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**Jointing and sizing - always one step ahead with the right concept**

**Innovative processes and durable tools as a guarantee for successful furniture production - a technical report by Andreas Kisselbach (Head of Research & Development, Leitz) and Dr Jürgen Graef (Head of the Leitz Technology Centre, Oberkochen).**

**Furniture and kitchens, as a form of expression for individuality and lifestyle, could not be more diverse in their type and design. Since consumers have been increasingly turning from utilitarian and functional objects to lifestyle objects, the demand for quality in terms of materials, workmanship, practical value and appearance has been growing. For manufacturing companies, the resulting growing variety of materials with demanding surfaces, coatings and structures is the main reason for the high demands placed on the production technologies used in throughfeed technology. Manufacturers are being forced to make their production processes more and more flexible and efficient, particularly with regard to processing costs - partly due to the special market and competitive situation in furniture production, which is increasingly placing the focus on cost optimisation.**

**Sizing - the basis for high-quality products**

Furniture and kitchen manufacturers increasingly have to deal with issues such as productivity, efficiency, flexibility and quality in order to be successful with their products on the market. Against this background, the sizing of furniture panels, as a finishing process before edgebanding, plays a key role in the entire production process. The line between the required processing quality and the maximum cost-effectiveness of the overall process is particularly thin here and in many cases holds unexpected optimisation potential. Perfect machining of the decorative edges and narrow sides before edgebanding is absolutely essential, especially for high-quality fronts (with a so-called zero-joint look) in conjunction with high-gloss and matt coatings, valuable real wood veneers or finish foils. The aim is always to achieve an almost invisible glue joint and a tightly sealed edge. From an economic point of view, these challenges can only be solved with suitable, perfectly harmonised machining and tool concepts. Frequent tool changes and the associated machine downtimes reduce productivity and drive up production costs. An additional cost factor is the resulting stocking of replacement tools, as these tools must also be purchased and constantly available to ensure a smooth production process.

The decisive factor in significantly reducing production costs is therefore the use of tools with particularly long tool life. This is actually a simple task. For many users, however, the question arises as to how this is even possible given the general state of development of current tool technologies. After all, at first glance, there is hardly any difference between common tool systems. The magic word here is: ‘tool life addition’.

Perfect edge quality can only be achieved with the described surface materials on chipboard or MDF panels by circumferential cutting with diamond tools, a process known as jointing. During the cutting process, the diamond cutting edges used wear out, particularly in the area of the surface layers. However, cutting edge areas that lie outside the tool engagement remain unused. With the concept of tool life addition, these unused cutting edge areas can be brought into the quality-relevant machining zone. In practice, this is done by axially adjusting the jointing tool. As a result, tools can remain in use over several tool lives.

An excellent example of how these still-sharp cutting edge areas can be utilised for tool life addition is the specially developed, width-adjustable jointing cutter from Leitz (see Figs. 1\_1 and 1\_2). By adjusting the width of this two-part tool system, it is possible to utilise unused cutting edge areas in the quality-forming machining area of the surface layers as the machining quality decreases. The adjustment is made in millimetre steps in just a few simple movements. In this way, the tool life of such a tool can be significantly multiplied compared to one-piece jointing cutters. For example, by adjusting the tool six times, seven times the tool life is achieved before the tool needs to be resharpened. In addition, the operator does not have to correct the spindle position, as the width adjustment of the tool is synchronised with the top and bottom of the panel. This is an immense advantage when you consider that fewer tool changes and no time-consuming adjustment work are required to set up the tools, which significantly increases production times. Practical applications have shown that machine downtimes can be reduced by up to 80 per cent compared to conventional tool changes.

The challenge for the tool manufacturer with such adjustable tools is to achieve the same precision as with one-piece tools and to ensure functional reliability under the influence of dust and chips. A specially developed hydraulic clamping system with user-friendly operation of all functions from above and integrated dust protection guarantees maximum precision and reliability of the tool system (Fig. 2 and 3).

