decomagazine

THINK PARTS THINK TORNOS 40 01/07 ENGLISH

History of the "Swiss-type" unit.

The influence of cutting oil on process capability.

Trade fairs – a necessary evil?

Subcontractor Opportunities in the Cardiovascular Market.

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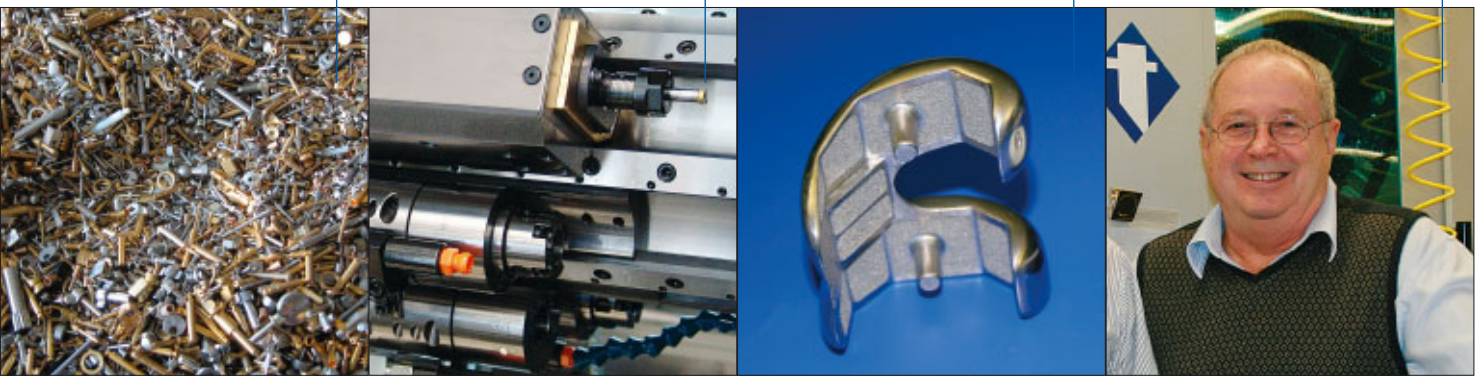

Journalists from French trade magazine Mach'Pro went to find out more about 'Swiss-type' turning machines by visiting a bar-turning specialist in the Besançon region of France where this kind of machine has been in operation for a long time.

The ongoing product implementation strategy for multi-spindle units is progressing in giant steps.

Bio-compatibility is a fundamental element in the cleaning of surgical implants. It is important to eliminate cutting fluids and lubricants after mechanical operations. This allows for a simplified final cleaning process and guarantees bio-compatibility.

When Mike Butler, President of DuAll Precision in Addison, Illinois, saw the Tornos Swiss style automatic lathes at IMTS in 2002, he knew the technology would transform his business.

IMPRESSUM

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SUMMARY

ORIGINAL THINKING FOR TORNOS US

By Scott Kowalski, President of Tornos Technologies USA

Sneak Peak at the new Midwest Headquarters.

Moving Forward

Since joining Tornos Technologies in June, I have seen many things that impress me. First and foremost on the list is the Tornos product itself. The quality of the Tornos product line is unparalleled. The Swiss design and precision deliver incredible, sustainable speeds. And the new DECO Sigmas' turn metal into money faster than anything else on the market!

Another is the commitment to success. There are many quality people working for the Tornos organization globally – and I'm proud to have a talented and dedicated group of individuals – from the internal support, applications and service teams to our top-notch distributor network – behind me here in North America.

The next thing that energizes me is the incredible unrealized potential of the Swiss turned parts market in North America – from the productivity demands of the automotive industry, to the complex parts made of exotic materials for the medical parts industry; while not excluding the tiny, precision parts for the ever-changing electronics and micro electronics industry. All these applications require the extreme precision that is ubiquitous in North America today; the kind of precision that The Original Swiss automatic lathe achieves day in and day out.

Finally the all-important task of attracting new and retaining existing customers: this is and will continue to be a top priority for me.

Customers are top priority!

By the end of the 2006, I will have implemented several important new initiatives designed to strengthen Tornos US:

• 4Corners: With the addition of two new Centers of Excellence (one in Connecticut and one in the suburbs of Chicago), we will be able to deliver a higher level of service to all four corners of North America. Both locations will house sales, applications, service and parts distribution operations, greatly enhancing our operating performance. Watch for an announcement about our new, streamlined facilities in both locations very soon.

• DirecTConnecT: This new service program shows we're serious about service in North America. Watch for this on www.tornos.us. Development of this new website dedicated to the needs of the North American market is underway and set to launch officially near end of 2006.

• Intense recruiting and investment in additional talented people to join our operation. And already, success – we are very proud to announce that Bob O'Hara has joined on as our new Operations Manager! Bob comes to us with 14 years spent managing the North American Advanced Technical Support Department for AgieCharmilles. He will head a revitalized customer service department of 21 experienced Tornos technicians and applications specialists.

• Launching a new "Original Thinking" North American marketing campaign extension – aligned with the global Think Parts Think Tornos branding statement. The "Original Thinking" campaign builds on the recognition in North America of Tornos as "The Original Swiss Turning Machine" and extends that idea to encompass all the ways Tornos US is embracing new ideas and Original Thinking to strengthen the brand in North America. The campaign will not use traditional advertising channels to convey its message. Instead, Tornos US will use new media and innovative web-linked print to communicate the new perspective.

Bring it on!

We at Tornos US have established an intense focus on original thinking across the company and I am confident that this will result in excellent customer growth and loyalty in the future. We've got aggressive sales and service targets for 2007 and the enthusiasm to make it all happen. Thus, our battle cry: Bring it on!

MEDICAL APPLICATIONS FOR DECO SIGMA 20

For straightforward workpieces, the medical sector faces the need to reduce costs without compromising quality.

Everybody is seeking the best solution

Manufacturing of medical equipment is a very demanding field and has been driven by striving for high complexity parts with high precision and repetitivity for years. The medical market is obviously a huge consumer of such high end solutions, but there is nevertheless a need for cost effective equipment to produce medium complex parts such as surgical screws too. The quality and accuracy has not diminished and the market is not asking for low-cost solutions, but well tailored solutions such as less axes with high quality and precision options.

Tailored answer

That need is recognised by Tornos, so it not only provides specific solutions for medical applications with well established product lines such as the DECO 20a and 26a. In its category of sliding headstock lathes for moderately complex parts, the DECO Sigma 20 is unique. It offers a counter-spindle that is as powerful as the main spindle and all the current machining operations which are, on other lathes, usually available only on the main spindle side. The counter-operations represent a lathe in its own class. Obviously the DECO Sigma 20 doesn't play in the same league as the DECO 20a; it is simply a perfect complement in the product range to allow users to work with the best adapted tool for their requirements.

In the category up to 20 (25.4) mm, DECO a and DECO Sigma are complementary products - only the type of workpiece determining which is used.

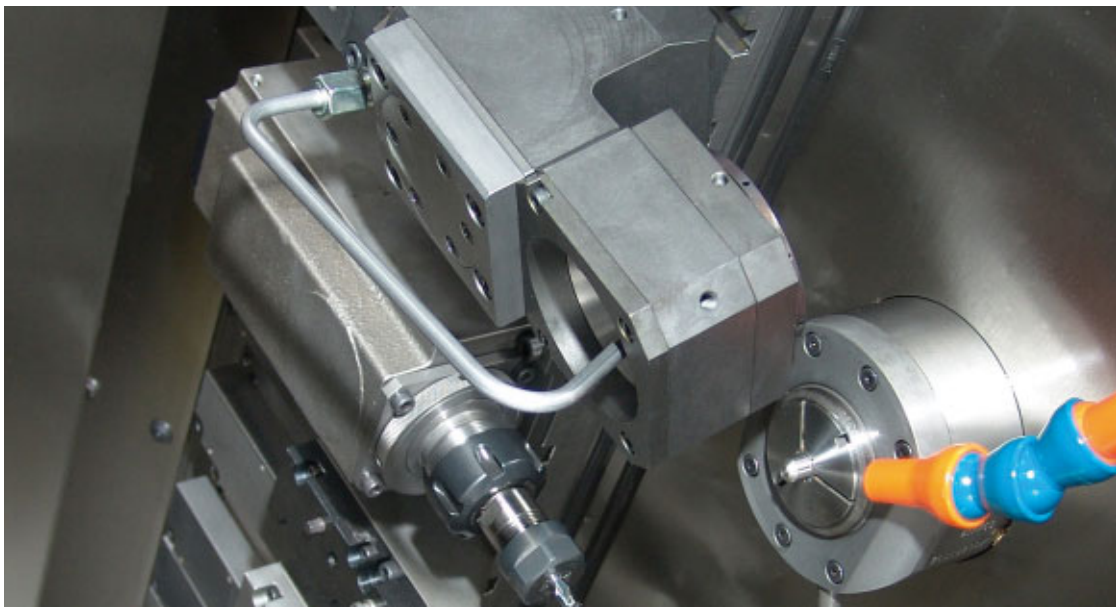
Even a simple machine can be adapted

The medical field (as well as some others) is in deep need for very special operations to machine parts in tough materials. The DECO Sigma 20 can be equipped with some options.

Thread Whirling

A quite well known mean to machine bone screw that clearly brings advantages to customers:

- no part deformation (small cutting forces)
- no burrs
- fast execution (produced in only one pass)
- high-quality threads achieved by surface states and dimensional quality
- no problems with chips as only fine particles are produced
- very long tool lives, hence little operator intervention.



Thread whirler on the DECO Sigma 20.

High pressure drilling

Up to 350 bar pressure drilling on incredible hole diameters of 0.8 mm to a length of 50 mm!

Example of results:

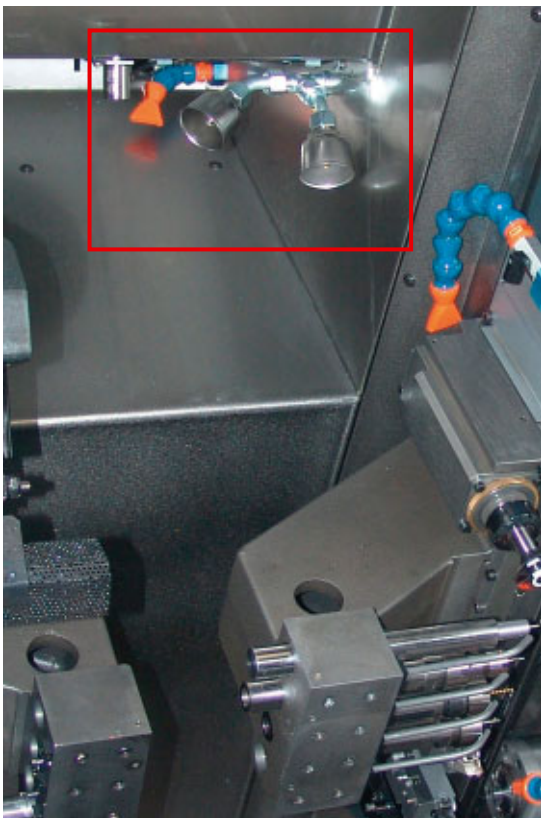
Practical tests carried out

- drilled material: titanium
- "3/4" drilling tool: dia. 0.8 mm at oil hole
- drilling depth: 50 mm (62 x the dia.)
- operating time: 150 sec.

