Sikatherm® NFF
INORGANIC, MULTIFUNCTIONAL FOAM TECHNOLOGY FOR SUSTAINABLE AND COST-EFFICIENT CONSTRUCTION

BUILDING TRUST

INORGANIC SUSTAINABLE FOAMS

Sikatherm® NFF

Construction chemistry has achieved an important breakthrough in concrete and insulating material technology with the development of a new product in the segment of non-flammable mineral foams (NFF). Based on the successful developmement, a new product line has been launched: Sikatherm® NFF.

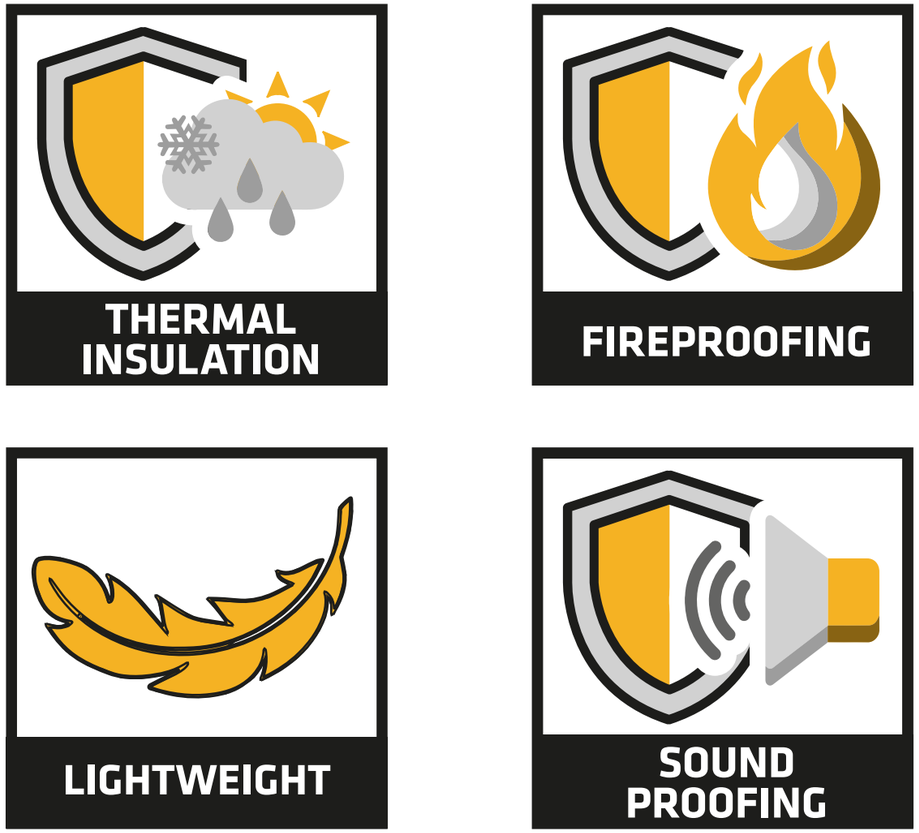
The new portfolio of inorganic foams is designed for on-site, prefabrication and insulation in a wide variety of application areas.

What is so special about Sikatherm® NFF?

The driving forces behind inorganic insulating materials are their excellent properties with respect to fireproofing, insulating capability, recyclability and their sustainable production.

These unique properties of the Sikatherm® NFF product family offer many options to building designers and experts in the construction industry. For example, it is possible to produce pre-fabricated insulating boards with greater process reliability and ease. The foam can be used in all fully automated processes, such as cavity filling, board or prefabricated element production.

Both Sikatherm® NFF products are non-flammable, A1, and have sound-proofing / noise-proofing properties.



WHAT DISTINGUISHES THE Sikatherm® NFF PRODUCTS?

Natural lightweight minerals such as pumice inspired the development of Sikatherm® NFF. However, the greatest challenges for building materials have essentially been the same for centuries: high strength combined with low density and good insulation.

Imitation of the porous structure of natural pumice allowed for the development of similarly lightweight, noise-absorbing and thermally insulating products. These products can also be given any shape or cast and can be produced continuously and in large batch sizes.