**Sizing concepts for maximum tool life**

As the wear and therefore the tool life of jointing cutters is strongly influenced by the infeed (chip removal), it is advisable to use double hoggers for pre-cutting when removing more than 0.5 mm of material in order to protect the quality-relevant jointing cutters (Fig. 4). Depending on the machine configuration, the range of parts and the production volume, Leitz has developed different jointing concepts for ‘tool life addition’ for use in almost all common throughfeed systems. These concepts range from pure joint cutting with manual width adjustment to fully automatic width adjustment with pre-cutting. The range of concepts extends from two to five spindles for machining solutions (Fig. 5 to 7). For each individual application, the aim is to select the machining concept that makes the most sense for the customer so that they can optimise their overall process and ultimately produce with the greatest possible economic success.

**Functional principle of various machining concepts using the example of a five-spindle solution**

To illustrate this, a fully automatically operated five-spindle solution is explained below (Fig. 8). This concept is already being used by numerous users. Despite its complexity and the use of several tool systems, this concept has been proven to realise very impressive savings in the overall process.

At the start of the machining process, a counter-rotating protective cutter cuts the front edge of the workpiece to the finished size and indexes out again after just a few centimetres (red). The double hoggers (orange) working in synchronisation then take over the pre-machining of the remaining panel length down to a small allowance of ideally around 0.5 mm to the finished contour. Two jointing cutters, also working in synchronisation and offset to each other, produce the finished edge - the first as a rebate cutter, responsible for the bottom edge of the panel (blue), the second for the top edge of the panel (green). As the edge quality decreases, both jointing cutters, one from below and the other from above, are automatically adjusted by 1 mm by axially adjusting the spindles. As a result, the previously unused cutting edge areas now take over the processing of the decorative coating. Multiple traversing of the jointing cutters results in the desired tool life addition and thus a multiplication of the total tool life.

This five-spindle concept can of course be adapted to any range of parts to be produced. If, for example, two different panel thicknesses of 16 mm and 19 mm are being processed, then the previously described width-adjustable jointing cutters can be used on the two finish spindles, which then process one of the two panel thicknesses 16 mm (green) and 19 mm (blue). This means that the wear on the cutting edges is always concentrated in defined areas, and the width adjustment results in the tool life addition (Fig. 9).

The concept of tool life addition as the innovative solution in the field of jointing and sizing offers advantages that almost every manufacturing company in the furniture and kitchen production sector would like to have. Users of the machining concepts and tool systems presented here confirm this without exception. Furniture manufacturers who are looking for solutions to achieve consistently high processing quality, longer tool life, shorter set-up and downtimes, lower production costs and satisfied employees will have to address this issue sooner or later.

The topic of jointing concepts and tool life addition is flanked by the reconditioning of worn or damaged tools. Here, additional sharpening cycles on the tool and thus further savings can be achieved through appropriate professional sharpening. Finally, it is not unimportant that the sharpening of diamond-tipped milling tools is carried out by qualified specialists and that only as much material is removed from the cutting material as necessary during the sharpening process. The professional service that Leitz offers in its more than 120 sharpening centres around the world is designed to conserve resources in this way. Here, the tools delivered are cleaned, sharpened and re-measured so that they can be used by the customer again after a short time, including a measurement report (plug and play). All Leitz tools are serialised (serial number and RFID chip) so that they can be managed individually and, in future machine generations, automatic data transfer between tool and machine would even be possible.

With its innovative, efficient and sustainable machining concepts and tool solutions, Leitz proves that economy, flexibility and quality can be harmonised.

**The company**

Founded in 1876 in Oberkochen, southern Germany, the Leitz Group celebrates its 150th anniversary this year. Today, as a family-owned company in its fifth generation, Leitz is the world’s leading manufacturer of tools for the professional cutting and machining of solid wood, wood-based materials, plastics, composite materials, and non-ferrous metals. The product spectrum covers the full range of machine-driven precision tools and tooling systems. As a manufacturing service provider, Leitz supports its global customers with a comprehensive range of services and consulting, ensuring the optimal application of cutting tools. Leitz products are regularly used in more than 150 countries. Together with its two legally independent sister companies Boehlerit and Bilz, Leitz forms the globally active Brucklacher Group. With a total of 17 production sites, its own sales and service companies in 38 countries across 137 locations and an exclusive partner network, the Brucklacher Group is a global player represented on all continents. The Brucklacher Group employs over 4,000 people worldwide and generates an annual turnover of around 450 million euros.