DECO Sigma 20, another way to machine medical parts.

Fire Prevention System

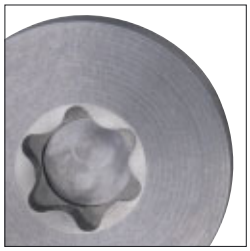
When machining material with a flammable risk as often the case in medical applications – Tornos Fire Prevention devices contains the beginning of a fire and then is part of a global solution.



Fire protection system.

DECO Sigma 20, an alternative to count with

Such a machine is not dedicated to machine complex parts, but is the perfect answer for simple to middle complex parts. In manufacturing of a Torx forms with



Torx recess.

a high frequency revolving spindle option, or deep drilling and thread whirling onto a bone screw, DECO Sigma 20 can be the right machine for cost effective production of middle-complex parts.

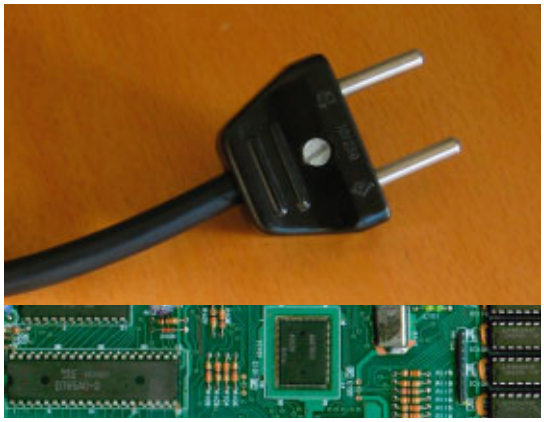
Do not hesitate to contact your Tornos sales representative to determine which of Tornos solutions is best suited for your requirements or the above mentioned person.

Willy Kaempfer, product manager, Tornos

THE CONNECTIVITY BUSINESS – WHAT'S THE FUTURE?

There is still a place for bar turning in this business sector.

In the electronic sectors, electrical connector systems are evolving. We have seen new technologies arrive on the scene and others are sure to follow. The manufacturing of workpieces for the connectivity business by specialists in the bar turning industry is as relevant today as it always has been.



Without electricity, the connectivity business would never have seen the light of day. Even if an electrical connection remains an electrical connection, there are basic differences between today's requirements and those of the past.

A few decades ago, the connectivity business was almost exclusively known for its electrical plugs, originally 110 Volts and later 220 Volts. A keen eye would be able to make out fine radial marks on the male plugs, these workpieces having been manufactured exclusively by turning. The quality levels would fall well below today's standards but would have been acceptable for the applications of the time.

Let's take a closer look at this very fragmented market.

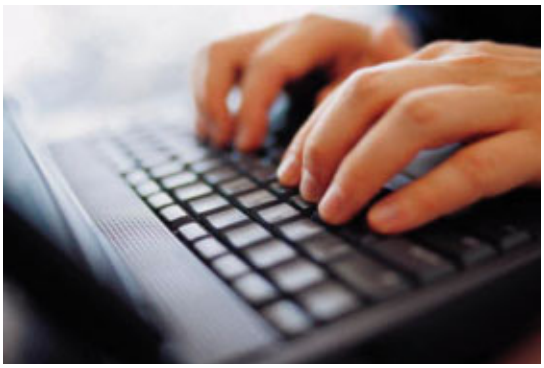
Times have changed. Electrical voltages have evolved considerably, especially in terms of low and ultra-low voltages. Another sector is also playing a role in the connectivity industry and a vital one at that: remote data transfer. Sectors such as information technology, industrial automation, GPS, digital photography, toys, aeronautics or the automobile industry are large consumers of connectivity parts of all kinds. Just as there are sectors where the reliability of a connection is of course desirable but not actually essential, there are also uses where a guaranteed permanent connection is absolutely vital.

Toys are still toys

The leisure, house and home and toys sectors certainly do not provide any quality benchmarks for the connectivity business, but they are synonymous with certain product lines such as the Walkman, white goods and others. The safe operation of these goods is highly desirable, but in case of a malfunction, neither the life of the user or of the people around him is put in danger. Data transfer and electrical contact must adhere to certain regulations but only very rarely do they need to meet high safety standards. In this sector, the connecting parts are often based on folded blades but other technologies have now also appeared on the scene with high volumes that often push prices right down. In this field, the stamping process is fairly ubiquitous.

High-end – even in the connectivity business

Things are different in other sectors. Today, many industrial sectors work with measuring systems operating at very low voltages. Information technology has witnessed incredible increases in volumes of data transfer in a very short time and these are still growing. The aviation industry is also very demanding when it comes to reliable transmission of measuring signals at low voltage, along with remote data transfer, and the same applies to technologies in the med-



Bar turning is a must for all applications which require increased levels of security and quality!

ical sector. In all sectors, a safe and reliable connnection is essential. In order to ensure an even better connection and with it a better signal quality, workpieces are often gold-plated.

Disconnect – connect – disconnect

Apart from safety constraints, either with respect to the electrical connection or to data transfer, another requirement must be taken into consideration: While in many cases the connection once made remains uninterrupted for the working life of the appliance in question, in others this connection is made and broken over and over again. And even in such unfavourable conditions, the connection must be made perfectly each time – from the first to the last. High-end connecting parts are therefore essential and they require perfect finishing.

Very challenging parts

The geometric characteristics of components used in the connectivity business tend to be challenging: They are often long and thin with a fairly unfavourable length/diameter ratio, i.e. length can often reach ten or even twenty times the diameter. So male parts can often have a diameter of two millimetres for a length of twenty to forty millimetres. This type of shape is a good match for the level of forces applied when bar turning on sliding headstock machines.

Automation stipulates the conditions

The huge volumes of consumer products (mobile telephones and global information technology growth) stipulate the conditions of highly automated production. In this way of manufacturing, assembly systems have one fundamental requirement: each part has to pick up and position parts absolutely identical to the previous one – from the first to the millionth part or more, otherwise production reliability can no longer be assured. And who wants to take responsibility for a costly production shutdown? For large volumes, assembly lines determine production capacities. If components are on a line, assembly is more efficient.

DECO 10e, a perfect solution to your quality and precision requirements for the production of parts which don't need the 12 axes of the DECO 10a.

What's left for bar turning?

As in the past, bar turning machines are still proving their worth. Turning machines like the Tornos DECO 10 range with its seven-axis model – designed specifically for the manufacturing of parts in the connectivity business – ensure unrivalled quality from the first to the last workpiece in the series. The DECO 10, 7 axes turning centre with counter spindle is particularly well suited to a specific market trend: The bar turner's prices are being put under increasing pressure. This pressure is passed on to his suppliers, and in turn to the makers of the machine. He is therefore looking for machines to meet his requirements precisely and has broken with the past; no longer being interested in complex and more general-purpose machines, instead seeking at all times to purchase a new turning machine at the lowest possible price.

Tolerances around the hundredth of a millimetre are commonplace for these machines-tools. The tooling is reputed and freely available on the market which also ensures an equitable cost price. One of the main requirements of these parts, repetitivity of dimensions is guaranteed by this DECO turning production machine tool . Even with materials that are difficult to machine, the turning machines in this range do the job safely and reliably. Moderately complex parts can also be machined, depending on the equipment available.

Benefit number one: Manufacturing a finished part

Today's DECO turning machines are able to machine a part from beginning to end, which means finishing with a part without fixture-changing operations. Manufacturing a part completely finished and ready for cleaning and shipping. Naturally, some parts are simpler and some are more elaborate than others, but even in cases like this, these turning machines – depending on the equipment fitted – deliver multiple machining options, regardless of flanks, drilled bores and other screw pitches. It's quite incredible what the skilled bar turner can get out of these machines. Even highly complex geometries can be machined with ease on these turning machines – naturally always right through to finished condition, i.e. the kind of end-to-end capability which customers now expect.

Benefit number two: flexibility and possibility of machining small series runs.

As a rule, the connectivity area is an area of long production runs. However, even in this sector breaking up series is common. For special products, small and medium series runs are often required. Of course, series repetition is one of the strong points of the DECO automatic turning machines. After a first run, command data simply need to be memorised and re-entered for each new series repetition. The result is a clear time saving when this is repeated because any amendments made during the first run will be carried over automatically. Result: reliability and continuity guaranteed for all series.

Benefit number three: geometric accuracy

Following the example of fibre optics, concentricity and optimum productivity are required in order to cope with powerful levels of signal transmission. This level of quality is guaranteed on workpieces machined on the most modern turning machines: the fact that the machined workpiece turns in front of fixed cutting tools ensures near perfect concentricity during machining. They are a perfect solution to the demands of the fibre optics sector where the fibres have to be placed in their casing with extreme precision.

Bar turning is alive and kicking!

As we have seen, bar turning has several strong arguments in its favour when discussing the manufacturing of certain types of parts. In this hyper competitive market where pressure on price is very high, today's bar turner requires a specialised automatic turning machine. He often refuses to invest in machining possibilities that he may need in the future. It's essential that we offer him solutions to meet the exact requirements of the workpieces he needs to turn. The DECO 10 from Tornos (over 2000 machines in service) is a machine that comes in three versions, including one with five axes for very simple operations, seven axes for specialised operations as well as a model with nine axes for complex operations. The bar turner's investment will therefore always meet his real needs.

Would you like further information about "electronic" solutions from Tornos? Please do not hesitate to contact your Tornos sales representative or download our catalogue from the following internet address:

http://www.tornos.com/dnld/app/tornos-ap-electronics-e.pdf

HISTORY OF THE "SWISS-TYPE" UNIT

Journalists from French trade magazine Mach'Pro went to find out more about 'Swiss-type' turning machines by visiting a bar-turning specialist in the Besançon region of France where this kind of machine has been in operation for a long time.
Is the contest between cam-type machines and CNC turning machines now at an end?
DECO Magazine takes great pleasure in being able to share this report with its readers.

A short history lesson...

The history of Tornos dates right back to 1880, the year when the first automatic bar turning machine came into being (used for producing bar stock to make screws) and started series production of small components for the watchmaking industry. This took place in Moutier, a town in the Swiss Jura region. During the Sixties and Seventies, three local companies, Tornos, Bechler and Petermann, merged to form the single company of Tornos-Bechler, whose global reputation has never ceased to grow since that point.

For their part, Claude Gillet and Daniel Thomas founded UND, their own bar-turning company, in Besançon back in 1979. Another specialist in the production of watchmaking components. This company also invested from the outset in the cam-type turning machines produced by the Moutier-based manufacturer. Although the best part of one hundred sliding headstock machines purchased in those early days are still there, most having undergone retrofits, the UND machine shop is now also the proud home to 80 CNC – numerically controlled – turning machines, many sourced from Tornos. Citizen bar-turning machines and Esco screw-turning machines also feature in this machine shop.