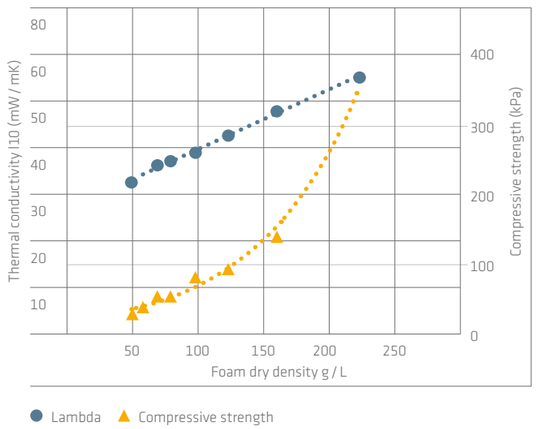
As a result, Sikatherm® NFF can be implemented easily as boards, blocks, semi-finished parts, lightweight construction parts and much more. The artificial minerals demonstrate enduring strength, good resistance to external influences, and unchanging material properties and what's more, they can be completely reused and upcycled.

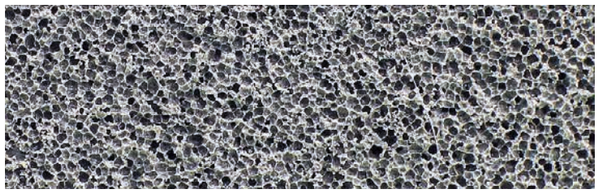
- With Sikatherm® NFF, a new technological level has been reached. Previously, no inorganic foam has been capable of demonstrating such versatility and the combination of advantageous properties as can be found in these new materials.
- The product lines of the non-flammable, inorganic materials consist of compounds that can be foamed with little effort, both mechanically and chemically.
- The products can be dried and hardened in ambient conditions even without additional energy input.
- They can be incorporated into a wide range of construction industry products as brick cavity fillers, as insulation for sandwich elements or as lightweight construction elements.

Ask us about your desired applications, regardless of whether they are in fireproofing, thermal insulation or sound proofing.

- Sikatherm® NFF fulfills the relevant fireproofing criteria for non-flammability. All of our products are classified as A1 foam.
- Our products are particularly appealing with regard to health and safety regulations because they are non-hazardous and non-fibrous both in processing and application.
- Sikatherm® NFF is sustainable and durable products with a long service life.

Thermal conductivity strength development for Sikatherm® NFF, measured in accordance with DIN EN 12667 (Lambda), DIN EN 826 (compressive strength) and conditioned at 23°C and 50% RH





The microstructure of the foam is formed through mineralic reactions like hydration or polycondensation.

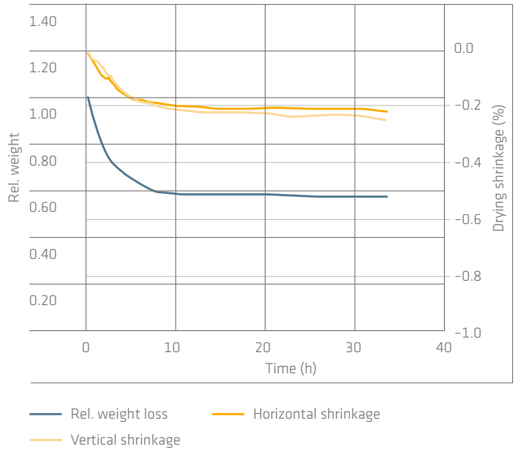
The pores in the microstructure offer excellent sound-proofing and heat retention properties.

Sikatherm® NFF products are solid, durable and lightweight at the same time.

WHAT DISTINGUISHES THE Sikatherm® NFF PRODUCTS?

- Sikatherm® NFF foams is resistant against freezing and thawing at all density classes.
- The foams show low water absorption due to their hydrophobic nature.
- Condensing water will be transported to the surface due to capillary action.
- The foam volume remains constant at all moisture and temperature levels and will not change.
- Sikatherm® NFF exhibits a low drying shrinkage rate of approx. 0.2 percent in the horizontal and vertical direction when stored at ambient conditions (20°C and 75% rel. humidity) and a specific dry density of 70 g / L. The equilibrium moisture content with the environment is reached after seven days without additional drying.

