Technology

Case-Study: A Woodworking Workhorse

As an indispensable part of the manufacturing process, machining centres equipped with CNC technologies and composed of various functional modules can contribute a lot to total performance. By Mike Beier, Marketing, Reichenbacher Hamuel in cooperation with Renggli and Balteschwiler

At present, computer numerical control (CNC) technology is creating a new breed of customised manufacturing features centred on some key elements: custom-based production, flexibility, production on-demand and personalisation. CNC machining centres are growing in popularity for both large and small woodworking shops engaged in the processing of a wide variety of materials.

Instead of traditional monotonous mass production, the trend towards mass customisation or the popular batch-size-one philosophy is gaining strong momentum. In this regard, more companies are converting to CNC machining centres that allow batch processing of customised items in addition to multifunctional flexibility, which will lead to reduced setup and lead time.

Streamlining

Driven by the idea of streamlining and riding on the green movement, factories are seeking solutions to keep both labour and space at an optimal level as far as possible. CNC machining centres with full-range capabilities and a zero setup bonus is a huge benefit. This in turn, calls for lean manufacturing cells powered by CNC with features such as automatic feeding and unloading systems without start up time.

At the same time, more intelligent working stations with coordinated and synergetic displacements are imperative to fuel this demand. Optimisation using CNC technology can be applied across the whole manufacturing process, ranging from programming, adaptive control, automatic generation of machining parameters, integrated and seamless production, interactive diagnosis, and even up to aftersale services and maintenance.

Flexibility remains a key requirement in the manufacturing world. This can be introduced at different levels. In the case of CNC machines, this is apparent with a combined performance powered...
by efficiency, precision, reliability and processing speed.

With the continuous development in processing techniques, more tooling abilities and applications, besides common routing, drilling, grooving, sawing and milling, sanding, shaping and profiling operations, can be developed using a CNC platform.

**Flexibility**

Moreover, in order to meet the demands for custom production, solutions increasingly need to be in hybrid forms. For instance, work tables capable of holding different types of components and materials in different dimensions combined with high capacity tool changers that can host a wide range of tooling systems and aggregates; or multiple processing zones leveraging on flexible automation technology to facilitating a smooth networking and integrating function.

CNC machining centres have continued to grow in popularity due to their versatile abilities to cope with multiple materials, including composite panels made up of different substrates, solid wood, metal, plastics, aluminium, as well as other non-ferrous materials.

The challenging task of being able to cut different materials on the same CNC machine calls for constant upgrade and advancements in tooling systems. When processing non-wood materials, flexibility in feed rates and RPM of the main spindle are essential areas that call for attention, as many plastics and non-wood composites require a much lower spindle speed than their wood-based counterpart.

**Panel Machining Centre**

Reichenbacher Hamuel is a German-based company which specialises in CNC technology and provides integrated machine lines to diverse sectors ranging from interior decoration, stair, door, window and furniture production, to aircraft, automotive, as well as shipbuilding industries.

Renggli is a Swiss company that specialises in manufacturing energy-efficient wooden buildings. The company is persistent in its pursuit of minimising energy consumption, so as to fulfil its commitment to sustainability and environmental protection. To this end, energy efficient system was introduced to the entire manufacturing process, where shorter lead times were combined with quality improvements.

At the heart of the company’s manufacturing facility, a ECO 3533 B-Sprint panel machining centre made by German machine manufacturer helps to realise this philosophy of flexibility, quality and speed. The two companies collaborated in the design and construction of the entire production unit to ensure that everything complement each other nicely.

A robot is responsible for the quick supply of all machining stations. It manages a total of 125 storage positions covering an area of 2,670 sq m and enables unmanned operation of the plant.

It was the need for an environmentally friendly, energy efficient and sustainable facility that created the demand for this plant. The continuous growth of the timber construction industry has caused many capacity bottlenecks at the factory workshop.

Max Renggli, CEO of Renggli, and his team believe in the potential of industrially prefabricated timber buildings. “The level of prefabrication in wooden buildings will continue to rise and there will be an increasing proportion, in particular of multi-storey objects. Consequently, it is imperative to realise in wood thanks to optimised and automated production processes. With the new plant, we are able to cope with many major challenges encounter during the manufacturing stages.”