Diverse range of cam-type and CNC units

UND, a bar-turning specialist employing 70 highly-skilled people with expertise in dynamic and reactive bar turning from prototype right through to long series production of high value-added components

To decorate its main reception area, UND has a container exhibiting the diverse and varied range of reference parts manufactured by this bar-turning specialist in the Besançon region. And that's just part of the story!

On a progressive basis, all the cam-type machines at UND, and indeed further afield, are being retrofitted and updated to comply with new safety and security standards. You need to keep your in-house expertise well protected.

has enjoyed annual sales growth of 10% for several years. UND not only focuses on highly technical components, it also produces a very wide and diverse range with 50,000 different references to manage. On the one hand, it is this quest for diversity that prompted Mr. Thomas also to invest in brands other than Tornos, and indeed in different technologies, since a component of the company's activity profile includes the provision of grinding operations. On the other hand, the diverse range of workpieces also prompts the company to retain a significant number of cam-type turning machines on its premises.

UND goes one better, manufacturing its own cams in-house, and has just recruited four young "Bac Pro" school-leavers for training in calculation and cam machining work. «Our cam-type machines are retrofitted by ACM to equip them with 1 or 2 numerically controlled axes, simply because they continue to deliver exceptional reliability and speed,» explains Daniel Thomas. «Having said that, if we had not started investing in CNC sliding headstock turning machines back in 1987, that would have marked the end of the company,» he adds. Indeed, cam-type turning machines are very fast and are independently capable of performing long production runs of relatively simple workpieces. In this context, with a very high proportion of its machine shop fully amortised, UND is every bit as competitive as the leading new low-cost provider for long production runs of workpieces requiring only a small amount of machining.

However, most production runs have now reduced in size to small batches and workpieces now tend to be much more complex. «To assure the future of our business, we need to strive ceaselessly to diversify our markets,» states the Chief Executive. «The medical, aeronautical and connections sectors require workpieces with a high value-added component, but always in small batches and invariably more highly complex.» In cases like these, cam-type machines are penalised by their setting times. CNC turning machines with sliding headstocks deliver shorter set-up times, a higher number of counter operations and simpler interpolation functions involving a larger number of rotating tools. At the end of the day, they offer the scope for producing complete components from difficult materials in limited series, and are

The range of CNC machines in this facility is being increased on a regular basis, dedicated to increasingly complex workpieces. The Tornos range enables these components to be viewed in a different light.

capable of doing so in a sequential series of operations on a single machine. «Although we have other makes of machine on the premises, we have always remained loyal to Tornos because its DECO 2000 range has often allowed us to take on these kind of components at market prices,» affirms Daniel Thomas. The contest between cam-type/CNC machines is not therefore finally at an end, continuing to be played out in decisions over whether to retrofit or instead to purchase new machines. On that front, things are developing very fast indeed.

A range of evolutionary changes.

Automatic cam-type turning machines only comprise mechanical components. When you take a look at their kinematics, it is relatively easy to grasp that a given cam actuates a given tool, and that a given cylinder enables a given stroke to be adjusted. The advent of CNC turning machines heralded a sharp rise in the number of simultaneous operations. Modern machines are able to operate 5, 10 or even 14 axes at once. The challenge is therefore to simplify the complex, and this is what Tornos has been seeking to achieve since 1986 with its TB-Logic. Following a difficult time for the general economy between 2002 and 2005, Tornos responded well by offering new lines of machine last year. It is this innovative capability which now enables the company to present a satisfactory order book and financial results to match. In overall terms, this manufacturer offers its DECO automatic, single-spindle sliding headstock turning machines for the manufacture of highly complex workpieces, and its DECO Sigma range of single-spindle, sliding headstock turning machines for the production of simpler workpieces. In multispindle mode, Tornos machines employ the same logic as their single-spindle units because the company philosophy is to offer machines capable of manufacturing workpieces across the range of difficulty, from simple to highly complex.

To make it easier to operate a mixed range of machines under a single roof, the TB-DECO programming tool can be applied in the same way to single-spindle units as it can to multi-spindle turning machines. Better yet for new products aimed at a market favouring simpler workpieces, the multi-spindle units can be programmed by the operator's choice of system: either TB-DECO or conventional ISO.

Back at UND, Daniel Thomas is showing great interest in the Sigma range of turning machines, with plans to invest in a DECO Sigma 20 and a DECO Sigma 8. The DECO Sigma 20 was designed for the production of workpieces of mid-range complexity, or of short production runs. This turning machine has 6 linear axes with 22 tool positions and a high level of interchangeability, offering users a very versatile range of functions indeed. We should also point out that, in order to offer every mechanical production business scope for benefiting from the rigidity, simplicity and power of the DECO Sigma 20, Tornos has created a package of standard equipment for the manufacture of simple workpieces offering a favourable ratio of multi-functionality to price. As for

As well as the need for optimum ergonomics and TB-DECO or ISO programming options, the robust nature of the DECO Sigma 20 offers substantial chip-cutting capability and the potential deployment of 2 tools simultaneously as a permanent feature.

the DECO Sigma 8, we should bear in mind that it was specifically designed to meet the very stringent requirements of the micro-electronics sector without neglecting other segments of the market such as the high-end watchmaking, automotive and medical sectors. «It is still the versatility of these machines that attracts our interest» states Daniel Thomas in their favour.

Since 1971, with 24 editions a year, Machines Production is the leading French journal dealing with metalworking technologies, i.e. chip-cutting/machining applications.

www.machpro.fr

Responding to market prices

By way of somewhat extended conclusion, Daniel Thomas explains his investment philosophy: «We always take on workpieces at market prices. This obliges us to find technological ways of achieving these prices, while at the same time protecting our margins». As a consequence, machines need to enable setting operatives to envisage using them for very different ranges of parts, thereby ensuring that they always remain competitive in the face of competition from low-cost countries.

The ingeniousness of setting operatives is an important point but on the other side of the equation, machine manufacturers need to be offering ever more versatile solutions, achieving an ever closer match with customer requirements, one example of which would be the downwards pressure on prices which compels bar-turning specialists to cut production times to the maximum possible extent. In this context, productivity and utilisation rates on production equipment are vital ingredients, as is the capability of completing entire workpieces on a single machine. Any and all secondary operations which can be eliminated all deliver tangible «win-win» benefits to customers.

When it unveiled its new range of machines, Tornos was also seeking to rise to this challenge on behalf of its customers.

Michel Pech
mpech@machpro.fr

INNOVATIVE QUALITY ASSURANCE: THE INFLUENCE OF CUTTING OIL ON PROCESS CAPABILITY

Did you know that the performance parameters of a cutting oil can be measured precisely, and that they therefore constitute an important factor in the context of process capability assurance? CAQ (Computer Aided Quality Assurance) is now just as regular a feature of the bar-turning business as tooling tips made of futuristic materials, high-performance cutting oils and state-of-the-art machine tools.

CAQ systems (computer-assisted quality assurance systems) analyse, document and archive quality data relating to production processes. The analysis, documentation and archiving of this important data is all extremely important to companies as they strive to minimise the risks associated with product liability legislation. For example, markets like the USA, demand a seamless system verifiable over many years for assuring relevant data in all key areas such as GMP, Good Manufacturing Practice in the medical technology sector and GDP, Good Documentation Practice.

Process capability index CpK

The CpK value (Process Capability Index) is an indicator used for evaluating the performance capability of a process. It indicates how frequently defined objectives (according to the specification document) are achieved. The CpK is defined as an average value. The higher this index is set, the more consistently an entire production process complies with a specification.

Comparison table CpK – PPM

Process capability index CpK	Parts per million/ppm	Continuation of CpK	Continuation of ppm
0,47	80'755	1,07	687
0,5	66'805	1,1	483
0,53	54'800	1,13	337
0,57	44'565	1,16	232
0,6	35'980	1,2	159
0,63	28'715	1,23	108
0,67	22'750	1,27	73
0,7	17'865	1,3	49
0,73	13'905	1,33	32
0,77	10'725	1,37	20,5
0,8	8'200	1,4	13,5
0,83	6'210	1,43	8,5
0,87	4'661	1,47	5,5
0,9	3'467	1,5	3,5
0,93	2'555	1,53	2
0,97	1'866	1,57	1,5
1	1'350	1,6	0,25
1,03	967	2	0,099

Example: With a CpK value of 1.07, 687 parts per million (ppm) are outside specified tolerances.

What does machine capability mean?

Machine capability is a term from the world of production technology which indicates the stability and reproducibility of a production step on a machine in production. This makes it possible to establish what proportion of scrap and rework material arises when a machine is in operation.

To determine machine capability under carefully defined conditions (e.g machine at operating temperature, fully trained operator, normal ambient conditions, defined workpiece etc), a random sample of workpieces (e.g. 500 units) previously established using statistical criteria is manufactured, after which the parameters critical to the future function of the component are measured. Over and above this, a statistical distribution is compiled for this random sample. For teaching purposes, it is common to assume the presence of normal distribution, despite the fact that this rarely occurs in a genuine production environment. You now go on to determine the position and scatter range of the parameters you have measured. From this, machine capability can be defined as a numerical value. In modern companies, it is common practice to apply a machine capability index of 1.33 (corresponding to a standard deviation for normal distribution of 8 Sigma), or 1.67 (corresponding to 10 Sigma). The smaller the value, the poorer the machine capability.

Cutting oil as a process parameter

As a process parameter, cutting oil assumes the important functions of workpiece and tool cooling, lubrication of the contact point between tool and workpiece and the removal of swarf. Nowadays, virtually no operator would change the machining fluid simply in response to a technical product description. Only realistic tests are able to reveal the true performance levels of a grade of cutting oil.