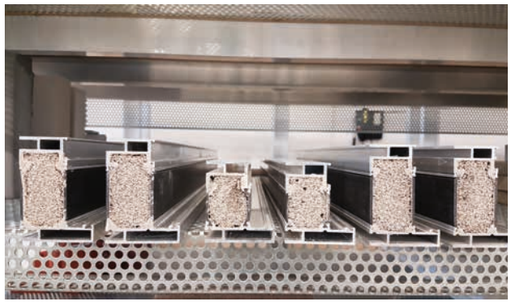
DRYING SHRINKAGE AND EQUILIBRIUM MOISTURE CONTENT



Example of insulated double-layer masonry. Sikatherm® NFF insulates the wall and holds the facing formwork without reinforcement.

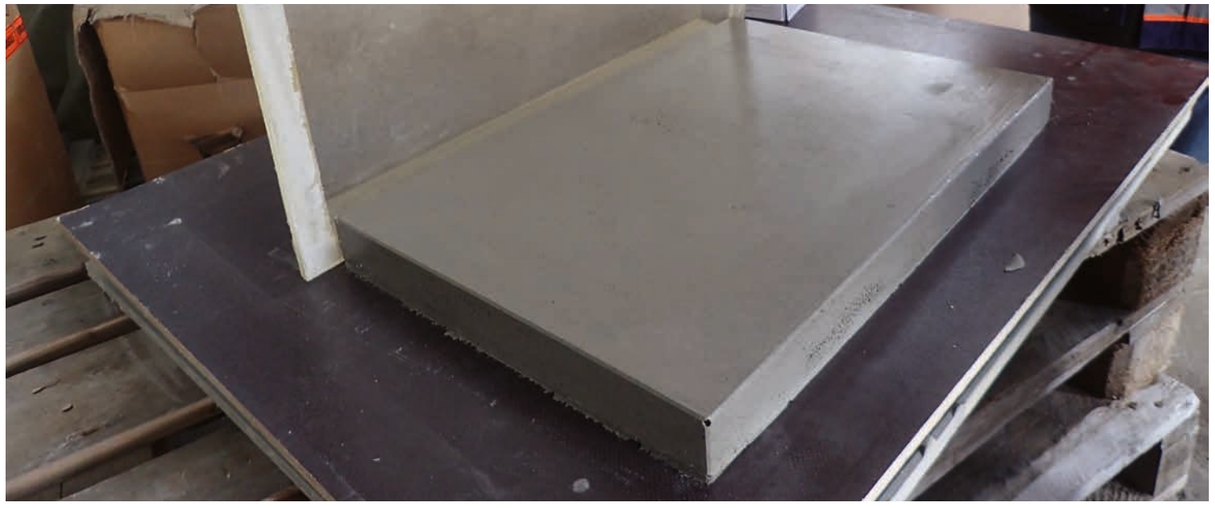
Example of a filled concrete block with insulating foam 33 mW / m*K

Successful production for the first exterior wall applications



Even small aluminum profiles can be successfully filled and provided with fireproof insulation.

HOW IS Sikatherm® NFF PRODUCED?



- Sikatherm® NFF can be combined with dusts and sands of various sources. The foam can be used to form boards, fill cavities in blocks or double layer walls.
- Sikatherm® NFF is foamed chemically or mechanically. Insulating boards for composite thermal insulation systems or cavity fillings can be manufactured in a scalable process both in batches and continuously.
- The foam can be produced safely at specified densities. It is possible to generate the desired product properties at a tolerance of less than five percent deviation in a continuous production process. The production processes are proven and have been in operation on the first customer's premises since mid-2018.
- Sikatherm® NFF can easily be cast in blocks. These can then be cut to the desired shape and size using a wire, which makes the product attractive for further processing into location-specific products. This also makes it possible to reduce cutting waste and accelerate the assembly process.
- Sustainability is an essential feature of the Sikatherm® NFF product. It is a "green" product line because it uses recycled materials and bonding agents with particularly low CO_2-equivalent values. Sikatherm® NFF offers a production process that uses resources efficiently. For instance, an energy-intensive autoclave is not needed. The concept provides the option of moving the entire foaming process to the customer's premises, which significantly reduces the energy demand that would be required with other products for transport to the location of use.

