A question of clamping

What is often complicated using conventional clamping methods, is simple to solve using vacuum systems

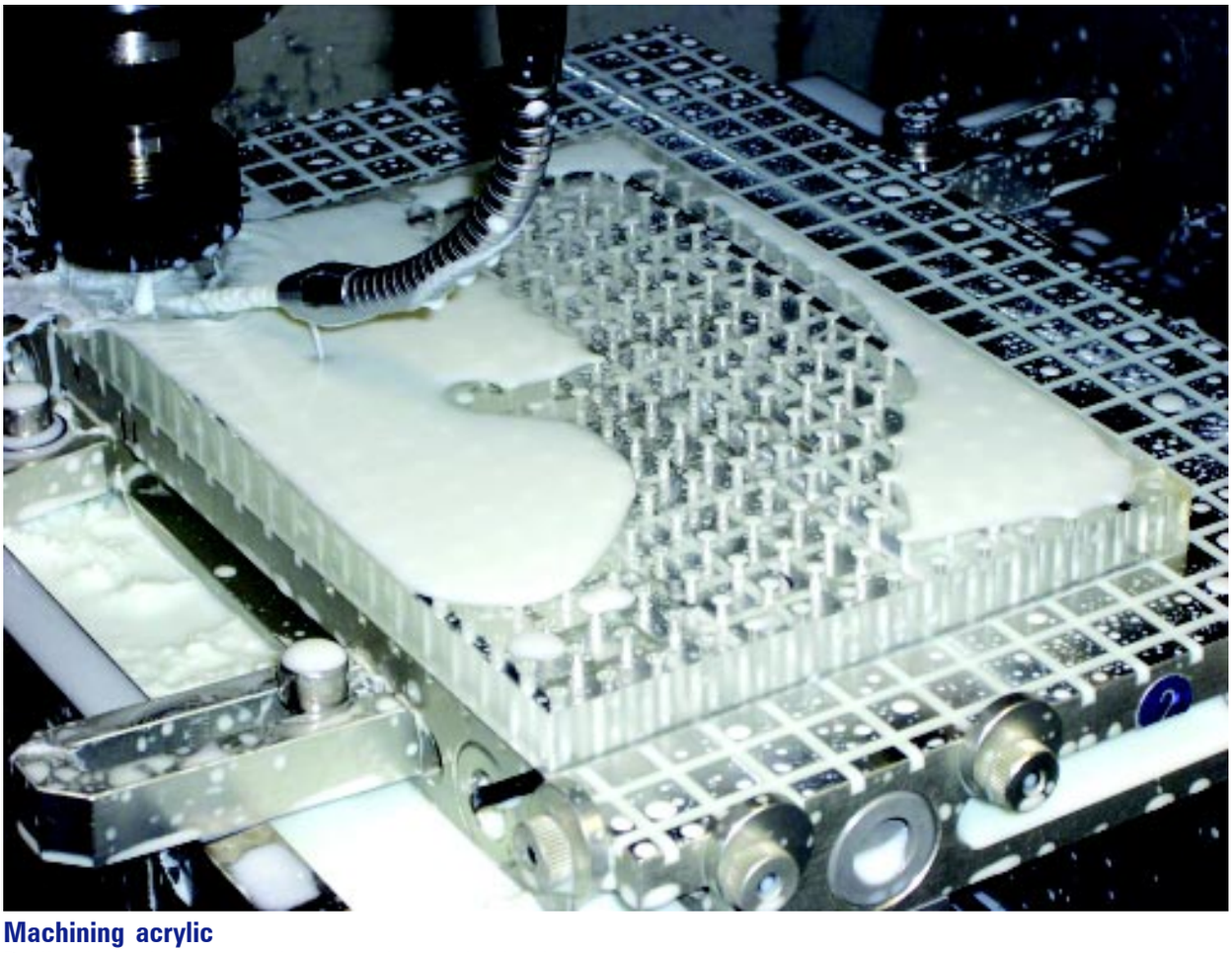
To fix and hold a part for CNC machining processes is not a problem. There are a variety of different clamping means available for today's users. These range from numerous variations of vises, to different kinds of three-jaw chucks to magnetic clamping fixtures. That's assuming the work piece or material to be machined is suitable for these conventional clamping methods.

However if very fragile materials, extremely thin work pieces or specific machining requirements are involved, special clamping methods are essential. Many materials require particularly careful handling and can by warped or damaged using jaws or vises.