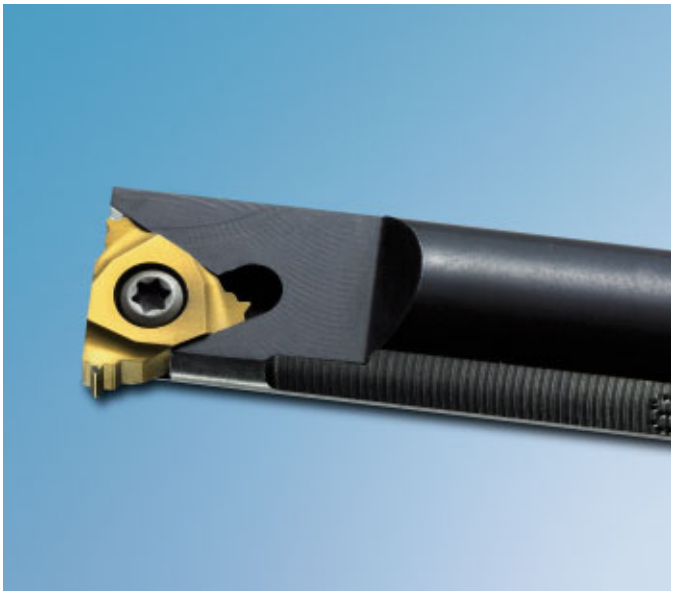
A short while ago, MOTOREX was able to test the capabilities of the high-performance cutting oil MOTOREX ORTHO in a comparison test with one of Europe's leading automotive component manufacturers, thereby demonstrating its beneficial product properties in an objectively quantifiable and verifiable manner. In this context the people involved were interested in establishing the precise, quantifiable factors with a direct influence on process capability:

1. **comparison of service life.**
2. **dimensional integrity.**
3. **surface quality.**

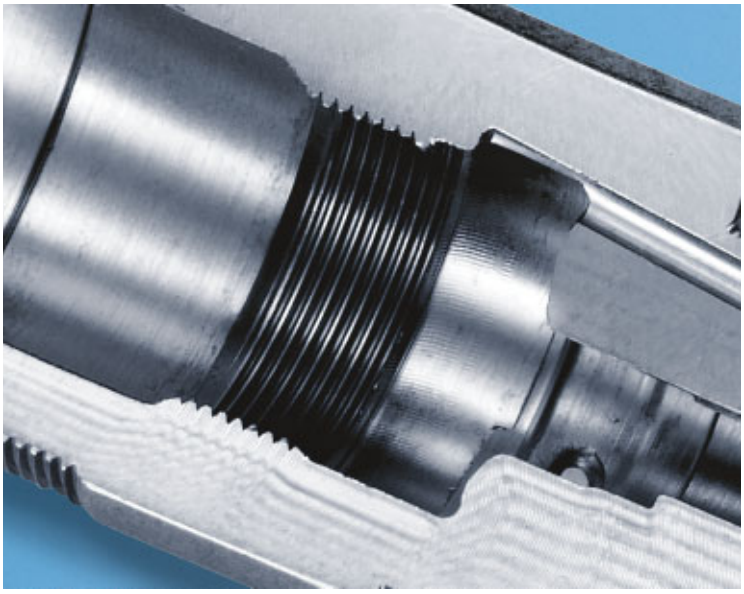
Demanding Operations

During tests, identical workpieces made from high-tensile chrome-molybdenum steel were examined on several different machines, applying the same process parameters and tools in series production. Firstly, these tests evaluated results for the three process capability factors indicated above, while also assessing the performance capabilities of the cutting oil.

Process	Size of production run	Comparison cutting oil	MOTOREX ORTHO
1. High pressure tangential bore Rmax 16 m.	500 units.	Clearly measurable signs of wear. Build-up of cutting oil at front of tool.	Minimum wear. The tool can continue to be used before having to be reground.
2. Rough milling with reversible tool tip miller Ø 50 mm.	600 units.	Several plate failures occurred in response to thermal overload, i.e. overheating. Vc and f need to be reduced.	None of the cutting tips show signs of wear – optimum cooling and lubrication of the cutting blade. Vc can be increased.
3. Drilling of threaded core bore Ø 12.7 mm.	1. Batch of 600 units and 2nd batch of a further 600 units produced using MOTOREX ORTHO.	In the 1st batch, the tool was worn after 600 units.	With MOTOREX ORTHO it was possible to produce a 2nd batch of a further 600 units with the same tool = + 100 % improvement in performance!
4. Deep bore drilling Ø 2.0 mm.	500 units.	Major differences in terms of surface quality. Rz max. value of 3.38 and 4.55 microns.	Smaller depths of surface roughness = better surface qualities of Rz max. 0.98 and 2.99 microns.



The shape of swarf and the condition of the tool blade provide clear information about the extent of loading on materials and also indicate any areas potentially affected by excessive mechanical wear or high temperatures.



If you compare the surface quality which is easy to measure (Rz value = corrugation and roughness) of the test workpieces, direct conclusions can then be made about the properties of the cutting oils employed.

As the evaluations shown here illustrate, it has been possible to substantially improve the tool service lives through the use of MOTOREX ORTHO. This also means that a first-class cutting oil is able to deliver an important contribution towards process reliability and capability. For example, if a tool tip breaks in a 'ghost layer', this immediately has a negative impact on the CpK value.

MOTOREX ORTHO carries conviction through its

- reduced sharpening and setting costs
- more in-depth levels of tool usage
- higher availability of equipment → improved levels of utilisation
- fewer scrap parts → high CpK value
- increased capacity through less frequent tool changes
- improved productivity through higher cutting speeds
- improvement in surface quality.

In summary, it is possible to state that the favourable properties of MOTOREX ORTHO had a direct and positive effect on all parameters measured. In particular, the substantial increase in tool service lives, the improved surface quality and enhanced productivity all helped to convince the specialists involved. These complex parameters are reflected in the CpK value.

We will be pleased to provide you with information about the new generation of ORTHO cutting oils and their influence on process capability.

MOTOREX AG LANGENTHAL
Customer Service
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CH-4901 Langenthal
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Fax +41 (0)62 919 76 96
www.motorex.com

MOTOREX ORTHO NF-X is capable of delivering convincing high-pressure stability. The workpiece receives optimum cooling, swarf is extracted rapidly and with minimum dissipation of oil volumes.

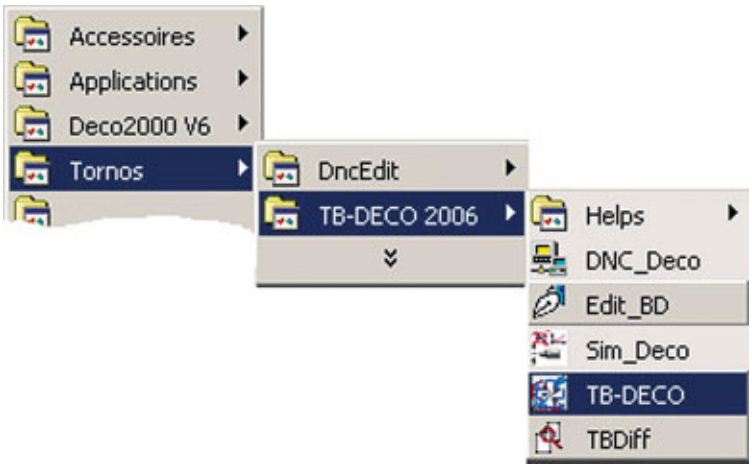
Automatic, ultra-precise measurement of bar-turning components based on a specified CpK value. The components are measured in a random sample manner and compared to a nominal dimension drawing, precise to the nearest micron!

USE OF V6 SIMULATION WITH TB-DECO 2006

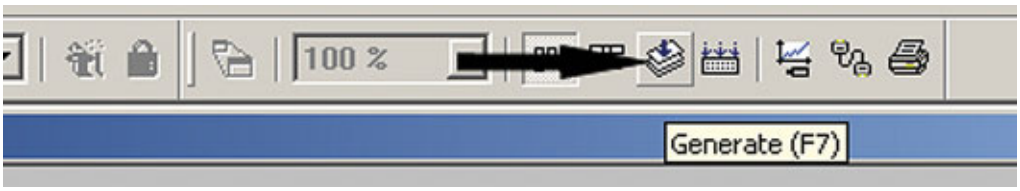
A good tip for users with the TB-DECO V5 or V6 who seek to use their old 2D simulation facilities with their new TB-DECO 2006 or 2007.

1. TB-DECO 2006

Open up the TB-DECO 2006, if you have not already done so, and also open up a workpiece program. Alternatively, create a new one (NEW WORKPIECE.part).



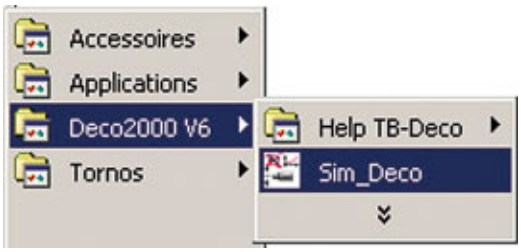
Then generate a workpiece, either with the mouse or the F7 key.



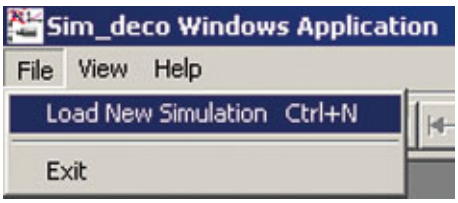
If there is no fault, you can move on to the next stage.

2. Sim_Deco V6

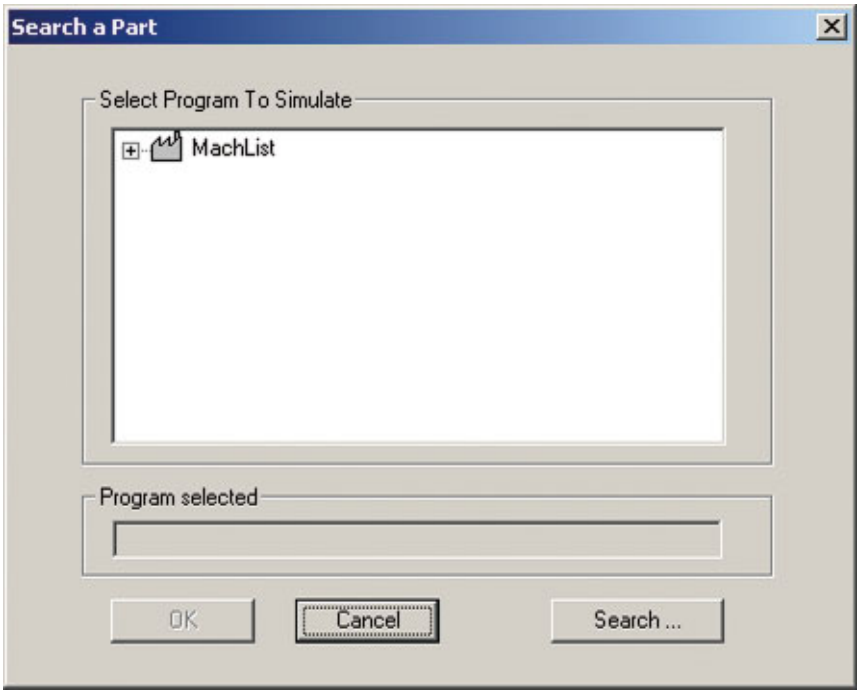
Open up the simulation function on the TB-DECO V6.



Then click "File > Load new simulation".



Proceed to "Search".

