

synthos
EPS



synthos
chemical innovations



We are
of the **part**
circular
economy

CONSTRUCTION-INDUSTRY PRODUCTS

Achieving energy efficiency is one of the biggest challenges in the construction market today. Being one of the components of the Circular Economy, energy efficiency is widely understood as a factor in limiting the consumption of energy resources and the emission of exhaust gases and particulates into the environment. This challenge is driving new solutions for increased energy efficiency, which include improved thermal-insulating performance in residential buildings, and improved environmental protection by way of reprocessing and recycling.

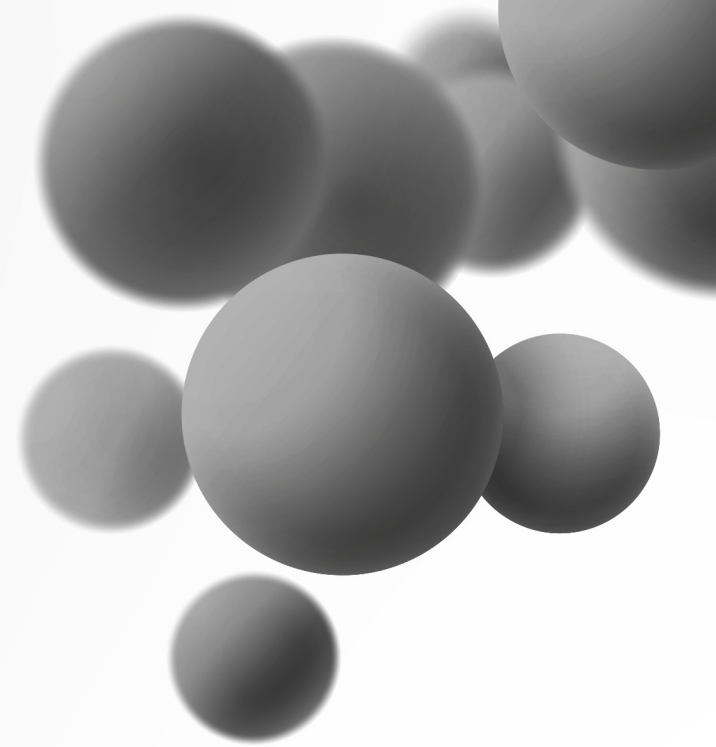
Synthos S.A. presents its latest products: **InVento Optima** and **InVento Prime** – thermal-insulation additives with the **best thermal-insulating performance on the market**, coupled with **unparalleled care for the natural environment**.



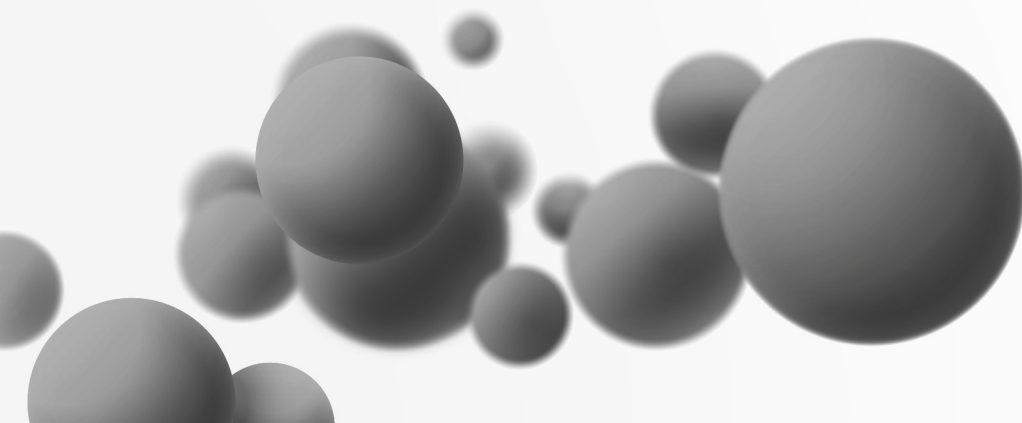
InVento Optima and **InVento Prime** are the latest premium products from Synthos, and have been developed as a response to the human impact on the natural environment. The concept behind the two products was to develop next-generation, innovative, and sustainable grey EPS (expandable polystyrene) products in alignment with the principles of the Circular Economy. The completely innovative, waste-free, and state-of-the-art manufacturing process facilitates the production of eco-friendly, high-quality EPS materials, with a recycled content of up to 100%.

A key feature of **InVento Optima** and **InVento Prime** is their **multiple recyclability**; hence they can be reused repeatedly to manufacture quality EPS materials.