Sikatherm® NFF IN COMPARISON TO OTHER PRODUCTS IN THE MARKET

Compressive strength DIN EN 826
Lambda 10, 70°C: Thermal conductivity DIN EN 12667 (10°C) after 70°C sample drying to constant mass

	Sikatherm® NFF		Mineral wool	AAC	Cement
Product	Cavity insulation	Insulating board	Board	Board	Foam
Lambda 10, 70 °C mW / m*K	31	33			
Lambda design mW / m*K	< 35	37	35	45	42
Dry density g / L	55	75	100	100	70
Flammability	A1	A1	A1	A1	A1
Compressive strength (kPa)	17	51	5	300	30
Unique selling point	Price/performance ratio, fast hardening, can be adapted to different requirements, sustainability				

ABSTRACT ON FOAMING

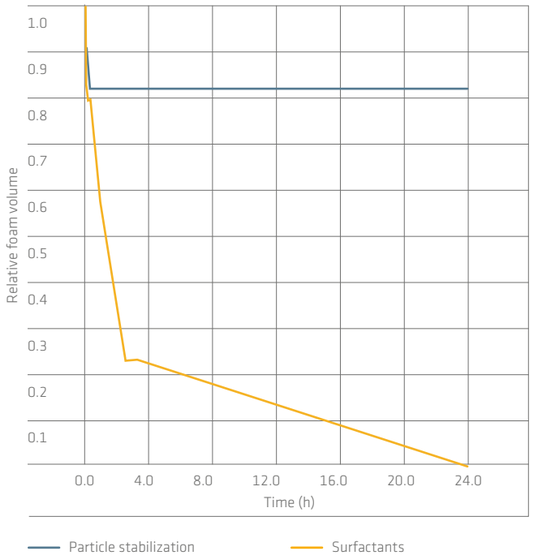
The process of foaming inorganic materials is made up of at least three process steps that must be coordinated with each other and optimized:

1. **Air introduction; this can be done mechanically or chemically**
2. **Air stabilization**
3. **Hardening of the matrix material**

Each of these process steps determines the quality of the end product and has significant influence on the next step. The size and number of pores is essentially determined by the type and duration of the air supply, which in turn influences the strength and density of the material. The mixing process, duration and energy play an important role here.

However, the foam of an aqueous solution is not stable for a long period. The external temperature and the type of the surfactant have a strong influence on the duration of air stabilization. Drainage and coalescence, i.e. the transition process of a system from many small air pores to a few large ones result in a significant de-aeration of the foam so that, after a short period, only a small part of the introduced air is still present. The foam thus collapses.

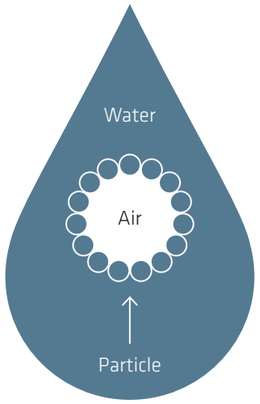
COMPARISON OF PARTICLE STABILIZATION AND CLASSIC SURFACTANT TECHNOLOGY

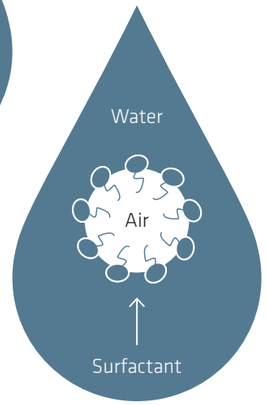


Inorganic bonding agents, e.g. cement, also react depending on the temperature and usually take some time to become stable. High temperatures accelerate the development of strength but unfortunately also the collapse of the foam. If the development of strength is significantly slower than the de-aeration, the foam will deflate. At least part of the introduced air will escape. If strength develops too quickly, air introduction will be impeded, and the maximum air content cannot be introduced into the system.