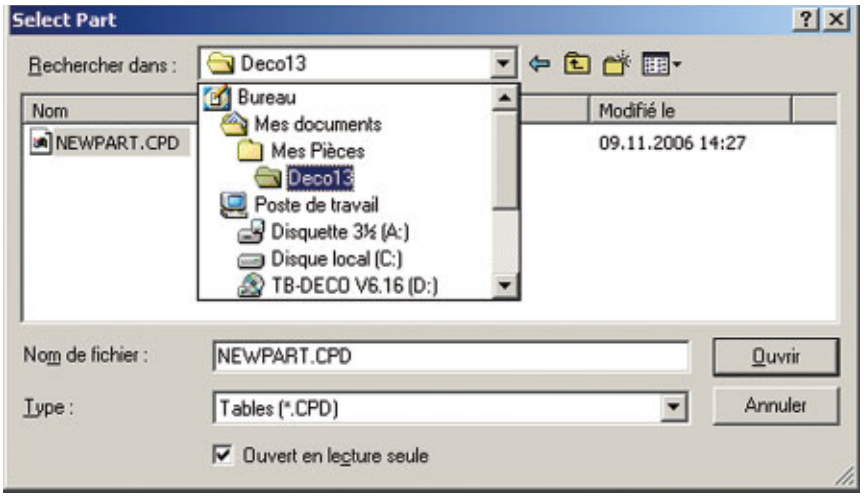


Search for the following folders:

My documents

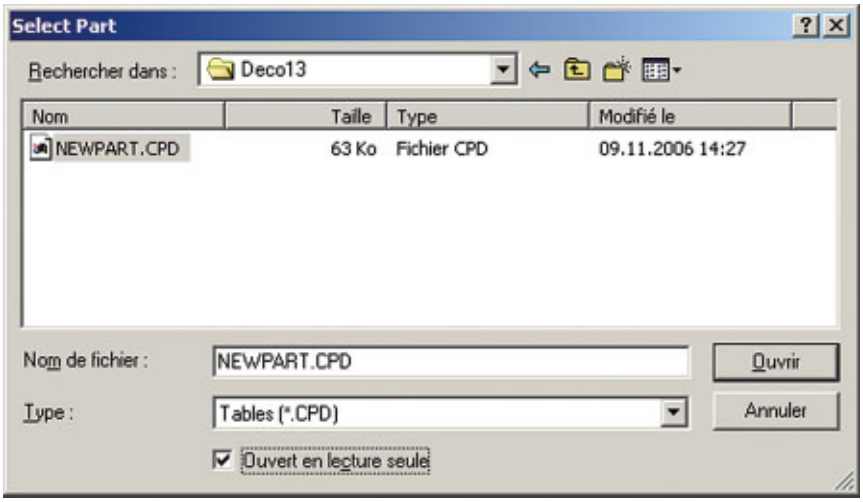
My workpieces

DECO 13 (e.g.)

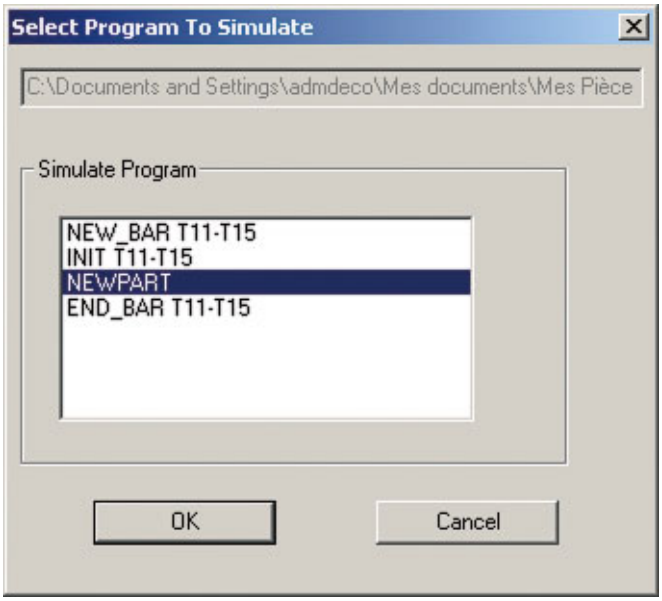


This last folder is the one in which you previously saved your workpiece program.

Here, you can open your workpiece, file ***__.CPD*** (in this example: "NEWPART.CPD).



The last stage involves selecting the program you wish to simulate.

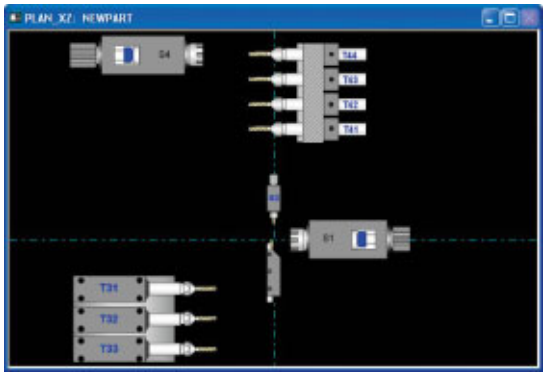


The simulation is now calculated and loaded.
The turning machine is now played!

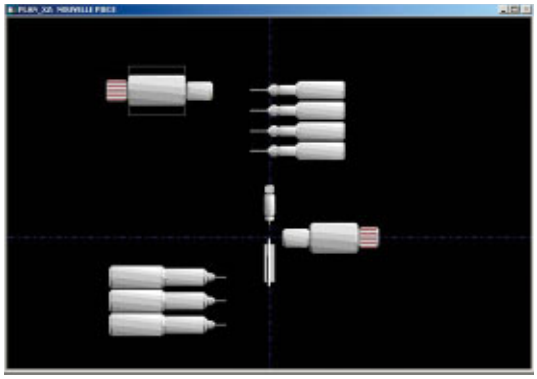
Would you like another tip?

If you order the TB-DECO ADV option, you will be able to enjoy a wide range of improvements, including a new simulation of the DECO units. All these new features will enable you to derive even higher standards of performance when programming your DECO and MULTIDECO units.

TB-DECO ADV 2006



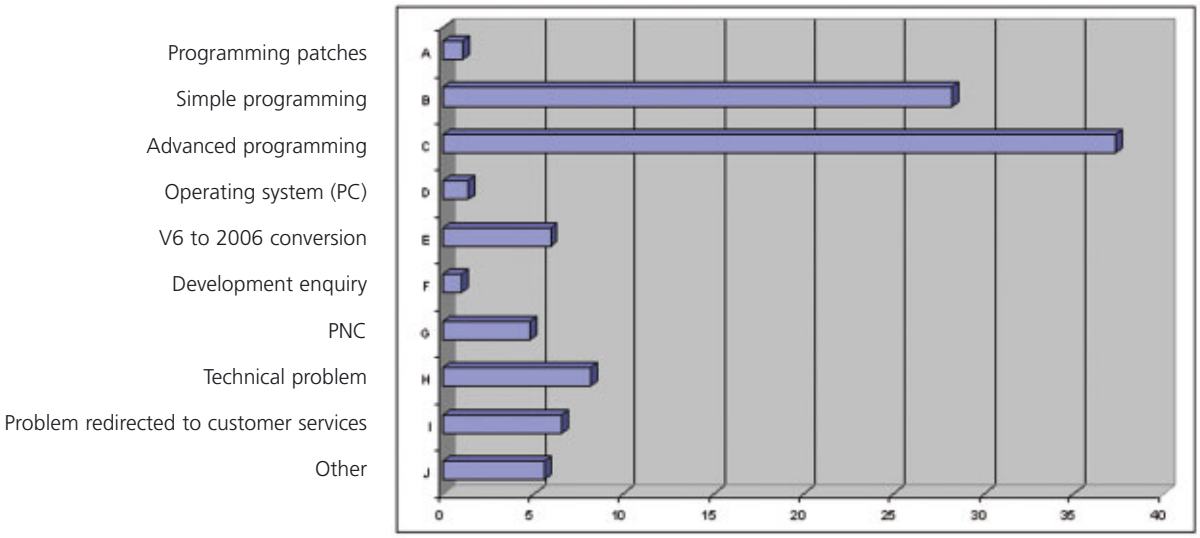
TB-DECO V6



HOTLINE SOFTWARE IS ALREADY IN ITS THIRD YEAR!

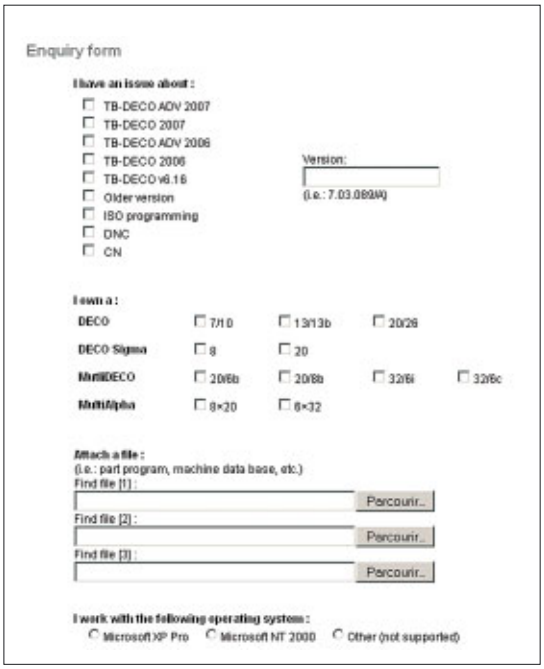
Set up in early 2004, the Tornos Hotline Software service has already dealt with over 2000 issues from customers in Europe, USA, South America, Asia and elsewhere.

Distribution of calls (%)



To improve customer service still further, Tornos services are now available on the internet: www.tornos.com – Technology.

As announced in a previous article (cf. DM 38: Easier access to information), a section dedicated to customer. support with Tornos software is now available. Read on!

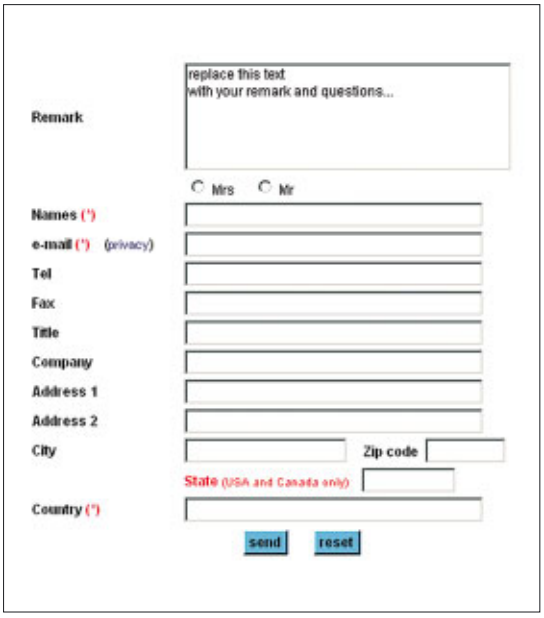


Enquiry form

A form has been added to the website to simplify the process of submitting enquiries to Hotline Software. This is a useful way of providing Tornos with all the information it needs to deliver an effective service.

The first section enables customers to describe the technical aspects of their enquiry precisely, such as the software in question or the type of machine being used. And on this form, the customer can easily attach up to 3 files (machine database, workpiece program, photo…).

You can add remarks in the second part of the form. This is followed by fields for personal details to enable Tornos to contact the right person quickly.



A picture speaks a thousand words

Can you get a clear and precise explanation within a few minutes, no matter how complex the issue? You can today!

With our latest tool, you're now just a few «clicks» away from finding what you're looking at Tornos. On the website (www.tornos.com), a new program enables you to open a window at a Tornos specialist's workstation.

You're in total command!

It's up to you whether you:

a) Let Tornos see your screen or take control of your PC and carry out the work before your very eyes.