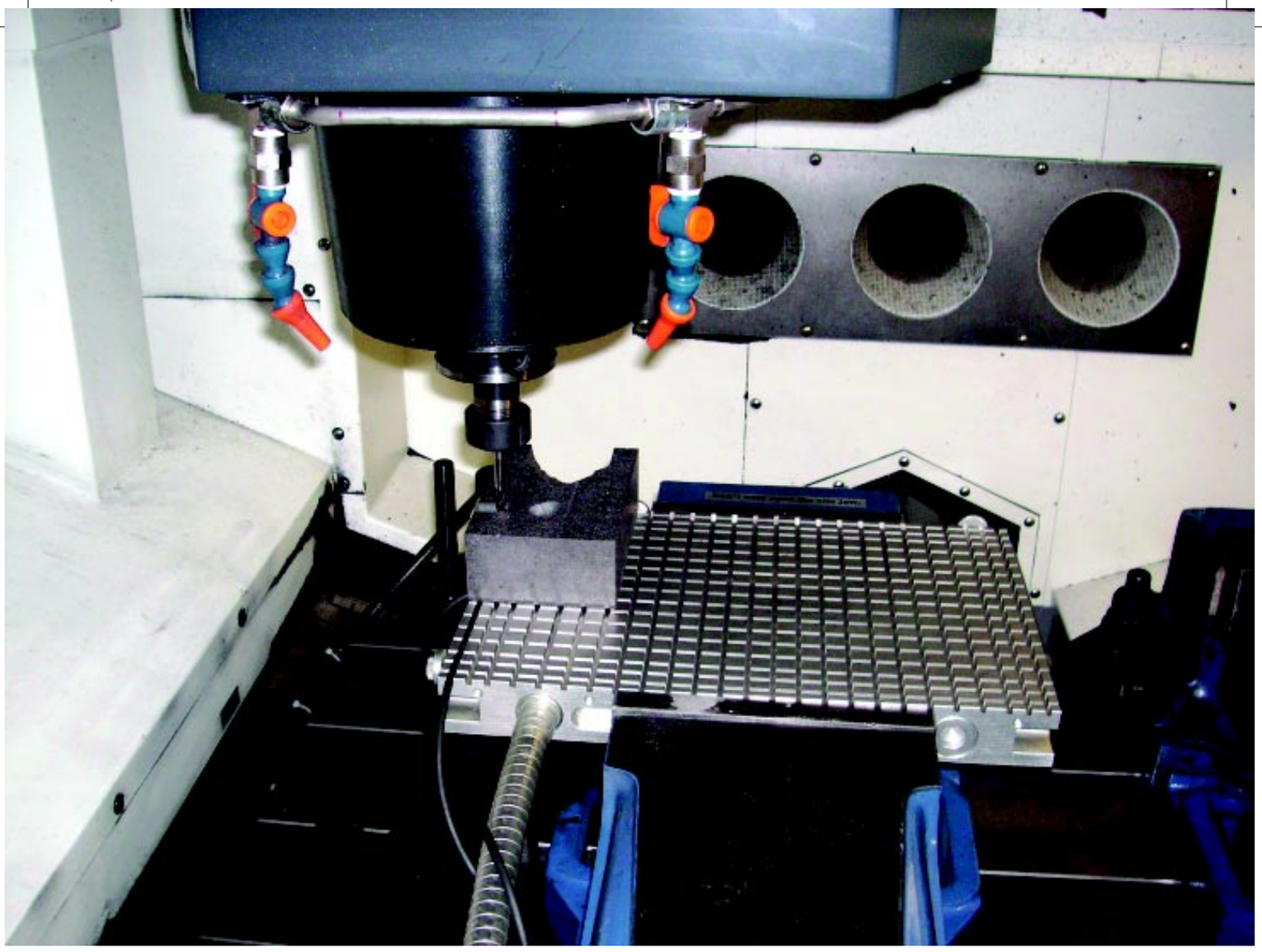
One possibility to hold sensitive parts securely and safely without applying force is vacuum clamping technology. This is applicable on almost all established CNC machines and is also increasingly in use for measuring processes. Only a vacuum chuck and a pump are required. The pump evacuates air between clamping plate and work piece undersurface and allows a vacuum to develop. Depending on application, systems can be extended with further accessories such as liquid separators for draining off coolant and lubricants, safety switches, manifold distributors etc.

Clamping with vacuum constitutes a safe and simply applicable method, which is used for both light machining processes such as grinding and also for heavy cutting jobs. For different clamping or machining tasks there are different kinds of vacuum systems available.

