



Lightweight foam board in a cleaning module - effective removal of any adhering particles.
(Images: Wandres)

Tornado Nozzles deal with particles

Fast and effective cleaning of core foam for lightweight construction

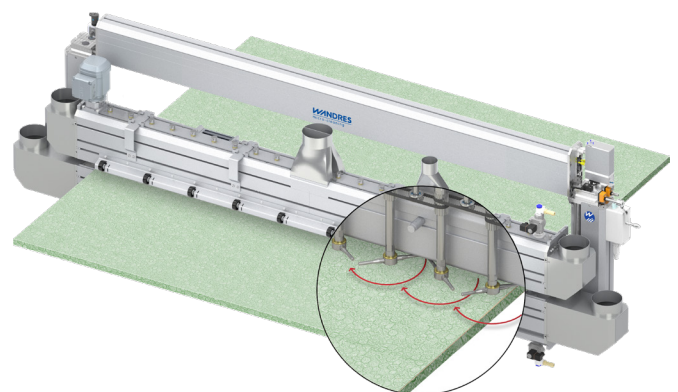
Large-scale lightweight structures are frequently constructed as sandwich structures using core foam layer materials with fibre reinforced outer layers. Ensuring thorough cleaning of the core material is usually the most challenging aspect of the production process and a key factor in achieving the required strength and surface quality.

Rear seats, HGV trailers or wind turbine blades often share a common structure with the core material consisting of structural foam boards. These could be particle foams manufactured from EPP or EPS as well as rigid foam made of polystyrene, PVC, PUR or recycled PET. The first type can be manufactured in varying thicknesses and densities and clad with a cover layer in the required dimensions.

Rigid foam made from recycled PET is slightly different and mainly manufactured from finely granulated PET bottles. By adding an expanding agent, thick sheets of foam are foamed and later welded together into blocks. These large slabs of foam are cut, perpendicular to the seams, and in the required shape and dimension, into boards featuring high mechanical strength.

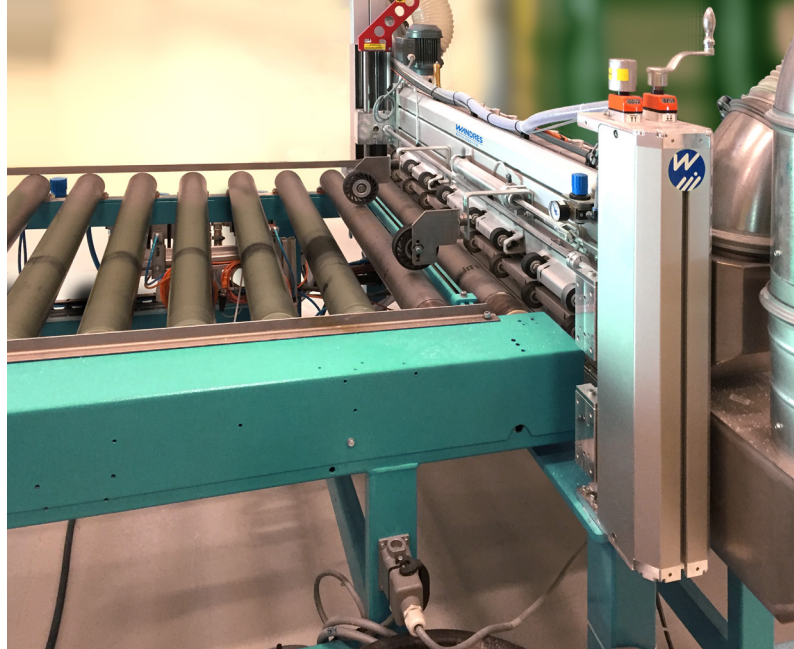
Porous surfaces prove challenging

Cutting processes leave innumerable particles clinging to the surfaces. Applying an adhesive cover layer or an immediate surface coating is simply impossible in this state. Loose particles



A board passes through the cleaning channel - the enlargement shows the interlocking arms of the nozzles as well as the cleaning radius.

settle on the surfaces, filling up the pores. During transport these particles tend to attach themselves to the transport rollers of the roller conveyor. Similarly, the suction pads of the vacuum lifting



Before and after: roller conveyor covered in particles at the infeed (left) but perfectly clean (right) after the boards have been transported through the cleaning module.

equipment become contaminated with particles and require regular cleaning to enable them to perform correctly. Fine dust particles on the floor of the production hall drastically increase the risk of slips and falls, while breathing in the polluted air is a health risk for the workforce. Blowing down the surfaces manually with compressed air makes little sense, as all that is achieved by this is to distribute the dust even more intensively in the environment. The cutting edges of the foam are porous and it is crucial to dislodge the particles from within the pores. Any electrostatic adhesive forces potentially present, might need to be cancelled if the tiniest contaminating particles are to be completely eliminated. The Tornado Channel TKR from Wandres, an air-assisted cleaning system working from above and from below and equipped with rotating compressed air nozzles, cleans the porous boards effectively and without any undesirable "side effects".

Cleaning with air technology

The compressed air nozzles are electrically driven and synchronized, spinning at high speeds a mere eight millimetres above the surface. As the nozzles are not driven by compressed air, the consumption of this rather expensive source of energy is comparatively low. Each nozzle has two small openings through which compressed air is expelled. The air from the nozzles is blasted onto the surface at sonic speed so as to dislodge even the tiniest particles. The circular cleaning areas of the nozzles overlap, thereby delivering flawless cleaning results across the entire working width. Once the dust has been detached, it must be extracted without delay by the suction system to prevent it settling back down on surfaces. Integrated vacuum channels at the inlet and outlet are tasked with disposing of the dust flung into the air by the turbulence. The arms of the Tornado Nozzles are on the same level and interlock precisely like cogs in a finely-tuned machine. The powerful force of the compressed air blasted onto the surface combined with the dust extraction means there is no way particles can remain clinging to the surface. Porous boards are cleaned simultaneously from above and from below while passing through

the cleaning module. Pressure rollers are deployed to provide excellent fixation thus preventing the lightweight boards from oscillating due to the powerful air flow. These adjust automatically to the varying thicknesses of the foam board. If the height adjustment is electrical, the actuator is connected to the overall control and, on receiving the appropriate signal informing of a variation in thickness, will adjust the position of the upper channel accordingly. Alternatively, with mechanical height adjustment, the operator can adjust the channel manually to the required position with the aid of a crank. The lower channel is equipped with an external blower on both sides thus preventing particles from settling there as a result of the reverse mounting position. A protective cover is attached close to the Tornado Nozzles shielding the belts and nozzles from airborne particles. Compressed air is directed onto the surface through a slot in the lower channel.

Put to the test

In a full-scale field test a processing company installed the cleaning system into their production line. As performance criteria, they applied a „knocking test“ where the edge of the lightweight foam board is knocked against the floor of the hall after cleaning. The quantity of particles knocked to the floor by the force of the jolt is then assessed. Following the successful test run, a space for the cleaning module, which has an installation depth of around 400 millimetres, was quickly found. Ever since the Tornado Channel was installed, it has been cleaning 1200 millimetre wide boards with thicknesses of between 2 and 160 millimetres at a transport speed of 10 metres per minute and delivering consistent and reliable cleaning results. In addition, since the successful integration of the cleaning installation, the transport rollers of the roller conveyors have remained clean and, with regard to the vacuum handling equipment, regular cleaning of the suction pads is a thing of the past. Following the initial experience in serial production, a further production line at the main plant, as well as one at a manufacturing facility in Asia, has been fitted with the air-assisted cleaning systems developed by Wandres.