Paper perfect packaging

Today's cements are no longer the same as they were 20 years ago. On the industry's path towards achieving its net zero targets, the composition of cements has changed. What remains valid: paper sacks are the perfect packaging for cements - not only due to their environmental credentials but also in terms of performance and efficiency. The European paper sack and sack kraft paper industry works continuously on innovating and improving its packaging materials and solutions to meet the cement industry's current and future demands.

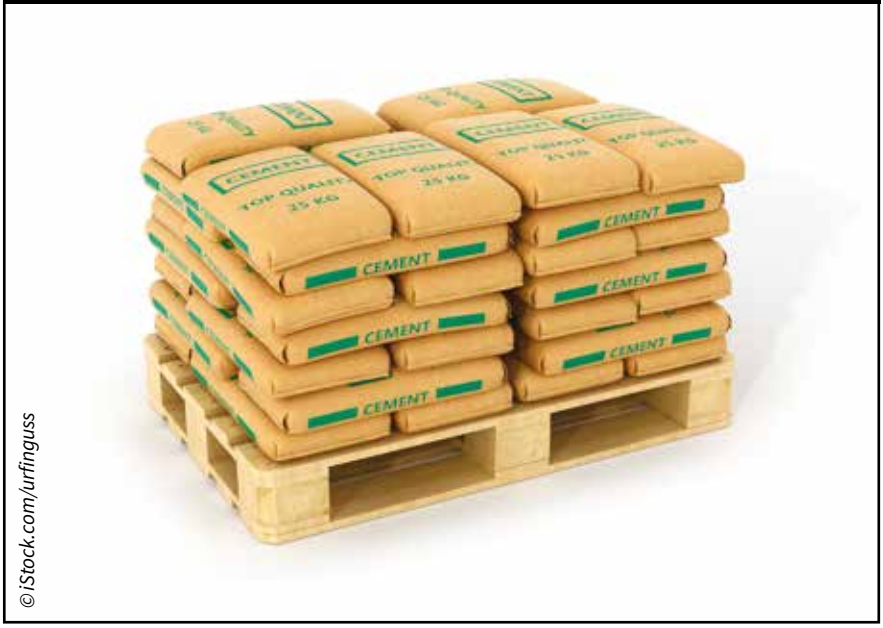
■ *by **EUROSAC**, France, and **CEPI Eurokraft**, Sweden*

CEMBUREAU, the European cement association, targets achieving carbon neutrality along the cement-concrete value chain by 2050. One important approach is a change in the composition of today's cements to substitute the CO_2-intensive clinker with other raw materials. In addition, the industry's net-zero target has wider implications along the supply chain that extend to the packaging of such cements.

"Our industry has a long-standing expertise in producing custom-fit paper sacks for many different products and requirements along the product supply chain," states Catherine Plitzko-Kerninon, MD of EUROSAC, the European federation of multiwall paper sack manufacturers, which represents over 75 per cent of European paper sack manufacturers in 20 countries.

With more than 1.9bn deliveries in 2021, cement is one of the most important markets for the European paper sack industry. Following other building materials, paper sacks for cement make up the second-largest market segment, accounting for a quarter of all paper sack deliveries. Moreover, the market continues to expand: by 9.4 per cent YoY in 2020 and by 3.4 per cent YoY in 2021. As sustainable and low-carbon packaging such as paper sacks can also be an important lever for meeting climate targets, the European sack kraft paper and paper sack industry expects a stable development of the paper cement sack market in future.

Paper cement sacks account for 25 per cent of all paper sack deliveries in Europe



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Finding the perfect packaging

"When looking for the perfect packaging experience, you have to consider the interaction between the product, the packaging and the packaging machine," explains Robert Westarp, technical expert at HAVER & BOECKER Institute, responsible for product analyses and packing tests. "One example: high-speed filling is only possible if we achieve the perfect flow of the product, have chosen the perfect machine and the perfect sack."

Due to the substitution of clinker with other materials today's cements have become finer and more diverse. That affects their filling behaviour, which differs increasingly between cements. Plus: the finer a cement, the more difficult the filling process. Air must be added during filling to make the cement flow. However, it must escape the sack so that it can be palletised and handled afterwards. That is why the specific sack design plays an important role in achieving the perfect packaging experience. Among other parameters: how many plies are used of which materials? How can the air escape through the sack? How tear-resistant is the sack? Typically, paper cement sacks are valve sacks with two paper plies. They must be very strong as they have to withstand high pressure during filling and protect the product during storage. Sack kraft paper is produced mainly from virgin fibres. A special arrangement of the long fibres as well as continuous developments in paper technology result in a high binding capacity, which gives sack kraft paper its unique strength.