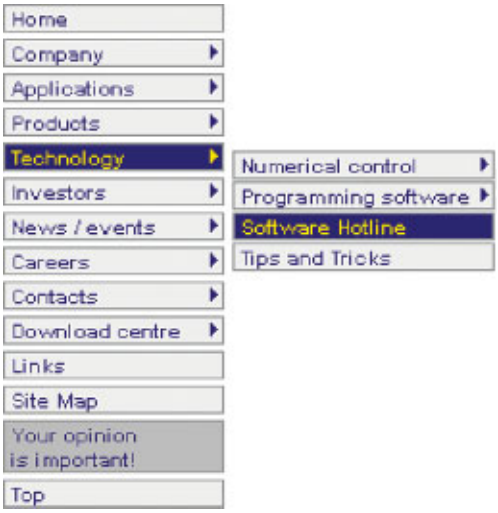
b) Simply watch the Tornos specialist's screen and learn from the demonstration.

You're just a few clicks away from opening a window at Tornos

You have phone contact with your Tornos specialist and you have an internet connection.

1. www.tornos.com

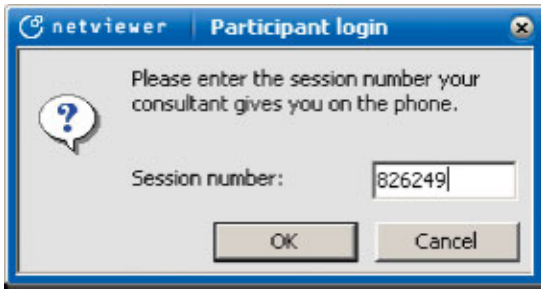
2.



3.

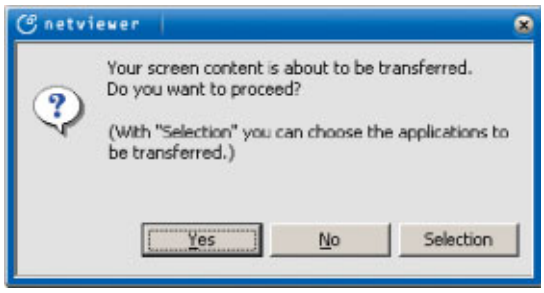
You will find a link to download the program at bottom of web page.

4.



You will receive a session number from Tornos.

5.



6.

This Hotline support is there for you to share and solve problems, and derive other benefits.

Display your screen / see the Tornos specialist's screen.

Allow remote control of your PC.

Just one «click» closes your session with the Tornos specialist.

OR

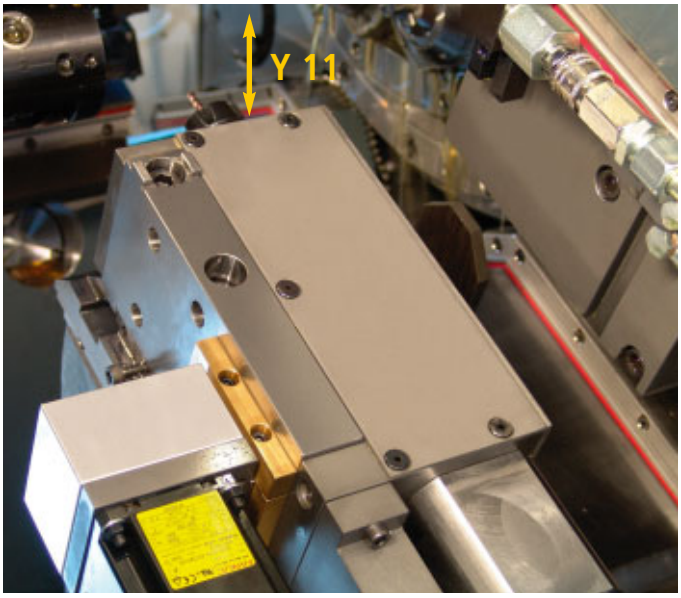
Your window at Tornos is closed!

COMPLEX COMPONENTS IN A SINGLE FIXTURE SETTING – NOW INCLUDING Y AXES AND A NEW TRANSVERSE DRILLING RIG

The ongoing product implementation strategy for multi-spindle units is progressing in giant steps. Following a great reception, customers accorded the new MultiAlpha 8x20 and 6x32 machines with their powered spindles and complex reverse face machining capability ; Tornos is continuing to pursue its strategy of machining complex components right through to completion in a single fixture setting. To achieve this, four additional units are being fitted to the new machines with immediate effect.

Y axis on the slide-rest

The Y axis on the slide-rest is an ideal addition when manufacturing complex components. It makes operations that used to be very challenging, e.g. offset transverse bores, the milling of surfaces with transit functions, the milling of slots and the deburring of transverse bores, a much easier proposition. An extensive and diverse range of macros are provided to make functions like these easy to program, and to enable the associated benefits to be enjoyed straightaway.



Y axis on the intersecting carriage of MultiAlpha 8x20, increased machine potential guaranteed!

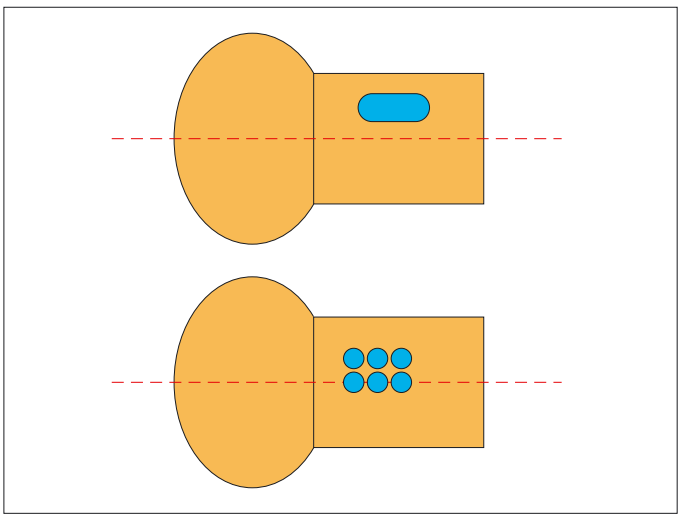
Technical specifications

Stroke Y: 12 mm.

Torque on drilling/milling unit:
Torque on drilling/milling unit 1.5 Nm.
Maximum speed: 8000 rpm.

With optional gearbox:
Torque on drilling/milling unit 0.75 Nm.
Maximum speed: 16000 rpm.

Gearboxes are of course still available, with which it is possible to reach twice this speed.



Compatibility

MultiAlpha 8x20 and 6x32.

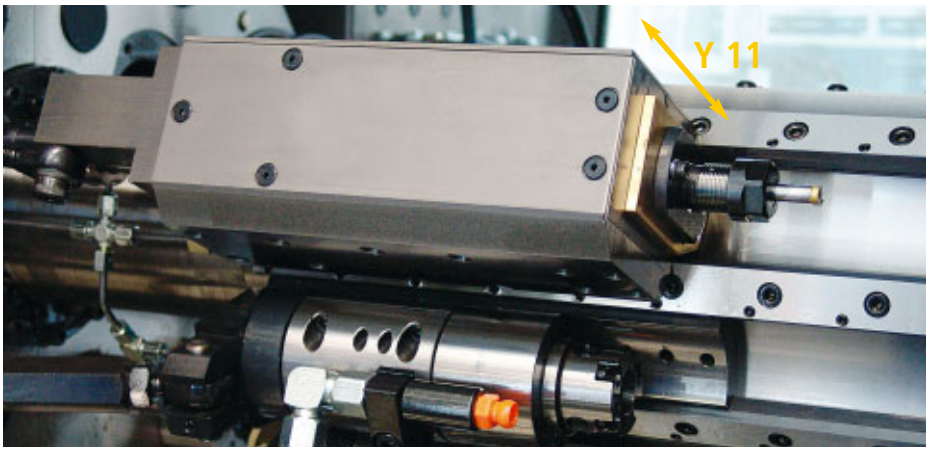
Availability

Delivery lead time 3 months.

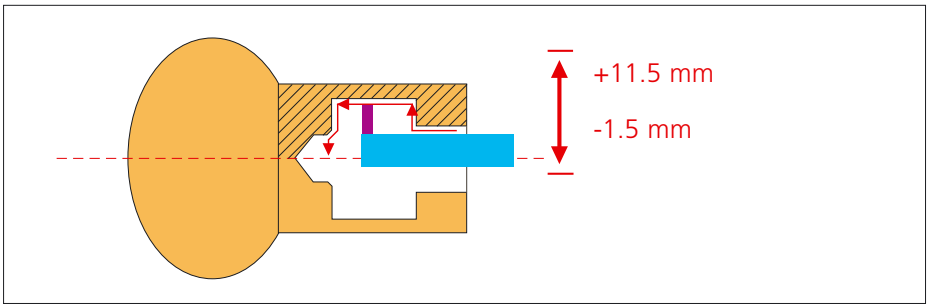
Y axis, frontal

The Y axis as a frontal unit exists in two versions – one as a driven unit and the other one not driven.

The non-driven unit is used primarily for internal machining. This makes it possible to perform processing steps directly from the front, which were previously carried out using the slide-rest. This leaves the slide-rest free to perform other machining operations simultaneously. Here too, macros can be employed for operations such as internal thread whirling to simplify the task of commissioning the unit.



Y axis for front operation, to do more!



The second variant takes the form of a frontal Y axis with drive unit. Complex components frequently require several drilling operations from the front, with relatively narrow diameters. This equipment is ideally suited to this purpose. Thanks to the powered spindles, bar stock can be positioned virtually anywhere. Not to forget internal deburring with ball milling.

The technical data

Stroke Y: 13 mm.

Driven unit:
Torque on drilling/milling unit 1.5 Nm.
Maximum speed: 8000 rpm.

With optional gearbox:
Torque on drilling/milling unit 0.75 Nm.
Maximum speed: 16000 rpm.

Compatibility

MultiAlpha 8x20 and 6x32.

Availability

Delivery lead time 3 months.

