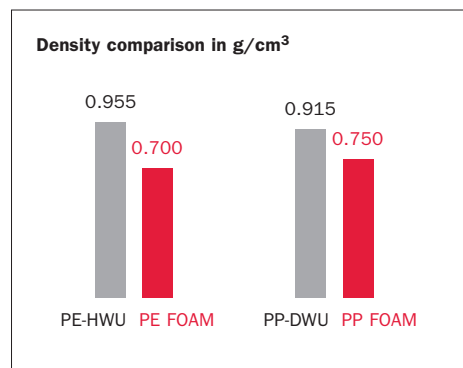
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SIMONA® PE FOAM/SIMONA® PP FOAM

Foamed Sheets with maximum Material Efficiency

The new products **SIMONA® PE FOAM** and **SIMONA® PP FOAM** are foamed polyolefin sheets. The foaming of plastics is a process that has been known for over 35 years (e.g. polystyrene, packaging materials etc.), which – in addition to the PVC foam that has been widely used for many years – **SIMONA** has also been applying to its polyolefin types **PE-HD** and **PP-H**.

The newly developed products **SIMONA® PE FOAM** and **SIMONA® PP FOAM** represent a significant improvement to material efficiency. Compared to compact material, the level of rigidity achieved is virtually identical, even though the weight is significantly less. At the same time, a higher level of thermal insulation is achieved. Owing to the method of processing, the internal stresses and strains are lower in foam sheets than in compact sheets, which reduces distortion tendency and thus improves fabrication capability.



Classification of foam types

Foam types are fundamentally classified by foam structure and method of manufacture:

Classification by foam structure

- **Closed-cell foam:**
The walls between the individual cells are completely closed.
- **Open-cell foam:**
The cell walls are not closed. These foams can therefore absorb liquids (e.g. sponges for washing up).
- **Mixed-cell foams:**
They contain both kinds of cell.
- **Integral skin foam:**
They have a closed thick skin and a cellular core. Their density decreases towards the center (e.g. PVC integral skin foam sheets).

Classification by method of manufacture

- **Physical foaming:**
The material is foamed by a physical process (e.g. injection of foaming gas).
- **Chemical foaming:**
A foaming agent, usually in the form of so-called master batch granules, is added to the plastic granules. By applying heat, a volatile portion of the foaming agent is released, which causes the melt to rise.
- **Mechanical foaming:**
In this process air is stirred into foaming resin or paste. The foam solidifies when the resin cross-links or the paste gels.

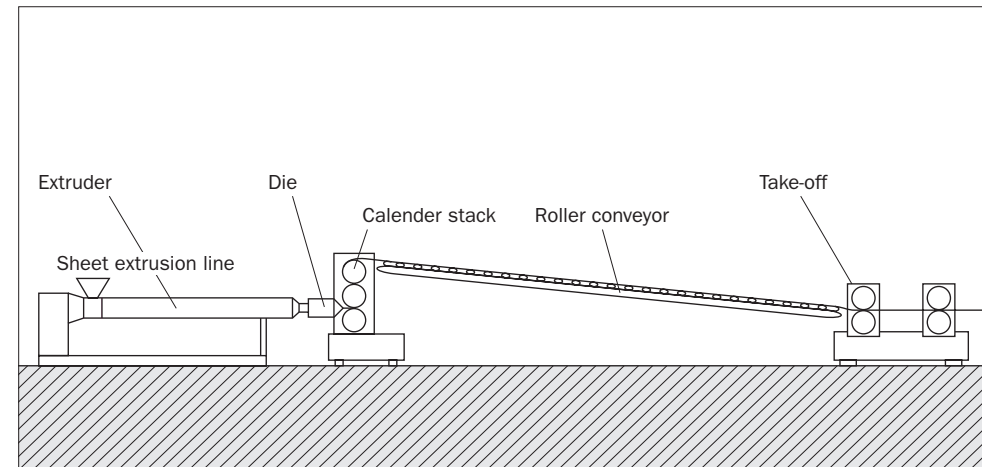


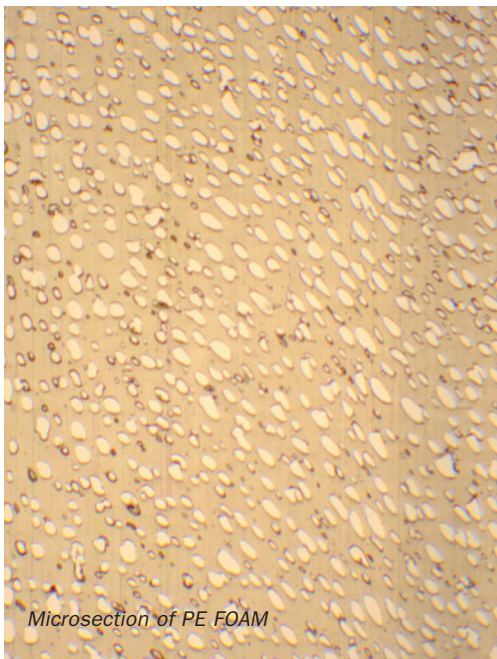
Diagram of foam extrusion

Foam extrusion


In the manufacture of polyolefin foam a foaming gas is added to a molten polyolefin (PE/PP) at high pressure in the extruder. When the plastic emerges from a flat-sheet die, it expands to a multiple of the previous volume due to the fact that the ambient pressure is significantly below the vapour pressure of the foaming agent. At the next roll frame the surface of the emerging foam sheet is substantially cooled down, thus preventing any further rise and enabling thickness calibration in the roll gap. On the downstream roller conveyor or the web of foam is cooled down to ambient temperature until the

finishing process finally reduces the material to the required sheet size and the sheets are stacked on pallets.