Permeability impacts filling capacity

Another major advantage of paper sacks is that they are naturally porous: the air can escape through their pores allowing an optimal filling behaviour. Air permeability differs in each sack, depending on the sack kraft paper and the construction used. The

permeability can be tested before filling on an air flow tester. The better it is, the faster the filling. A tighter sack construction, for example with a plastic liner, reduces the filling speed. Typically, the filling starts with a coarse flow into the sack and continues with a fine flow. Towards the end, the air pressure in the sack is at its highest, and the air must escape before the filled sack can be discharged onto the conveyor belt. Otherwise, cement would spill out of the valve. For fillers looking for a high-speed filling process, paper sacks with high permeability made from high-porous paper are recommended. They allow the air to escape very quickly during filling while the cement stays inside the sack, resulting in dust-free operations. On average, a good breathable 25kg paper cement sack takes 4-4.5s to fill. Another option is to use needled or slitted paper and/or plastic sacks. But they will be dusty as the cement can leak through the needle holes or slits.

Tight sealing for dust-free sacks

To achieve completely dust-free sacks, the sack's valve can be sealed after filling. The ultrasonic sealing technology is applicable for paper valve sacks with a short outside valve and a sealable coating on the inner valve. The ultrasonic closing head is attached to the filling machine's spouts. It pneumatically swivels downward and welds the coated paper valve. This process does not considerably prolong the overall filling speed and results in tightly-sealed and clean sacks.

In addition to ultrasonic sealing other measures are important for achieving a high degree of product protection and dust-free operations. The European Paper Sack Research Group (ESG) – a collaboration between EUROSAC and CEPI Eurokraft – publishes industry guidelines for dust-free paper sacks. They contain established technical methods on how to obtain dust-free paper sacks after filling with cement or similar building materials.

Extended shelf life with paper sacks

But not only the filling speed or cleanliness matters to cement fillers. An additional trend emerging in the cement industry is the demand for an extended shelf life. Thanks to the multiwall construction of paper sacks, it is possible to add barrier liners to fulfil extended shelf life requirements in different conditions such as moisture, light or oxygen. A study by Sintef concluded that paper sacks with two paper plies and a high-density polyethylene-free film barrier retain the quality and properties of cement for at least 18 months during storage (usual storage time is estimated at 2-3 months). They provided equivalent shelf life as standard plastic sacks stored under the same conditions: whether total weight, level of hydration, mortar strength, initial flow behaviour or 28-day compressive strength.

"By using a plastic liner or coating instead of a plastic sack, fillers can reduce their use of fossil-based materials," states Ms Plitzko-Kerninon. "Relying mainly on renewable packaging materials has a positive effect on the environment."

Ultrasonic sealing tightly closes the sack

Better choice for the climate

Paper sacks contain up to 100 per cent natural and renewable fibres. The fibres are extracted from tree thinning and process waste from the timber industry, and originate from sustainably managed forests in Europe. Acting as carbon sinks, forests play a key role in the mitigation of carbon emissions. Paper sacks also have a low-carbon footprint. A comparative study by Research Institutes of Sweden (RISE) concluded that the carbon footprint of paper cement sacks is 2.5 times smaller than the carbon footprint of form-fill-seal polyethylene cement sacks. It also found that paper cement sacks are more energy efficient: almost five paper sacks can be produced with the fossil energy consumed to produce one plastic sack. Moreover, the production of paper sacks uses a high degree of renewable energy sources. Therefore, paper sacks are clearly the favourable option when it comes to climate change. "Against the background of the EU climate policy, the demand for climate-friendly and climate-neutral packaging and supply chains will increase in future," says Ms Plitzko-Kerninon. "Our industry is constantly working on further reducing its carbon footprint and protecting the planet by enhancing product protection at the same time."

Meeting cement packaging needs

The industry's innovations that bring the most benefit to its customers and the environment are honoured in the EUROSAC Grand Prix Award each year. In recent years, there have been several award winners catering to the rising demands of the cement industry, especially concerning product protection, shelf life, cleanliness, efficiency and sustainability. Some examples include:

- Tidy from dy-pack creates leakage-free paper sacks by using a special glue application technique which closes all micro channels in the sack. The results: better health conditions in the workspace, a cleaner product presentation and prolonged shelf life.
- The dispersible sack for building materials, EkoMix by Klabin, can be fully incorporated into the cement preparation process. This reduces not only waste disposal at the construction site but also costs for logistics and reprocessing.
- The interactive Seal Calculator by HAVER & BOECKER reports all influencing factors along the value chain for improving the usage of seal technology, giving orientation for adjustments.

Developments in bio-barriers

Other award participants tackle an equally important field: they aim to further improve sustainability and shelf life of paper sacks by replacing plastic barriers with bio-based barriers. Among them is the waterproof plastic-free sack MoistShield® by Fiorini, which due to its hydrophobic properties can be used in any sector. Award-winning MoistShield® has a longer shelf life and high-quality printing.

A second example is the Terra Bag® by Mondi, a biodegradable paper sack with an optional biodegradable film for better protection, optimised for industrial composting. ■