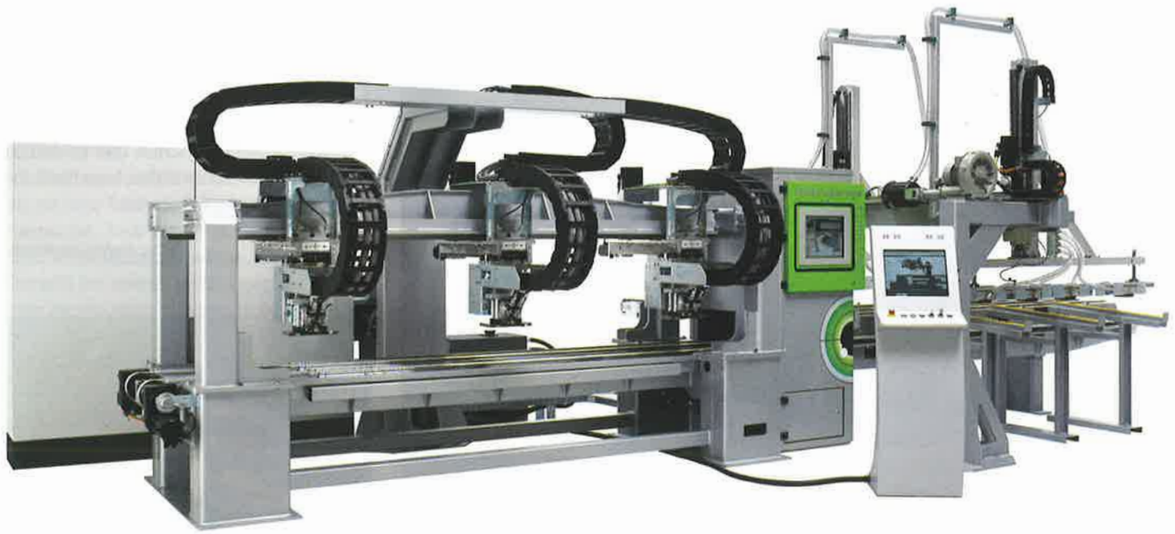
Automated quality control using "chemical sensing"

Using the Perception HEAD enables the Woodtech Division of Wintersteiger AG to precisely detect the structure of defects in wood. This allows chemical characteristics such as blue stain, weak spots, branch decay, galls, and knotholes to be precisely scanned & machined, setting new quality assurance standards in the timber industry.



Fully automated timber repair and cosmetic system TRC 3000 with defect scanner (photograph: Wintersteiger)

Changes in the price of wood alongside new material requirements and applications present challenges in the growing, constantly shifting timber market. At the same time, this offers up opportunities for innovative timber processors aided by improved quality control and long-term cost savings. The application of chemical sensing in the timber industry addresses quality requirements, price pressures, and application innovation all in one.

Scanner technology is among Wintersteiger's core competencies and is applied in systems for timber surface repair as well as in diverse sorting lines. Perception Park now supplies the Perception HEAD, a special solution that uses hyperspectral imaging technology. This innovative technology that enables the "chemical sensing" of the raw material to be identified has aroused a great deal of interest among Austrian machinery and plant engineering businesses.

"Our current scanner technology gives us information on the geometry, position, color, and size of a defect, such as a knot or a crack in the wood. Our solutions from the "Timber Repair & Cosmetics" product group can then automatically clean or machine out the defect and permanently fill it. Hyperspectral imaging will then additionally tell us about the structure of a defect. So, only those defects that would cause problems in the downstream process, such as knotholes, can be pinpointed and removed. That way, you can achieve a more natural look," explains Markus Weissenbrunner, Head of Strategic Product Development at Wintersteiger AG, as he sets out his vision for how the HSI technology could be used.

Another application example can be found where there is a need to distinguish heartwood from sapwood when cutting green round timber, such as pinewood. Since the color of the heartwood will only change on contact with UV light, production has to be halted to be able to definitively detect the differences. Using the Perception HEAD means the wood can be scanned and classified at the sawing stage.

Wintersteiger is currently testing hyperspectral imaging for other customer requirements, e.g., for moisture measurement to trace signs of decay when analyzing glued joints in multilayer boards or when detecting resin. "In addition to our existing scanner technologies, hyperspectral imaging gives us much more information and is opening up completely new application areas in wood processing," according to Weissenbrunner, who delightedly points out the potential of the HSI technology.

The cooperation saves costs in later production steps. Variations in quality (in lumber, engineering timber, etc.) can be identified enabling more accurate pricing. Its use also represents a benefit for the end customer – since the quality of timber products can be better matched to the application.

"Fitting wood scanners with a Perception HEAD was pure inspiration! Chemical sensing permits new levels of quality – as yet unseen – that will significantly improve production processes," believes Ulrich P. Schön, Business Development Manager at Perception Park.

Cooperation driven by innovation

The outstanding benefits of this new inspection technology will become available to future customers of Wintersteiger AG. This cooperative development between the Woodtech Division of Wintersteiger AG and Perception Park GmbH is set to further strengthen the position of both companies in the market.

VAP-Wintersteiger GmbH as part of the Woodtech Division in the Wintersteiger Group specializes in plant engineering and automation. From feasibility studies to remote maintenance of the overall installation, the innovative plant engineers deliver automation solutions for the production of windows, engineered flooring, furniture, and multi-layer boards, as well as large sawmills.

Perception Park is a world-renowned pioneer in the field of chemical sensing, often enabling solutions to problematic challenges where other technologies miss the mark. This technology allows materials that are very similar visually to be distinguished on the basis of their chemical composition or the concentration and distribution of their constituents – such as in foodstuffs or pharmaceutical products – and to precisely capture this data in real time.

Defect: raw, repaired, and sanded down (photograph: Wintersteiger)

Chemical sensing

Their chemical properties mean substances reflect completely different spectrums of light. Using a hyperspectral camera, images can be captured outside the visible range, such as infrared. Unlike normal cameras, hyperspectral technology shows a spectral image of the light reflected from the material. Each point is depicted not only by an intensity value, but also by hundreds of spectral wavebands. This ultra-precise spectral measurement allows the properties of materials to be tested and their chemical composition to be visualized. The user gets a unique "fingerprint" or "spectral signature" of the object, which in its turn allows flaws and dirt invisible to the naked eye to be detected.

Chemical sensing is used for applications where materials need to be analyzed and/or sorted based on chemical information.

It is used in the food-processing industry (to identify pressure marks and decay in fruit, ripeness requirements), the recycling industry (material-selective plastics sorting), and diverse medical technology applications.

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