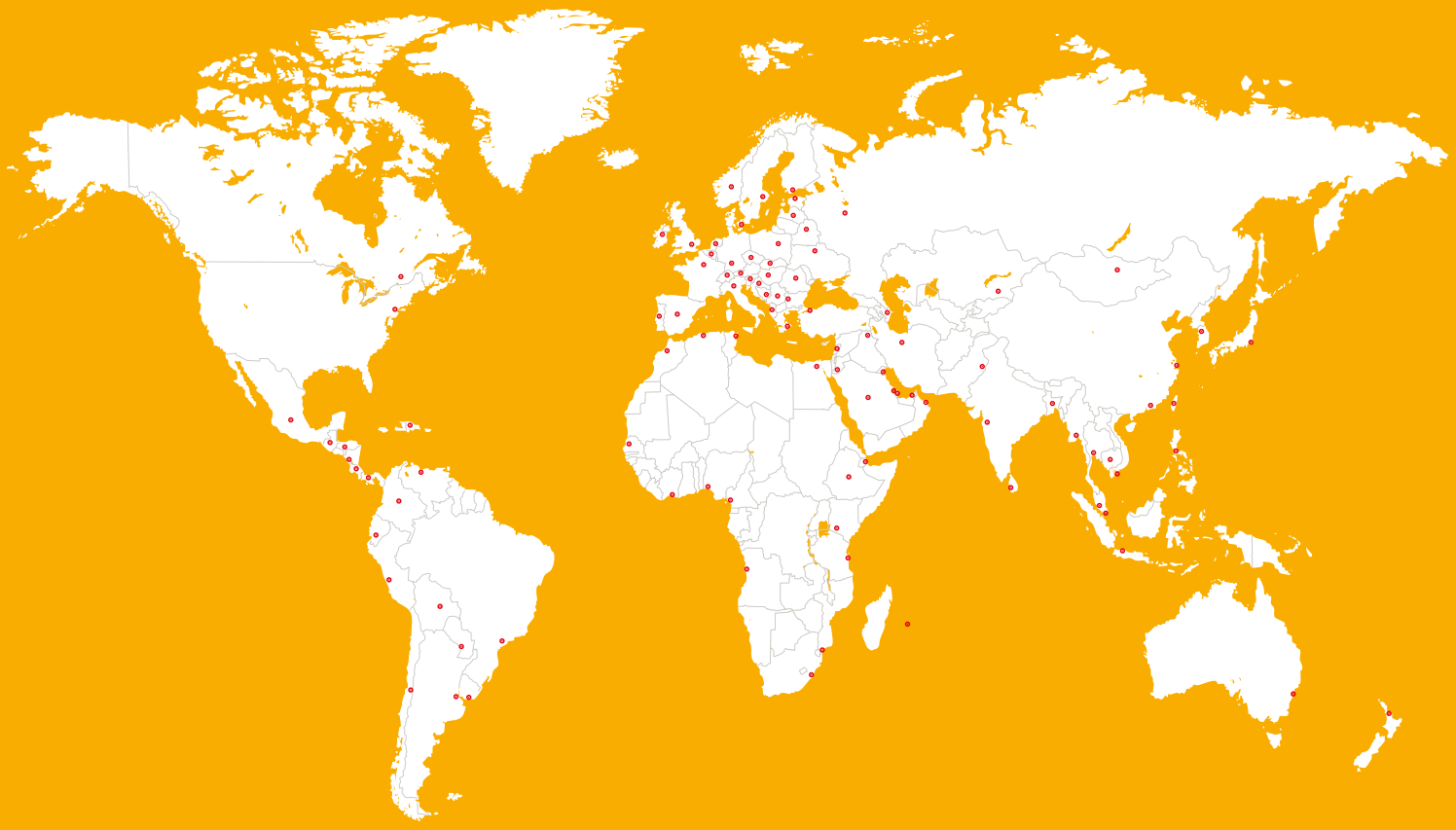
These problems have been solved by the particle stabilization used in Sikatherm® NFF. Unlike surfactant-based foaming agents, the particles form a shell structure at the water-air boundary. This shell is stable for a longer period (see graph) and permits the bonding agents to react more slowly and achieve lower densities.

INFLUENCE OF PARTICLE STABILIZATION ON AIR INTRODUCTION





GLOBAL BUT LOCAL PARTNERSHIP



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