A further advantage of vacuum clamping is that up to five sides can be machined in



Machining acrylic
Drilling holes into an acrylic plate using a grid chuck.
Conventional clamps could easily have caused damage to this sensitive material



Machining graphite
Graphite part on vacuum grid chuck. The clamping area has been limited using elastic O-shaped seal. For complete 6-side machining the part must only be clamped twice. The grid enables accurate, repeatable positioning on the chuck. If a vise is used (photo right) there is a danger of damaging the graphite through too much force from the jaws.

one single clamping process. Aligning and fixing of the part only once leads to substantial time savings.

Certain factors such as size, weight, material and material thickness of the part as well as the type of machining involved have to be taken into account when choosing a clamping system.

Grid with seal

According to vacuum chuck manufacturer Witte Far East Pte. Ltd. (Singapore), grid type chucks are the most widely accepted. They can be used for both light and heavy cutting processes of almost all materials. Grid chucks are suitable for parts of different shape and size. Standard modular chucks, which measure 200x300mm, can easily be assembled together to make a larger clamping surface. In addition also special contour chucks are possible. Using O-shaped seal the clamping area (to which vacuum is applied) is limited according to the workpiece outline. The area outside that limited area is not affected by vacuum. For the next workpiece only the O-shaped seal must be rearranged. The elastic seal offers a further advantage of being able to compensate unevenness on the part clamping surface. Depending on the seal diameter unevenness and/or curvature of up to 1mm can be evened out.

This type of vacuum chuck is very versatile and covers many applications. However, there are limits when milling cutouts or contours or when machining fine, thin materials.

Chucks with mats

Machining cutouts requires special attention. With conventional clamping methods cutting through workpieces is a difficult process. Cut parts can fly off and cause accidents. That's why such parts are usually only surface-milled to a certain thickness, which leads to time consuming

finishing work. The remaining material must be separated and deburred by hand.

By using the Vac Mat vacuum clamping system the process can be substantially simplified and speeded up. This system comprises of a vacuum chuck on which flexible rubber mats are laid. The thin, soft mats have vacuum suction holes through which air is conveyed between part and mat clamping surface. Underneath the mats plastic lugs serve to position them on the chuck. The Vac Mats enable milling of cutouts, slots etc. Also machining of outlines and chamfers, which would normally only be possible with for instance special adapter plates, is feasible with this method. Vac Mat allows complete part machining in one clamping process. With certain applications up to 70 per cent of the clamped material can be milled away without losing vacuum or cutouts inadvertently flying off.

Expensive, time consuming finishing processes like breaking out, deburring, conventional clamping or using double tape are no longer necessary.