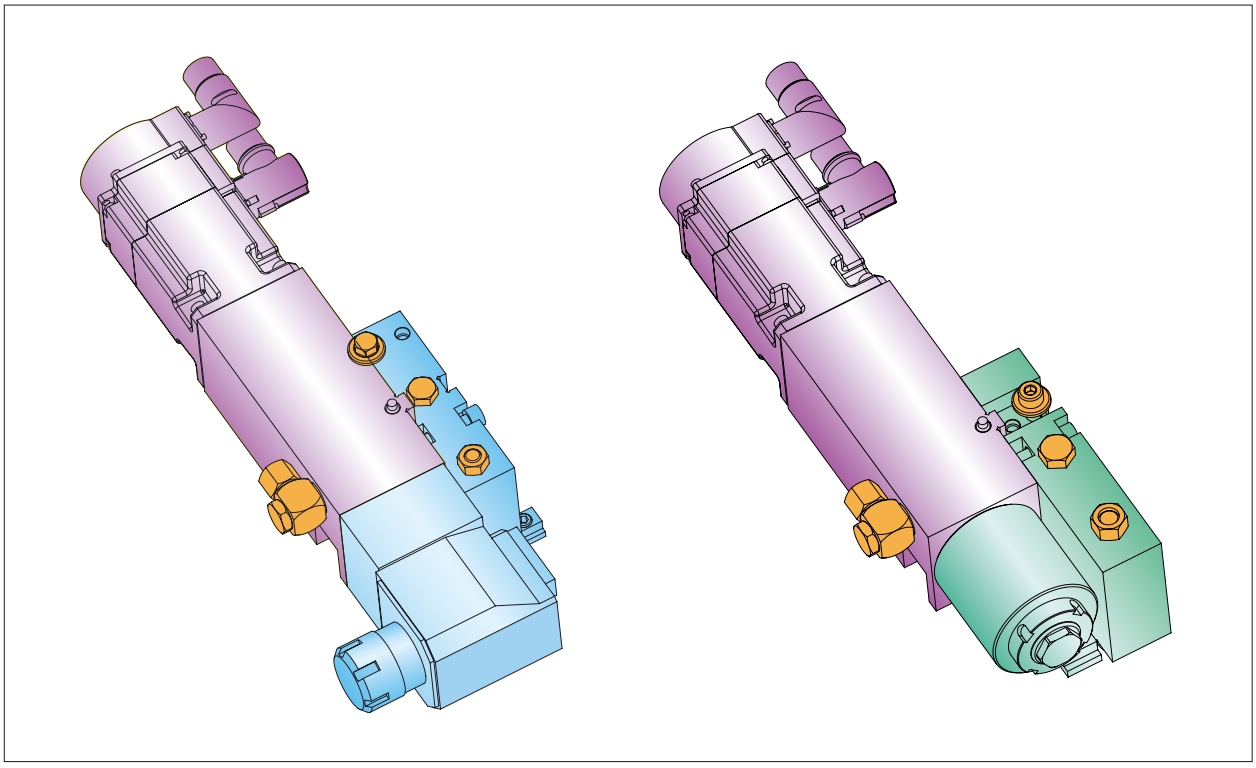
Transverse drill

The new transverse drilling unit is proving to be the icing on the cake. It is smaller and more powerful and can be fitted in any position without problem thanks to its intelligent symmetrical design. This equipment can also be retrofitted to existing MULTIDECO units.

The modularity of this unit is further enhanced by equipping it with a diverse range of heads, either in the form of a direct drilling unit or with a 90 degree head for performing lateral drilling/milling operations.

Customer-oriented products

With these standard items of equipment, Tornos is consistently pursuing its multi-spindle product strategy, enabling complex components to be machined through to completion in a single fixture setting. «The intensive and close co-operation with our customers and the exhaustive analysis we have undertaken into customer requirements have taught us that our customers are looking to have ever fewer intermediate steps since these do not contribute to value-adding. We are now busy implementing the lessons we have learned step by step and in a very focused manner. Tornos does not only wish to understand its customers, instead it seeks to develop products in an ongoing manner to deliver those customers better performance and the ability to compete on their markets even more effectively. That makes this into a real win-win situation," states Matijas, Meyer Product Manager Multispindle at Tornos, with conviction.



The new drill and its modular drill heads. Additional interchangeability.

Technical data

Standard:
Torque: 2 Nm.
Maximum speed: 8000 rpm.

With optional gearbox:
Torque: 10 Nm.
Maximum speed: 1250 rpm.

Compatibility

MultiAlpha 8x20 and 6x32.

MULTIDECO 20/6b, 20/8b, 32/6i (retrofittable).

Availability

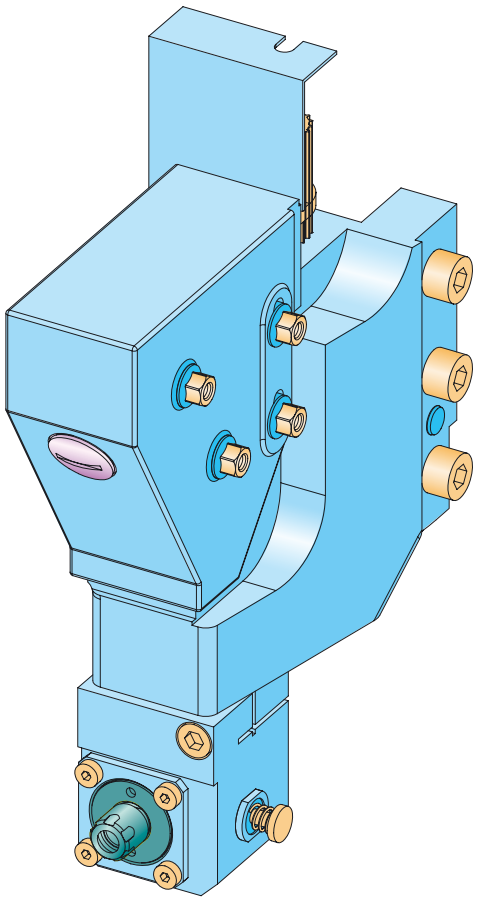
Ex stock.

GOING FROM STRENGTH TO STRENGTH!

The DECO Sigma 8 automatic lathe offers extremely versatile options for meeting customer requirements. In this edition of DECO Magazine we are introducing two new options recently unveiled by Tornos.

Motorised unit for tools with rotary tips

Option 232-2250



Application

This explanatory leaflet enables you to install a front-mounted and a rear-mounted rotary tool for simultaneous primary operations and counter operations respectively.

Possible operations:

- Drilling, face milling on or off axis.
- Tangential milling on the diameter.
- Other functions including polygon cutting, thread whirling and thread milling are being researched.

Advantages

- Enables the workpiece to be machined on its front and rear faces.
- Compact dimensions – still retaining every tool position.
- Powered by the same S11 motor used to drive transverse spindles.
- Rotational speeds can be set digitally.

Technical specifications

Max. rotational speed: 10, 000 rpm.

Collet type: ER 8 (maximum 5mm at diameter of tail of the tool).

Mounted:

Right at the back of the tool system X1/Y1.

Can replace 'L-shaped' tool support for 2 x 4 fixed tools (front and back).

Whenever this equipment is being employed, an 'L-shaped' bracket can be fitted to hold 6 fixed-position axial tools, 3 at the front and 3 at the back.

Compatibility

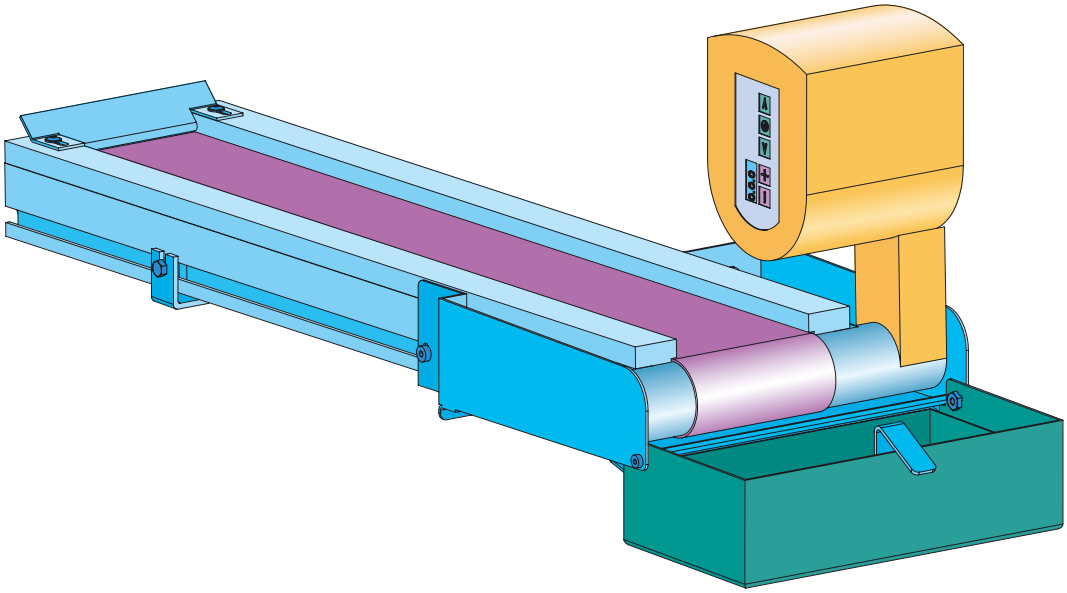
DECO 8sp, DECO Sigma 8.

Availability

Available with immediate effect.

Workpiece conveyer belt

Option 232-6320



Application

This option enables workpieces to be conveyed from the workpiece separating unit, which is located outside the machine. The machined workpieces are collected in a perforated tray.

When another sorting system is used, e.g. a turntable or a bucket distributor, a workpiece slide can be mounted in place of the tray.

Key benefits

- Workpieces are removed carefully.
- Conveyor belt speed can be adjusted to suit work cycle.
- Machine can be adapted to work with customer's choice of external workpiece retrieval and sorting systems.

Technical specifications

Adjustable belt feed rate: 1.2 - 21 m/min.

Speed setting: manual.

Compatibility

DECO 8sp, DECO Sigma 8.

Availability

Available with immediate effect.

TURNED PARTS SPECIALIST OPTS FOR TORNOS

DECO 13, first DECO machine installed at Turnomatic.

Like many UK sub-contract manufacturers of precision turned parts, Edmonton-based Turnomatic is steadily diversifying away from volume production. Formed 50 years ago to supply batch quantities of up to 1 million to the electrical plug and socket industry using coil-fed rotary transfer machines, the past five years have seen the company gradually move towards far lower batch sizes of more complex components produced using CNC sliding head technology from Tornos.

The CNC aspect of Turnomatic's business has grown from zero to 45% in recent years; a fact that works manager Ray Reeve says would not be possible without the introduction of CNC sliding head lathes.

"We looked at all of the leading Swiss and Japanese models but in the end it was the ease of set-up and accessibility that convinced us to purchase Tornos," he explains. "Add that to their reputation and brand name and we knew we couldn't go far wrong."

Mr Reeve says that having a large working envelope is crucial in order to achieve rapid changeover and set-up.

"On certain sliding head machines it is not always easy for an operator to get his hands in and set-up for the next job easily. When handling batch sizes of around 100, quick changeover is vital to profitability. Tornos was by far the best option for us in this respect."

In 2001 Turnomatic acquired its first Tornos CNC single spindle automatic sliding headstock lathe – a DECO 13a, 10-axis reconditioned model. Such was the impression made by this machine that the company subsequently embarked on a period of intense investment, purchasing a further four Tornos machines in the following two years: two DECO 13bi models and two DECO 20/26 variants.

"Components that were produced on the rotary transfer machines we can now do in one-hit on the Tornos machines," says Mr Reeve. "This has cut our set-up times dramatically, as well as our work-in-progress – we can just turn and ship the parts."