The cellular structure of **InVento Optima** and **InVento Prime** is formed by uniform and stable extrusions. The excellent dispersion of a **unique geopolymer additive** endows the products with superior performance characteristics.



The new **InVento Optima** and **InVento Prime** products raise the innovation bar for EPS materials.



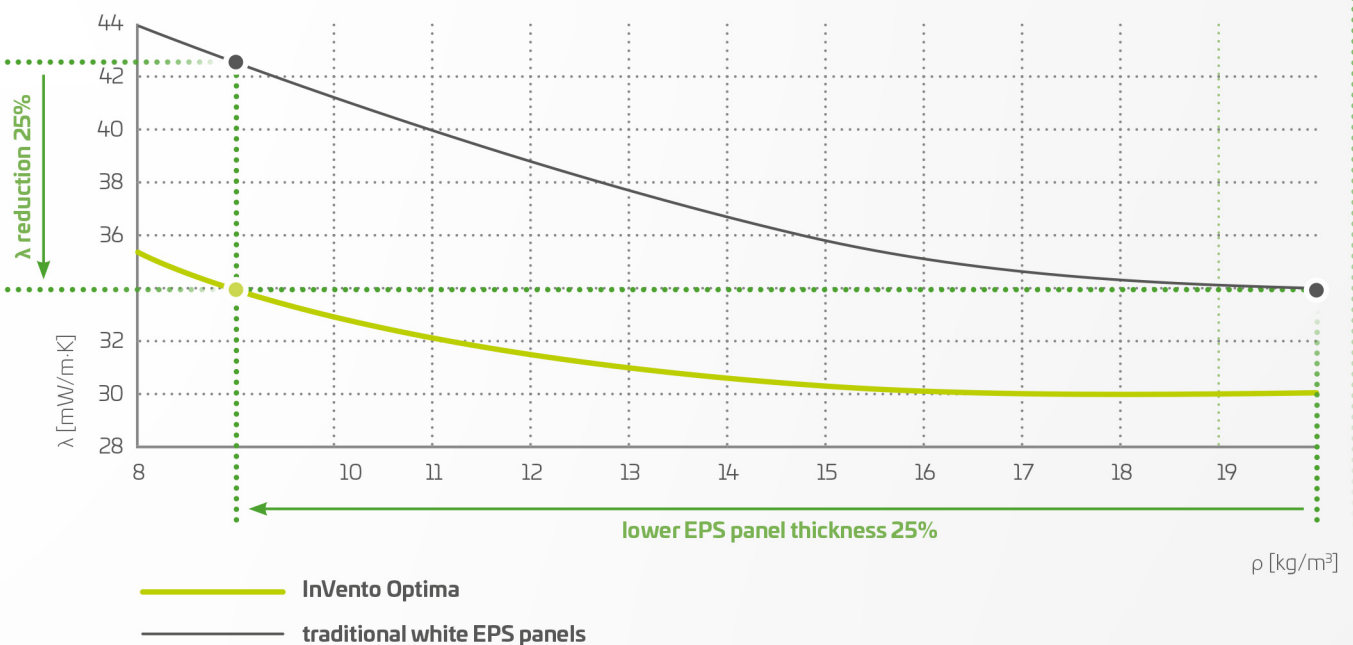
The environmentally friendly Geopolymer is an innovative formulation of components that supplies the market's most-advanced EPS additive.

A unique feature of the new **InVento Optima** and **InVento Prime** products is the state-of-the-art geopolymer additive embedded in the product structure, and manufactured by Synthos to a proprietary formula. The additive significantly improves the thermal-insulating performance of the EPS materials to levels **unseen in any other product on the market**.



Testing has demonstrated that the thermal-insulating performance of panels made from InVento is 25% higher than with traditional white EPS panels.

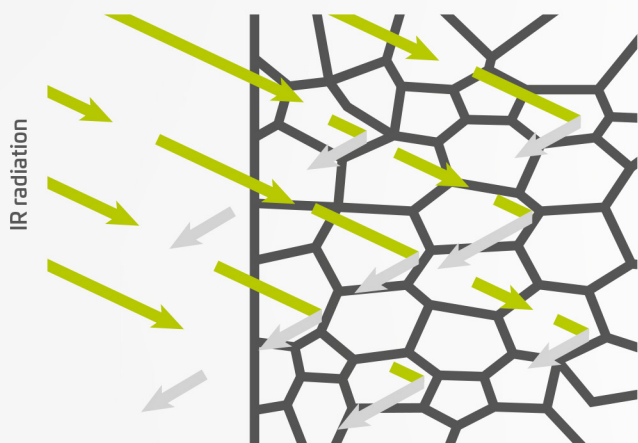
Thermal conductivity (λ) vs. density



The Geopolymer additive is a two-phase amorphous material. It is a mineral-carbon hybrid material which significantly improves the thermal-insulating performance of EPS. Coupled with an optimal carbon phase, which largely absorbs IR radiation, the geopolymer phase enhances the dissipation of heat radiation and the reduction in the heat-transfer coefficient.

