



Images: Wandres GmbH micro-cleaning

Air-assisted cleaning unit, view of rotating nozzles in the Tornado Channel

Dual cleaning technology for chipboard

A combination of brush cleaning and air technology prevents rejects at camera inspection

In furniture production and interior design as well as the construction of exhibition stands and shop fitting work, melamine-faced chipboard is used extensively. The compact Combi Sword Brush provides for the effective cleaning of this chipboard in modern short-cycle press lines.

During the manufacture of melamine-faced chipboard, a resin-permeated paper overlay is dried, cut to size, and placed on the raw chipboard for bonding. These multiple layers, consisting of a baseboard core and resin-infused papers, are then compressed in a short-cycle press under the application of pressure and heat and trimmed to the desired panel width. Edge-trimming of the bonded panels generates enormous quantities of particles, chips, edge fragments and shavings, some of which are hurled onto

the panel surface. These contaminants can lead to false error messages at subsequent camera inspection and to increased reject rates. For this reason the chipboard must be cleaned as effectively as possible prior to vision inspection.

Two-stage cleaning concept

Due to the build up of thermal residual stress in the composite materials, the bonded panels frequently display wavy surfaces after pressing, or blown areas

and blisters near the edges. Wandres GmbH micro-cleaning has developed a sophisticated cleaning system which reliably cleans even large format boards with undulating surfaces. This cleaning installation has already shown impressive results in several short-cycle press lines. The cleaning principle is based on a combination of brush cleaning technology and air technology. Sword Brushes are stationed at the infeed of the compact installation to remove coarse particles from the surface. If this debris catches the unprotected and raw edges of the chipboard, smaller particles will sometimes detach and are flung onto the surface of the panels. To dispose effectively of these particles, brush cleaning is followed by a contactless cleaning procedure. Compressed air is ejected at several times the speed of sound from air jets rotating at high velocity and removes particles and dust from the surface.



Cleaning chipboard from above and from below: touch control elements are visible on the left of the image, adjacent two Sword Brushes and to the right the upper and lower Tornado Channels

Brushes clean wavy surfaces reliably

During the first stage, two Sword Brushes clean across the upper and lower surfaces of the chipboard crosswise to the panel surface. They remove edge strips and cover layer fragments from the surface. Finer particles cling to the filaments and are transported towards a suction system by circulating linear brushes. The linear brushes are refreshed here by compressed air nozzles and a rotating rack in a self-cleaning process.

A pneumatically regulated flexible buffer or pressure buffer, similar to a cushion of air, is integrated in both the upper as well as the lower Sword Brush. This ensures a constant wiping pressure and optimal cleaning results. The flexibly mounted linear brushes not only adapt perfectly to wavy surfaces, but are also able to smooth these down during the wiping process. The brushes of the linear brush belt were developed specifically to deal with the particular challenges posed by the cleaning of chipboard and have a very long service life. Boards with blown areas and blisters or warping show significant differences in height which could damage the upper linear brush. To avoid this happening, a touch control system is built into the infeed of the cleaning installation and raises the linear brush of the upper cleaning unit to accommodate variations in height of the panel. The use of this technology allows even extremely wavy surfaces to be cleaned safely and effectively.

Contactless cleaning with innovative air technology

The Tornado Channel TKRB 405, an air-assisted cleaning unit, is positioned at the outfeed of the Sword Brushes, using ventilation technology to carry out contactless cleaning of the upper and lower surfaces of the panels. Tornado Nozzles rotate at the heart of both the upper and the lower air channels. These rotating air nozzles are electrically driven and synchronized, spinning at consistently high velocity. The arms of the nozzles interlock precisely like cogs in a finely-tuned machine. The circular cleaning areas therefore overlap, thus guaranteeing flawless cleaning results across the entire width of the board. To prevent particles from settling on the timing belt of the lower channel, the Tornado Channel is supplied with a protective stream of air. A side channel blower produces this airflow by taking in ambient air, filtering and compressing it. The Tornado Nozzles emit compressed air at several times the speed of sound. The blast of compressed air dislodges particles from the surface and drives them towards the suction channels.

Effective cleaning of panel surfaces using brushes and compressed air paves the way for automated vision inspection of the panels using cameras. False error messages caused by contaminating particles and the associated increase in the scrap rate are thus prevented.

Integration of the cleaning installation into the production line

The cleaning installation can be easily and speedily integrated into existing production lines thanks to a compact footprint. The cleaning modules are mounted on a shared adjustment unit and the cleaning system as a whole has an installation depth of merely 650 mm, therefore requiring only a minimum of available space. The height of the upper and lower cleaning modules can be adjusted in parallel. In case of operational machine stoppage, the cleaning modules are rapidly removed from the surface by a short-stroke pneumatic cylinder to avoid a polishing effect on the surface of the product. Should an upstream laser light barrier detect the risk of collision, for instance due to extreme blown areas or blisters on the surface of the panel, the multi-position cylinder lifts the cleaning module with a pneumatic long-stroke into a safe position.

"That is by far the best cleaning result I have ever seen," was the verdict of the production manager at a facility which manufactures wood-based panels, shortly after the commissioning of the installation. Thanks to the new cleaning system, the camera inspection of the panels after edge-trimming works faultlessly. In fact the installation is such a success that, in the meantime, an identical Combi Sword Brush has been integrated into other short-cycle press lines.