PE film offers a variety of benefits, including protection from rain during outdoor storage on pallets, tough, tear-resistant packaging and more multicoloured film for enhanced branding. For the supply chain and end user, the main advantage of PE film is its seal against moisture – a particular requirement when packaging dry cementitious products.

From PE barrier...
Despite PE packaging providing a good seal against moisture, one of its greatest obstacles has traditionally been the evacuation of excess air. During the filling process, air becomes trapped in the fine powder particles. The air must then be released before the pack is sealed, otherwise the resulting package tends to puff or ‘pillow’ – making the bags prone to damage and making secure palletising impossible.

Previously, when handling fine powder products in PE bags removing this unwanted air was usually achieved by micro-perforating the film, allowing air to escape relatively quickly after filling and sealing have taken place. However, these micro-perforations also allow moisture ingress over time which, of course, is a drawback for cement-based products.

More recent improvements at the filling machine level to remove almost all excess air before sealing has even allowed plain PE film to be used, without any micro-perforations or complicated labyrinth systems, enabling completely hermetically-sealed and fully-waterproof packs as well as good pallet stack presentation and stability.

Case study
Italy-based packing specialist Concetti has been at the forefront of the latest developments and has recently completed four installations for a cement premix manufacturer in The Netherlands. The latest line is typical of contracts undertaken by Concetti, where a range of different materials needs to be handled, including significant particulates with 10-20mm gravel in some dry concrete products, and relatively short job runs rather than running constantly on a single material. The line includes two Concetti multi-station Continua 900 form fill seal machines together with a PS-AA high-level palletiser and a stretchhood pallet machine.

A new generation of packaging for cement-based products such as dry mortars and specialised concretes is now available using polyethylene (PE) film with a particular strength being its seal against moisture. Issues with the removal of excess air have now also been overcome thanks to innovations in film technology and deaeration techniques, providing the essentials for a good, tight pack.
wrapping machine. Flexibility is a key feature, with the system able to handle conventional and lightweight concrete mixes, as well as pointing and smoothing mortars, and even pure cement products.

Initially, the lines will use PE film with a labyrinth seal, but in future both form fill seal (FFS) machines will have the facility to allow fully airtight film without any micro-perforations. Output is between 600-1400 bags/hour depending on the type of product and film used.

**Form Fill Seal technology**

At the heart of the system is the Concetti Continua Form Fill Seal machine. Already proven in many heavy industrial applications for sand, gravel, fertiliser, etc., the Continua has been extended and developed to give increased speeds when handling the fine, abrasive powders and premixes typical in the cement industry.

Bags are formed from a continuous reel of gusseted or flat, tubular LLDPE film. When necessary, this allows very long production runs eliminating the need to frequently replenish the store of empty bags. A single reel of gusseted film will typically provide 1500-2000 bags depending on reel diameter and bag length. Reel exchange is a five-minute operation. The film is usually made with embossing to create friction between bag layers and improve pallet stability.

An optional attachment on the Continua machines punches carrying handles into the PE film. When necessary, this allows very long production runs eliminating the need to frequently replenish the store of empty bags. A single reel of gusseted film will typically provide 1500-2000 bags depending on reel diameter and bag length. Reel exchange is a five-minute operation. The film is usually made with embossing to create friction between bag layers and improve pallet stability.

An adjustable bag flattener on the Continua machines punches carrying handles into the PE film. Product is dosed gravimetrically using an abrasion-resistant two-speed screw feeder into a net weigher. The screw can be fitted with an automated air blast system to clean the screw flights between products where necessary, and a rear outlet allows any residue to be discharged into a container with the screw running in reverse. For more complete cleaning, the internal screws can be easily removed.

**Six-station approach**

The new linear FFS unit now has six stations. The first station manufactures the bag by pulling film from the reel under constant tension, cutting, and sealing the top and bottom in one simple operation before transferring it smoothly in a reciprocating action to the dust-tight filling spout. The spout allows the bag to be filled and deaeration probes carry out the first stage of air removal from the bag. The bag is then closed, but not sealed, and subsequently indexed through two additional stations both equipped with bottom vibration to assist in further settling of the product. Station number five also has systems for cleaning the sack mouth and the Teflon sealing bar, as well as a device for partial evacuation of any remaining air. Once the air is evacuated, heat is applied to the top of the cleaned bag to give a secure, hermetically-sealed pack.

Sack mouth cleaning prior to sealing is vital to ensure reliable closing. Any contamination of the seal area can lead to failure of the bag’s integrity so this is an area to which careful attention must be paid. Concetti also offers a feature where the bag top is double sealed to further ensure security of the closure.

Finally, on station six the bag top is cooled to rapidly increase the seal strength before the filled bag is released. An adjustable bag flattener on the downstream conveying line presses the bag to give a more compact and consistent shape. The result is a completely sealed, clean, well-shaped bag without excessive air trapped inside that can be easily and confidently palletised.

**To the palletiser**

Between the filling machine and palletiser, a conveying line may include other devices, such as a checkweigher or inkjet coder, according to market needs.

The Concetti PS-AA palletiser is a conventional high-speed, high-level layer depositing unit with side conformation plates and top compression between layers to produce neat, square palletised loads.

The finished pallet is transferred to a stretchhood machine where a clear, heavy-gauge contiguous hood is cut to length from a reel, stretched and applied to provide extra load security during transport as well as a weatherproof protection that keeps the product clean even after long periods of being stored outdoors.

**An integrated whole**

Employing equipment from different suppliers for the first time on one production site can often be fraught with unforeseen issues. Adjustments to one part of a line may have an unintended knock-on effect to another part of the process and sharing the design responsibility can create divisions. Purchasing a complete line from one supplier who can test the whole line together prior to being shipped to the customer means any unforeseen problems to be addressed prior to delivery. Moreover, installation, commissioning and further technical support and services are simplified with a single supplier.

An ever-expanding range of products is now available in PE films that are easier and more convenient to handle, store and use with a longer shelf life and less wastage.