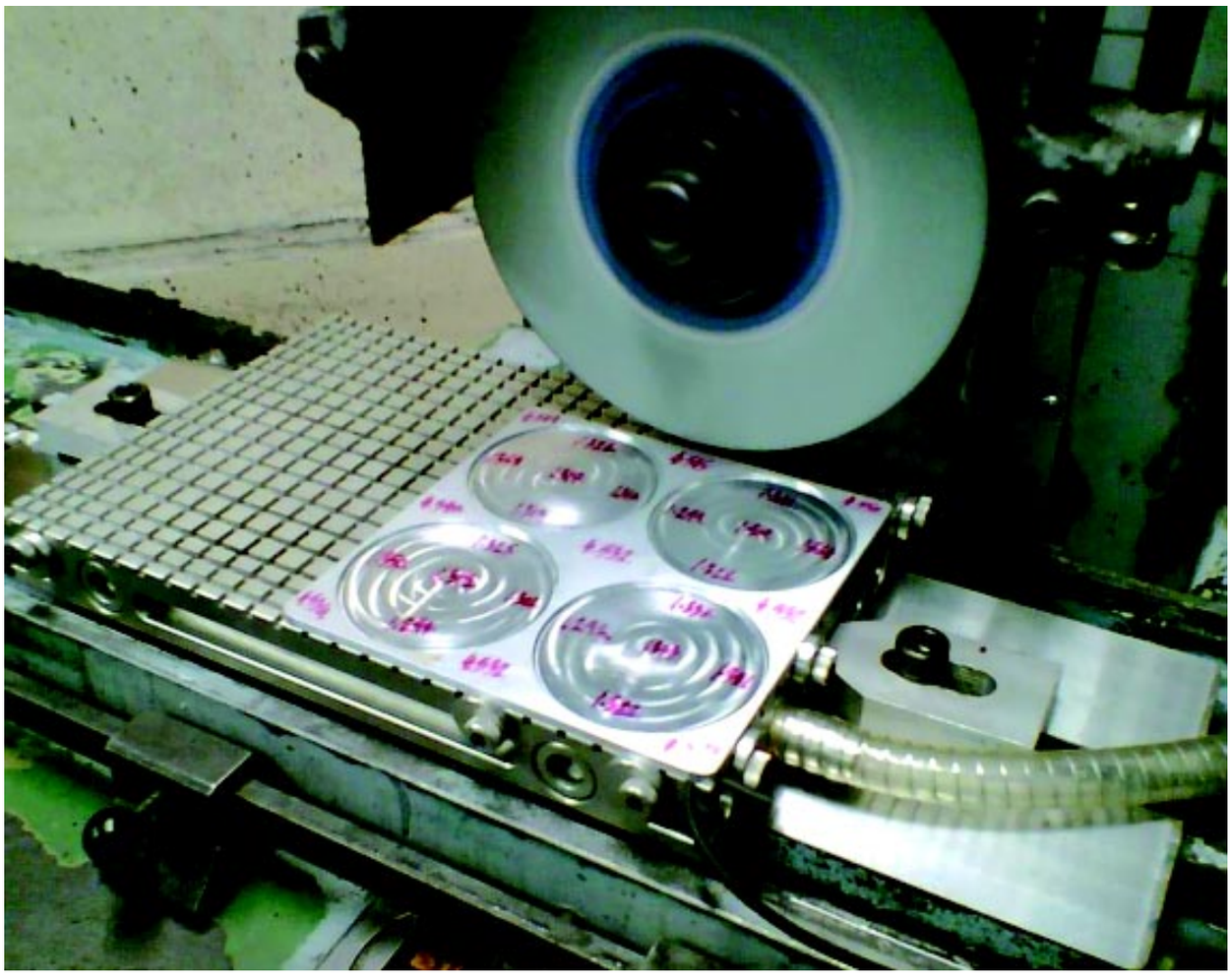
Similar to grid chucks, modular Vac Mat chucks also allow flexible applications. They are suitable for different machining tasks and materials. The Vac Mat - system further simplifies machining due the fact that only 60 per cent of such a chuck need be covered by the part. It is not necessary to cover and/or define the unused clamping surface. Accurate machining with Vac Mat is facilitated by the accuracy of the mats, thickness tolerance is 0,04mm.

External recesses around the edges of the Vac Mats make the use of stops possible, so that aligning workpieces is made easy.

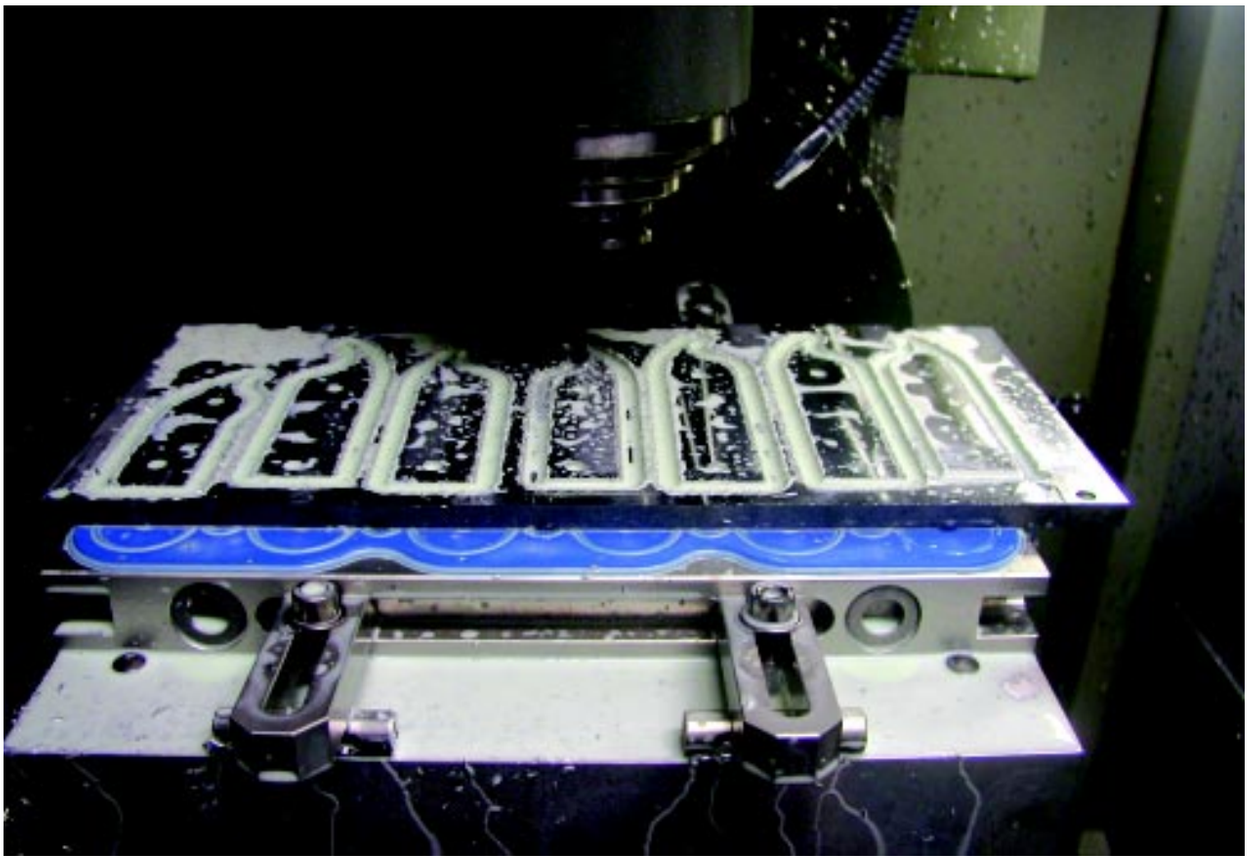
The mats are re-usable; only those Vac Mats which are damaged need to be exchanged. The flexible rubber mats are also suitable for working with coolant and liquids.

