

## The ultimate solution for clamping difficult workpieces

When traditional clamping technology reaches its limits – whether because parts are too small, thin or permeable to air -, manufacturers are desperately looking for alternative solutions. One of them being clamping with ice.

For Kurt Kutschmann, sales specialist at Reichenbacher Hamuel, the advantages of freeze clamping are evident: clamping with ice is a technology that even permits the fixing of workpieces from difficult materials or with an intricate geometry. Traditional technologies fail, for example, in the manufacturing and machining of plates from sintered materials. The impracticality of vacuum clamping these plates without distortion puts manufacturers in a particularly precarious position. How could these plates then possibly be machined at an accuracy of one hundredth of a millimetre? It can be done, but requires expensive additional working.

The same applies to air-permeable materials, such as honeycomb structures from paper and plastics or porous sponge structures from aluminium, as they are used, for example, for truck superstructures, in rail vehicle construction or by the suppliers of the aircraft industry. So far, these materials had to be glued together for machining. The ensuing problems with the bonded edges and the removal of the glue after machining are obvious.

For surfaces with insufficient planeness, tension-free positioning will not be possible either. When freeze clamping is used, gaps and irregularities are filled with water and the parts can be clamped and machined accurately then.

Proven in practical use. The freeze clamping technology itself and the cooperation between Inteccs Ltd. and the machine manufacturer Reichenbacher were presented for the very first time on the occasion of the Composite Europe at Stuttgart. In view of common projects in the past, like Kutschmann, Managing Director Friedemann Lotsch is sure that there is a market for this technology. "It is now essential to convince those users of the benefits of this innovative system, who had mostly dealt with the known problems presented by traditional clamping techniques by means of an additional time and technology input," he says and mentions renowned companies, some of whom have been using the new technology for 15 years. A German supplier of the aircraft industry, for example, has successfully applied this technology in a machining centre of the Vision series for about one year. The convincing fact for this customer of Reichenbacher was that the honeycomb structures to be machined possess no inherent stability and that their clamping until then had been very complicated. The freeze technology permits a frictional connection and therefore accurate machining. Inteccs from Dortmund took care of the familiarization with the operation of the freezing unit, while Reichenbacher was in charge of the coordination of the control technology involved.

As Kutschmann emphasizes, the handling of the system in a machining centre is easy, as the Kryotool clamping plate, onto which the part to be machined is fixed by freezing, can be held on the machine by the conventional fixing elements. A hose connects the plate to the cryogen control unit, which

controls and regulates the freezing and thawing process via micro-processors. Moreover, the standard system is equipped with two circuits, meaning that the user can machine a part on one plate while he can fix the next part onto another plate and prepare it for machining. The clamping plate is subject to permanent cooling to achieve short set-up times. Clamping is effected by using water to freeze the workpieces to a base in a safe and tension-free way. Thus, the tension forces are uniform over the entire contact surface. Parts with free-form surfaces or little mechanical stability are frozen into an indentation in the clamping plate and can then be fixed in any machining plane required. 5-sided milling, grinding or polishing will be possible in one passage without the need for a time-consuming additional clamping operation. The efficient automatic thawing system ensures a quick release of the workpiece after machining.

A real alternative also under economic aspects. The experts from Reichenbacher and Inteccs point out that the handling of the clamping system is easy, provided that the machining parameters are strictly respected. Therefore, the milling programme needs to account for and to incorporate the shrinkage of the workpiece caused by the temperature difference. The experts, however, see this technology as a very interesting and, above all, profitable alternative to traditional clamping technologies, as the machining speeds and accuracies achieved are clearly higher, because part clamping is simpler and better. An extra benefit of the freeze system is its flexibility and favourable handling, which requires no additional devices, etc.

Bildunterschriften:

(from the left) freeze clamping system in a Reichenbacher MC of the Vision series (pictures: Reichenbacher)

Freeze clamping plate with a freeze area of 950 x 800 mm

Nomex honeycomb core on a clamping system with a freeze area of 1,500 x 1,050 mm