This is caused by the special optical properties and polymeric structure of the Geopolymer, where the latter partially blocks near and mid-range IR radiation.

The phenomenon of blocking IR radiation



InVento cell structure containing Geopolymer

The Geopolymer additive acts not only as an infra-red blocking compound, but also as a halogen-free flame retardant. It is also fully recyclable.



The chemical structure of **InVento Optima** and **InVento Prime** provides many processing options, including full recyclability.

EPS recycling is a feature which integrates our product with the implementation of the principles of the **Circular Economy** through the viability of the repeated reuse of elements in the production of EPS materials. **InVento Optima** and **InVento Prime** help reduce the extraction and consumption of natural resources.



Environmentally friendly, zero-waste, and highly energy-efficient manufacturing processes facilitate the production of high-quality EPS materials with up to 100% of recycled content.

The sustainable nature of **InVento Optima** and **InVento Prime** is beneficial in many fields. Recyclability and recycled content aside, the products feature:

- Extremely high thermal-insulating performance that reduces exhaust gas and particulate emissions into the air, and significantly reduces the consumption of natural resources.
- Excellent quality, stability and processability help reduce the EPS-processing cycles to eliminate the loss of stock and energy in the production of thermal-insulation panels.





InVento Optima and **InVento Prime** are intended for thermal-insulation products and designed to provide customers with **green feedstock materials with extremely efficient processability and guaranteed high yield of the material.**

InVento Optima and **InVento Prime** products will be available in three versions:

- **InVento Optima FR** and **InVento Prime FR**
(fire-retardant)
- **InVento Optima FRP**
(fire-retardant, for perimeter layers)
- **InVento Optima SR** (without flame retardant)

The diversity of the products generates a variety of applications in compliance with the laws of many EU Member States.

Downstream processing encompasses the full density range, in every shape and block moulding process, onto the final use in the manufacturing of products with different density ratings.



APPLICATIONS

InVento Optima and **InVento Prime** are generally intended for the high-performance production of EPS blocks and shaped modules with a variety of density ratings. **Premium thermal-insulation panels** fabricated from EPS blocks and **with an extremely low heat transfer** are intended for various applications.

Typical finished-product applications include the thermal insulation of:

- ETICS, perimeter and indoor walls
- flat and gable roofs
- floors and foundations
- cavity walls

TYPE	PARTICLE SIZE RANGE (mm)	TYPICAL BULK DENSITY (kg/m ³)	MATERIAL CHARACTERISTICS
PRODUCTS WITH POLYMERIC FLAME RETARDANT (F) AND WITH REDUCED CONTENT OF PENTANE (R)			
InVento Optima 500 FR/PL	0,8 – 1,0	15 - 40	grey EPS (geopolymer additive), reduced λ value, with flame retardant (pFR), reduced pentane content
InVento Optima 800 FR/PL	1,0 – 1,6	11 - 30	
InVento Prime 500 FR/PL*	0,8 – 1,0	15 - 40	grey EPS (geopolymer additive), significantly reduced λ value, with halogen free flame retardant, reduced pentane content
InVento Prime 800 FR/PL*	1,0 – 1,6	11 - 30	