The new plant takes into consideration the requirements of demanding conditions concerning processes, flexibility and capability. Many concepts can be realised by the CNC-cutting units.

For example, the panel machining centre, which is driven by a 5-axis working spindle, allows two-side machining of large-scale panels and is equipped with a fully automatic loading system.
**Automatic Delivery System**

On the other hand, it can also be used in the processing of small parts, which enables the simple cutting of cladding panels, slatted frames and other small parts. The line is automatically fed and unloaded by a robot.

A delivery passage, controlled via an automatic storage and retrieval system, supplies the high-rack store directly from the delivery vehicle. Both raw materials and purchased components are stored here and are ready for further processing. There is also an option to operate the whole system in partially automatic mode by a separate storage and retrieval area and by manual raw material and finished part positions.

Some other key features include two machine tables which are divided into 16 vacuum areas, a nesting table that can be covered by a stainless steel plate for a plane table with double circuit pods and an automatic chain magazine for up 80 tools. The routing spindle is supplied with the pre-selected tool by double-gripper module and the machine is also supported by tele-diagnostic and multi-channel techniques.

By separating cut and assembly of elements, the production process fulfils the demands concerning production depth and quality of parts. This panel machining centre is fully-integrated and synchronised with other machining stations at the plant. This entire production process brings to mind that of the automotive industry: efficient single steps, simple scaling of capacity, shorter processing times and high quality.

**Cutting & Machining Centre**

Another example can be seen in the Vision III-TTT-Sprint CNC cutting and machining centre installed at the Balteschwiler headquarters in Laufenburg, Switzerland. The company is known for its timber surface treatment used in the field of interior design and outdoor facades.

Panels of various wood composites up to a length of 13.5m, a width of 3.5m and a thickness of 400mm can be cut, routed, chamfered and ground with this large-scale unit. The machine not only opened new opportunities for joinery, carpentry and woodworking companies, but also for steel processing companies and general contractors.

The CNC-machining centre can achieve a high degree of automation and boasts imposing dimensions: 19m long, 8.5m wide and almost 5m high. The workpiece is fixed upon the table while the machining gantry runs on five axes—this concept allows for high processing speed.

Three pick-up stations are provided for saw blades and the multi-spindle drilling unit comprises of 19 spindles in T-form. Continuously programmable working speed up to a maximum of 60m/min in the X/Y-plane can be achieved on
any desired path.

Panels of different materials and functions are processed on the through-feed table: the raw panels can be machined on five sides without requiring repositioning. The mechanised infeed and outfeed of the conveying system guarantees quick handling of large panels.

The highlight of the machine is the precision it offers. It has a maximum deviation of 0.1mm—regardless of the size of the workpiece. The maximum deviation is consistent for miniature parts as well as 10m long monsters. This provides flexibility to customers who want to order components.

“The high degree of automation is in turn translated into cost benefits. Time factor should also be taken into consideration as our aim is the consequent reduction of the delivery periods for all customers.” Peter Schweizer, an employee of the company pointed out.

Versatile Workhorse
Customers are the ones who decide upon the degree of prefabrication for panels, beams and wooden components—basically, the deep vertical production range covers the entire spectrum. Everything from pre-cut to surface treatment can be achieved at one source. Ceiling and wall constructions, prefabricated modules, as well as complex elements of hall or bridge construction can be produced at the same site by the means of an integrated and linear manufacturing line.

Logically, this ‘wood technological all-rounder’ requires a planning team that provides customers with various services at an early stage to satisfy their demands. The delivery logistics at the end of the process complete the full range of services.

These case-studies have demonstrated that CNC technology has a great future ahead. The potential of its application can be further developed so as to streamline production processes in a more efficient way, while reducing labour cost and other operational overheads.

Customers will always want to achieve a wider range of production with one machine. In this manner, CNC machinery, a versatile workhorse, can offer an ideal solution.