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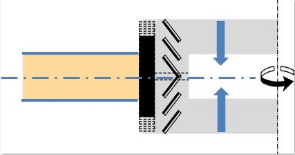
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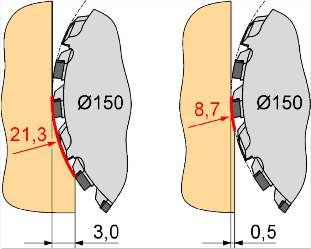
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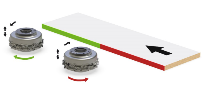
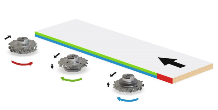
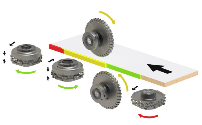
**ill.1\_1 / ill.1\_2:** The width-adjustable jointing cutter from Leitz is available in various designs. This system guarantees significantly less machine downtime caused by tool changes and adjustment work during jointing. (Photo: Leitz)

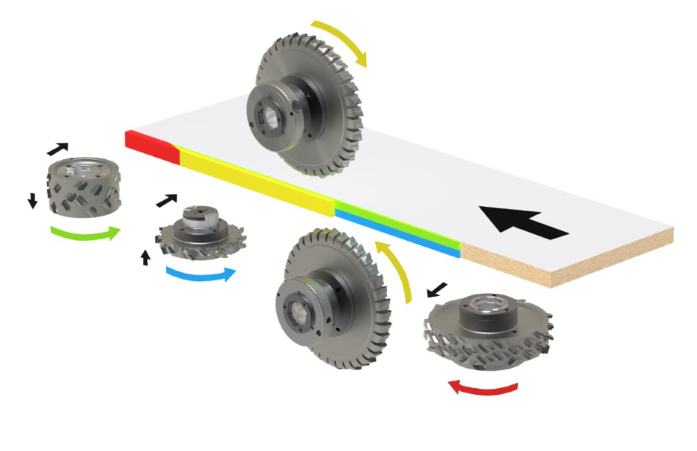
**ill.2 / ill.3:** On the left is the functional diagram of the width-adjustable jointing cutter. As soon as quality losses become noticeable on the workpiece, the synchronised adjustment of the upper and lower tool section brings a new cutting edge section into the application area. This means that the entire cutting edge is utilised over the entire tool life and performance time is increased many times over. (Photo: Leitz)



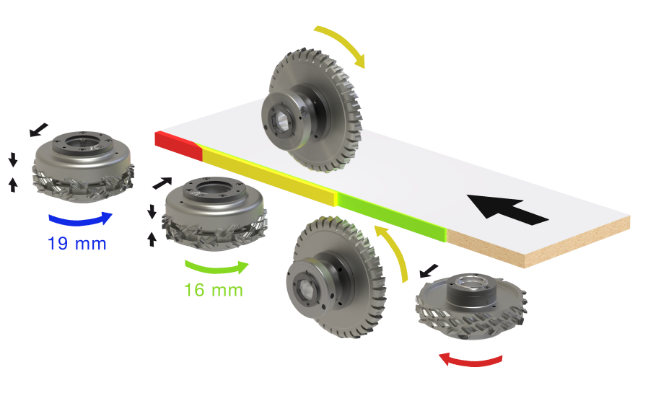
**ill.4:** The greater the material removal during the jointing process, the greater the wear on the quality-relevant tools. The so-called cutting curve length is decisive for how long a jointing cutter can remain in use. The shorter the infeed and therefore the cutting curve length, the lower the mechanical load and therefore the wear on the cutting edge. For this reason, it makes sense to use the principle of so-called pre-machining. Compact hoggers are used for coarse material removal. The quality of the finish is then produced by the jointing cutters, which are subject to significantly less wear and therefore need to be changed less often. (Photo: Leitz)

**ill.5 / 6 / 7:** Various jointing concepts are conceivable depending on the design of the machine. Whether in throughfeed machines with two, three, four or five spindles. (Photo: Leitz)



**ill.8:** The functional principle of a fully automated 5-spindle solution. Whatever the size of the company, whatever the requirements - customers all over the world rely on the broad process and technology knowledge of Leitz consultants and use it to optimise their manufacturing processes and, in the long term, their production costs very successfully. (Photo: Leitz)



**ill.9:** Illustration of the five-spindle concept from Leitz, with synchronised, width-adjustable jointing cutters and pre-cutting. (Photo: Leitz)