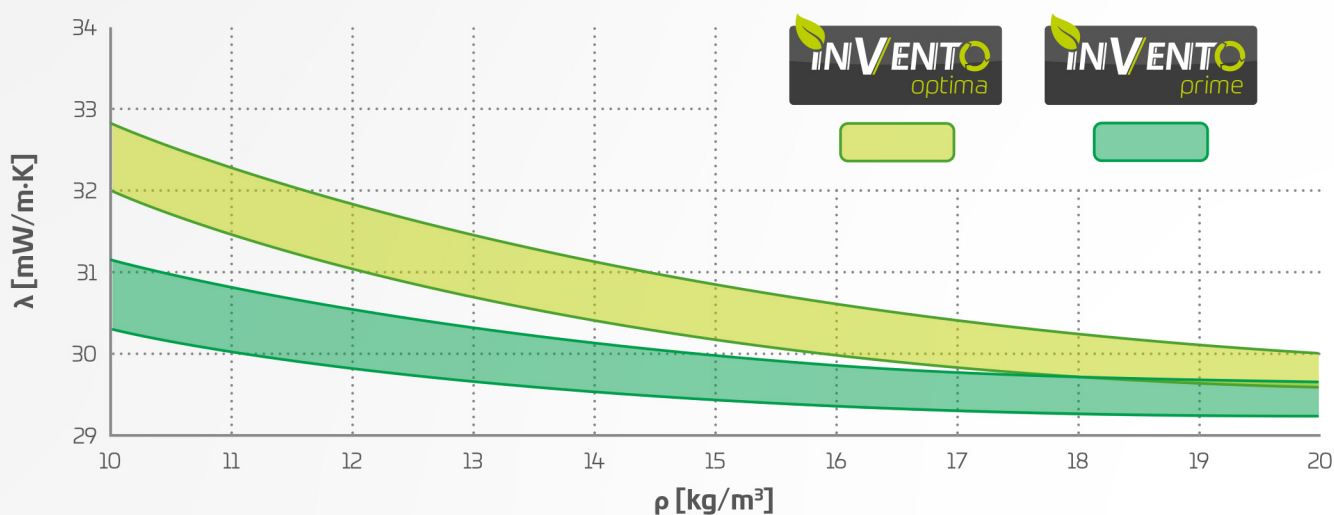
* the product will be available for sale from 2020.

ADVANTAGES

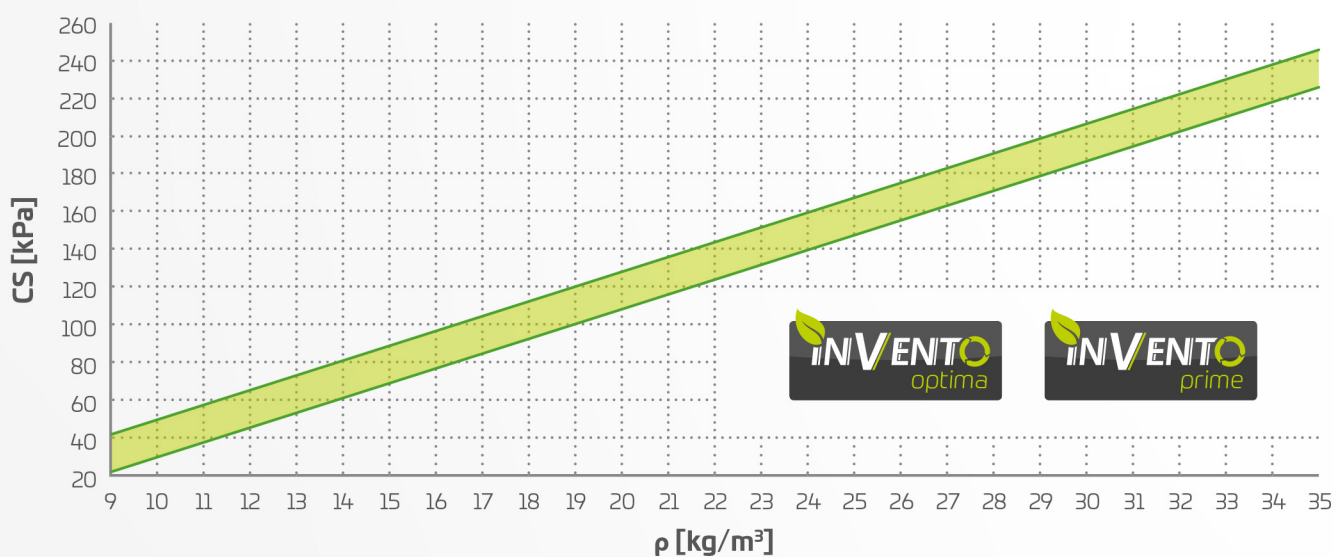
Thermal-insulation materials made from **InVento Optima** and **InVento Prime** are the most environmentally friendly feedstock materials for EPS. The innovative manufacturing process guarantees excellent performance in finished thermal-insulation panels. The performance reduces the loss of materials and lowers processing-cycle times; this means lower energy consumption in the production of thermal-insulation panels. **InVento Optima** and **InVento Prime** are high quality materials which provide indoor thermal comfort by ensuring protection from high and low outdoor temperatures. **InVento Optima** and **InVento Prime** care for users' comfort, save money, and reduce energy consumption, producing an improved quality in the natural environment.

The **InVento Optima** and **InVento Prime** additives allow the fabrication of products with excellent thermal-insulating and mechanical characteristics across the whole range of the density requirements. The diverse **InVento** product portfolio generates different applications with a variety of finished product specifications.