Porous for fine applications

That vacuum clamping technology is not only applicable for milling and turning, but also for other machining methods, becomes apparent when using chucks with a universal porous and thus air-permeable surface. This



Machining aluminium
Vacuum grid chucks are suitable for many kinds of machining i.e. grinding

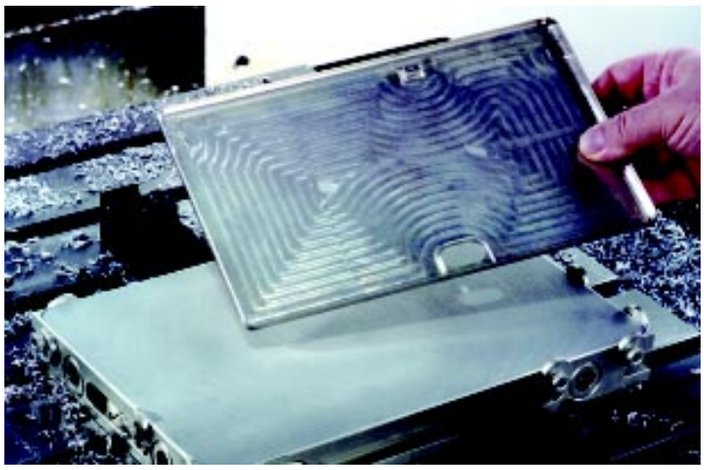


Vac-Mat-Vacuum chucks
A Vac-Mat vacuum chuck is fixed to the machine table using conventional clamps. The aluminium part lies secure on the rubber mat enabling machining of cutouts.

type of vacuum chuck is frequently used for holding thin foils or rubber products. A preferred application is also in measuring and inspection. Parts such as circuit boards, circuit foils, electronic chips etc. are secured damage and deformation free by the porosity and evenness of the chuck over the whole surface. In order to reach an accuracy of 5μ to, the surfaces are generally diamond-milled. The chucks are frequently equipped with fitted bushes around the edge to facilitate repeatable positioning using stops. These chucks also have the advantage that unused clamping surfaces do not need to be covered.

Different vacuum clamping systems are available in standard dimensions of 200x300mm. Witte Far East offers an extensive range of chucks and accessories. "The modular Witte chucks can be assembled to provide larger clamping surfaces and be used again separately if required", explains Stefan Roeding, Managing Director of Witte Far East, Singapore.

Since applications which require the use of vacuum clamping technology, frequently prove to be difficult, design and manufacture of special solutions from chucks to complete engineered projects are often the case.



Vacuum chuck with porous clamping surface
Holding extremely thin parts on chuck with completely porous surface

For details contact:
WITTE FAR EAST PTE. LTD.
13 Joo Koon Crescent, Singapore 629021, Singapore
Tel.: +65 6248 5961, Fax: + 65 6898 4542,
E-mail:info@witteasia.com, www.witteasia.com

Press/PR: Maren Roeding, Tel.: +65 6248 5980,
E-mail: marenroeding@witteasia.com