Page 3 continued



Product Range

	SIMONA® PE FOAM	SIMONA® PP FOAM
Extruded Sheets (Formats/Thicknesses)		
 2000 x 1000 mm	6, 8, 10	5, 6, 8, 10, 15, 20
2000 x 1250 mm	10	–
Colours	white	light grey

All dimensions in mm. Further formats, colours and intermediate sizes are available on request.

SIMONA® PE FOAM/PP FOAM – lightweight sheets with high flexural strength

Owing to their closed-cell foam core and co-extruded outer skins made of compact material, SIMONA® PE FOAM and SIMONA® PP FOAM sheets provide an excellent blend of low density, premium surface quality and high flexural strength. SIMONA® PE FOAM and SIMONA® PP FOAM sheets combine properties such as high strength and light weight, which are generally seen as opposites.

Material properties

- Low density, high surface hardness and high flexural strength

- Easy to clean
- Very easy to process
- Chemically resistant surface
- Corrosion-free
- UV-resistant (PE FOAM)
- Printable after pretreatment (PE FOAM with corona discharge)

SIMONA® PE FOAM

Using SIMONA® PE FOAM, it is possible to replace many components made of plywood and MDF. Compared to the latter wood-based materials, PE FOAM is much more durable, especially in applications exposed to moist/wet conditions. Other key benefits include versatility in fabrication, high surface quality in grained finish

and low water absorption. PE FOAM is provided with additional UV stabilisation for outdoor applications as standard.

Examples of applications

- Boatbuilding (partitions, bulkheads, control desks etc.)
- Banner material
- Lavatory containers, toilet walls and doors
- Partitions in agriculture

SIMONA® PP FOAM

SIMONA® PP FOAM sheets have smooth, compact surfaces and are more rigid than PE FOAM sheets on account of the material. They are very easy to process, have

extremely low water absorption and are used for non-critical components in apparatus construction, for example.

Examples of applications

- Construction of small sewage treatment plants
- Apparatus components
- Encasements
- Linings
- Packaging systems
- Insulation components
- Reusable containers
- Transport containers

Processing

Owing to the low inherent stresses and strains, SIMONA® PE FOAM and SIMONA® PP FOAM sheets are ideal for processing in many different ways and are easy to clean.

Fabrication processes

- Welding
- Thermoforming
- Cutting
- Drilling
- Milling
- Sawing
- Water-jet cutting
- Die cutting
- Printing (with corona pretreatment)

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Project Report

Sports fields in Katowice/Poland made of SIMONA® PE FOAM



Volleyball action. A total of 110 sheets made of SIMONA® PE FOAM were used for the barriers.

The creation of new pitches for beach volleyball and football was at the top of the list when it came to expanding the range of leisure facilities on offer at BUGLA Aqua Park. The challenge consisted of incorporating the fields within the developed segment of the facility, while separating them from the green areas and five swimming pools. TRANSCOM, the construction company overseeing the project, used SIMONA® PE FOAM sheets.

Initial situation

The principal investor, MOSiR Katowice, was planning to build new sports pitches at BUGLA Aqua Park in Katowice. The contractor, who required a high-quality material with a range of outstanding product characteristics, opted for SIMONA® PE FOAM sheets. Within this context, simple processing and assembly proved a key advantage when it came to meeting the challenging deadline.

Task

The investor had highly exacting standards for the material from which the barriers were to be made:

- UV-stabilised
- Low weight with high rigidity
- Resistance to mechanical and environmental factors
- Excellent processing properties

Solution

Various types of sheet were shortlisted for the project, but SIMONA® PE FOAM was the only product deemed suitable. SIMONA® PE FOAM sheets were used to separate the sand on the surface of the sports fields from the surrounding green areas, the main purpose being to reduce the spread of loose soil. To achieve this, the main contractor, TRANSCOM, mounted SIMONA® PE FOAM sheets on a steel construction. The sheets were drilled and subsequently screwed onto galvanized racks. Due to the high quality of SIMONA® PE FOAM sheets, the perimeter boards were installed quickly and effectively, without the need for additional structures.

Owing to their special properties, SIMONA® PE FOAM sheets are the perfect solution for a wide range of projects. What is more, combining UV stability with high rigidity, SIMONA® PE FOAM sheets are ideally suited to outdoor applications. Their lightweight design makes them particularly easy to handle and quick to install.

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Top: preparation for mounting barriers.
Bottom: completed application.

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