Thermal conductivity (λ) vs. density



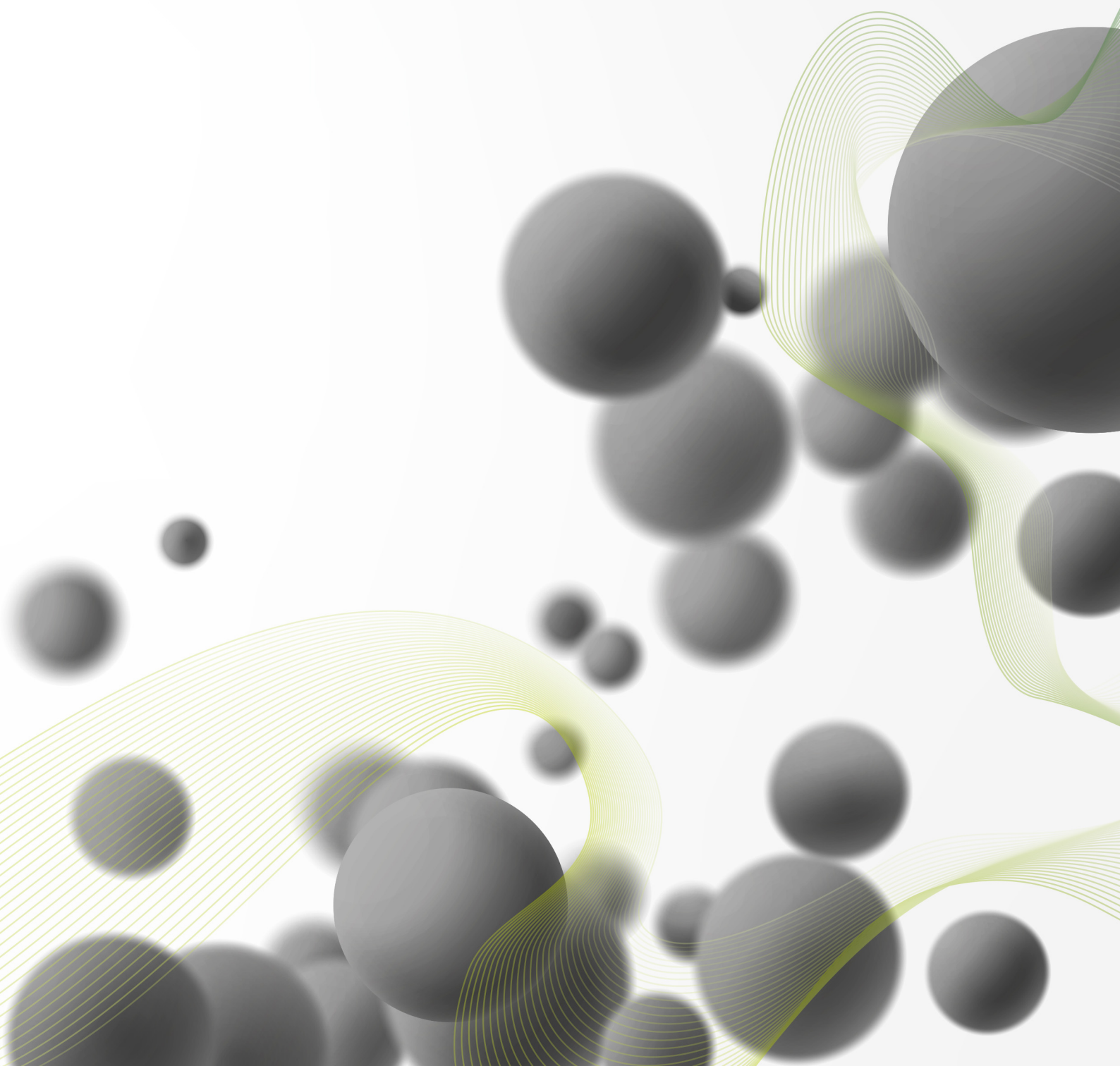
Dependence of compressive strength at 10% strain (CS) on density



HEALTH, SAFETY, AND THE ENVIRONMENT

Finished products with **InVento** additives are safe to humans, animals and the environment during the life cycle and at the end of life. EPS can be reprocessed into original materials, and it is the only fully recyclable thermal-insulation material on the market.

Synthos and other players in the entire supply chain for the construction market are proactively developing recycling technologies for expanded polystyrene. The developed techniques for mechanical and chemical recycling emanating from polymer dissolution are aimed at implementation of the principles of Circular Economy (CE).



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