The DECO machines work daily producing a wide variety of parts from brass, steel, phosphor bronze

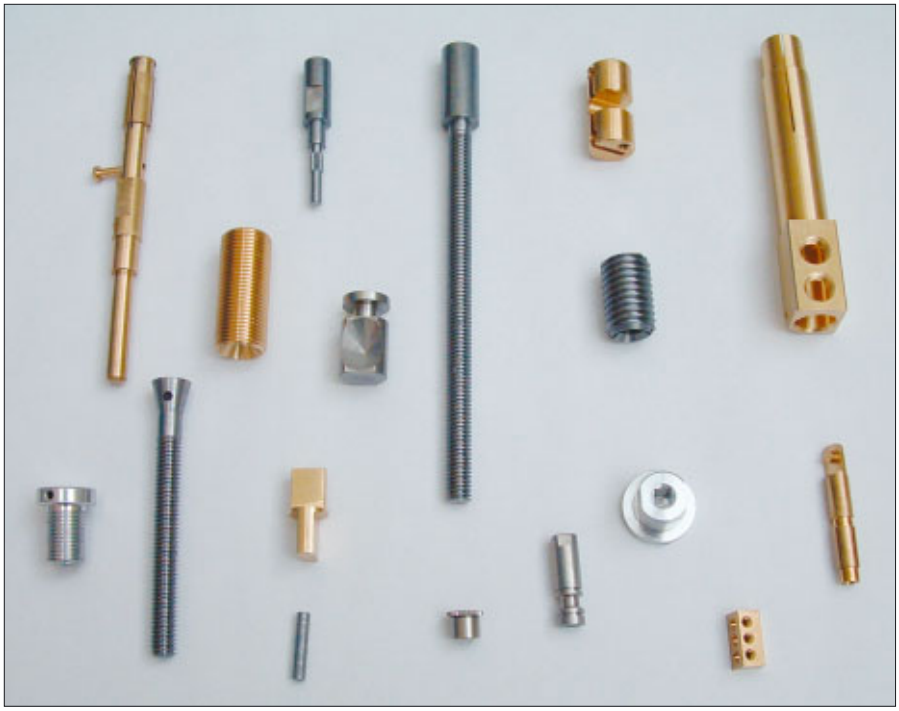
and aluminium for industries such as the electrical, electronic, display and modelmaking sectors. Overnight the machines are often set and left to run 'lights out', something Mr Reeve says he can do with confidence, safe in the knowledge the machines will hold tolerances of 0.02mm consistently. He adds that costing a job when it's run unmanned has a huge effect on competitiveness.

Tornos also gets praise from Mr Reeve for its level of applications support.

"Even though programming is exceptionally straightforward on the DECO machines, when we have had highly complex parts and asked for applications advice, Tornos engineers have always been more than prepared to help," he states. "I have often congratulated them on that side of their business."

Mr Reeve concludes by emphasising the importance of investment in the latest technology.

"Investment is critical to remain competitive," he says. "I can honestly say that our five Tornos machines have helped attract around 50 % of the new orders we have secured in recent years."



Examples of workpieces machined on DECO at Turnomatic, high added value!

TURNOMATIC
LIMITED
Manufacturers of
TURNED PARTS & SUB-ASSEMBLIES

Contact:

John McBride
Tornos Technologies UK
Tornos House
Garden Road
Whitwick Business Park
Coalville
Leicestershire
Tel: 01530 513100
E-mail: sales@tornos.co.uk
Site web: www.tornos.ch

TORNOS – SOMETHING TO WRITE HOME ABOUT

Norfolk-based Mussett Engineering is using two DECO 20a automatic sliding head CNC lathes from Tornos to manufacture parts round-the-clock for a leading producer of writing implements.

DECO 20a, a flexible solution for scribing tools. Who knows how many contracts have been signed around the world thanks to parts produced on this turning machine at Musset engineering?

Mussett Engineering, located 10 miles southeast of Norwich, claims to be the largest sub-contract engineering facility in the East of England: boasting a workforce of over 100 and an array of some 50 CNC machine tools at its 33,000 sq ft facility, the ISO9001:2000 accredited company is probably right.

Although in recent years the company has tended to specialise in the manufacture of complex parts in batches of 10-100 for the aerospace, automotive, oil, petrochemical and compressor sectors, some contracts still call for batches of up to 20,000 components. For this reason Mussett Engineering can keep its two 10-axis DECO 20a sliding head autos busy 24 hours a day.

"We originally acquired the machines to tackle a very small diameter part for the telecommunications industry," says managing director and founder, Gordon Mussett. "However, they are so versatile that we have since used the machines to produce parts for a number of different sectors, including medical and armaments. At present they are both running non-stop producing internal and external components for writing implements."

Mr Mussett says that the Tornos machines have helped cut cycle times dramatically in comparison to the company's conventional twin turret, twin head machines.

"I recall one part, a regulator for a pressure gauge valve, which previously took 6 minutes 35 seconds on a twin turret, twin head lathe that was subsequently reduced to 1 minute 45 seconds on a DECO 20a," he confirms. "There are many more examples where cycle times have been at least halved, with many operations reduced to just one."

Yet despite the significant reductions in cycle time and number of operations, Mussett Engineering witnesses no compromise in quality from its Tornos machines.

"The quality of the machines and the quality of the products they produce were primary reasons behind our decision to buy Tornos," explains Mr Mussett. "If we get our bar preparation right, these machines have no problem holding micron tolerances time-after-time."

A three-shift system allows Mussett Engineering to run 24 hours a day for nearly seven days. Using only one operator to oversee both Tornos machines permits the company to price its products extremely competitively in what has become a tough marketplace. Yet such is the economy of the machines that Mr Mussett says he doesn't always need large volumes to bolster the bottom line.

"We've put batches as small as 200 on the Tornos machines," he says. "For long, slender shaft work there isn't much that can beat these machines, even for low volumes."

Such is the success of the current contract for writing implement components that both Tornos machines are fully loaded for the foreseeable future.

"It's true that we haven't got much capacity to sell on these machines at present," says Mr Mussett. "The only way we can fit other jobs in is to get ahead and make a gap in the schedule, but that's not a bad situation to be in is it?" he says light heartedly.

The pattern of growth at Mussett Engineering shows no signs of abating. In fact, it is only the local shortage of skilled labour that is holding the company back. Such is the extent of the problem that Mr Mussett has resorted to advertising as far afield as the Midlands in an attempt to attract skilled people to relocate.

"If we could find 25 skilled people tomorrow, we could find jobs for them," he says. "We will expand only as fast as we can find the right personnel. However, we do not let our customers down. We offer realistic delivery times and stick to them. For this reason we have probably turned down as much work as we have taken on lately. It is easy to say 'yes' when new work presents itself but I don't believe in making promises that will be tough to keep."

With a bulging order book Mussett Engineering has to get maximum output from all of its machine tools and the DECO models are no exception.

"Thankfully the reliability of the Tornos machines has been exceptional," concludes Mr Mussett, "which is a relief because we cannot afford to have a single moment of downtime at present. Both machines are excellent servants to this company."

Mussett engineering

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TRADE FAIRS – A NECESSARY EVIL?

In 2007, the year of the EMO exhibition there will be for the first time, a slight relaxation of the rules because it is now possible to participate at other trade fairs in the CECIMO countries from the end of April onwards. For 2007 there will be few changes and few new exhibitions, in line with common sense. Exhibitions are regarded as a 'must' in the industrial/machine tool sector, but the overbidding for exhibition stands and surface areas results in an unwanted escalation in prices.

EMO Hannover 17-22·9·2007

Tornos presented seven 42" plasma screens during EMO 2005.

How does Tornos see things this progressing in 2007? To find out more, we visited Mr. Kohler, head of marketing and communications, who confided that the machine tool manufacturer had already adopted a strategic process to achieve an improved return with this particular medium.

P-Y Kohler: An exhibition is a very costly investment for us, with its prices per square metre, the cost of transporting machines, very complex infrastructure and not least, because it makes no sense to exceed a certain threshold. Since 2006 we took the decision not to exhibit the same bar feeders on our stands twice, and in the same way we also decided not to exhibit two multi-spindle machines any more. We are convinced that it is still possible to welcome our clients without 'having to go to auction'.

DM: "No bar feeder"... does this mean the machines in question won't be running?

PYK: In fact, very often machines that are exhibited are not running, which simplifies our logistics. To demonstrate the production side, we shall use plasma screens, which allow a better view than from a machining area.

DM: Will you be filming machining operations without the use of oil?

PYK: Absolutely! The only weak aspect of this solution is that our clients may get the impression that we only machine brass (as filmed). It is obvious that brass is used purely for 'video' reasons.

DM: If you exhibit machines that 'do nothing', why not go that step further and just dispense with them?

PYK: Where there are innovations, it is absolutely essential to exhibit the machines, but in other cases, why not!

DM: You mean an exhibition without machines?

PYK: This type of exhibition would be beneficial to our clients, since we would be 'wasting' less money on transport and other activities of no added value, and with the savings we could invest these more intelligently in tools that can better demonstrate our solutions to our clients.

DM: You seem to be agreeing with a lot of this – are you already working on this type of concept?

PYK: We are thinking about it, but I don't know whether we will "take the plunge" in 2007. Personally, I would like to proceed with such an operation, but we will really have to provide our clients with added value!

DM: Coming back to the exhibition, will you exhibit everywhere, as usual?

PYK: Absolutely. We shall be exhibiting our solutions in Europe, with the highlight at the EMO, and also in Asia and the USA.

We will always be there to meet our clients. To say that trade fairs are a necessary evil is putting it too strongly, but if you have to ship a fully equipped MultiAlpha 8x20 lathe weighing more than 10 tonnes to the other end of the world, then yes the trade fair is very restrictive. Whilst we have not come up with anything better, we shall continue!

It goes without saying that DECO Magazine will monitor this subject…

TORNOS TRADE FAIRS 2007

Europe				
France	Lyon	Le Mondial des Métiers	01.02.07	04.02.07
Italy	Padova	Venmec	02.03.07	05.03.07
Switzerland	Moutier	Open House Tornos	14.03.07	16.03.07
Italy	Montichiari	Muap	16.03.07	19.03.07
Spain	Barcelona	Maquitec	20.03.07	24.03.07
Germany	Villingen-Schwenningen	Turning Days	12.04.07	14.04.07
France	Vigneux de Bretagne	Open House BPLMO	21.03.07	23.03.07
Switzerland	Moutier	Medi-Siams	25.04.07	28.04.07
Italy	Bologna	Open House UMA	May-June	
France	Peillonnex	25 years Ham France	June	
England	Leicestershire	Open House Tornos	June	
Switzerland	Lausanne	EPHJ	05.06.07	08.06.07
Germany	Hanovre	EMO	17.09.07	22.09.07
Switzerland	Moutier	Open House Tornos	10.10.07	12.10.07
France	St-Pierre en Faucigny	Open House Tornos	24.10.07	27.10.07
Spain	Granollers	Open House Tornos	07.11.07	10.11.07
Italy	Opera / MI	Open House Tornos	22.11.07	24.11.07
East Europe				
Slovenia	Ljublijana	Open House Teximp, HFO	March	
Slovenia	Celje	Forma Tool	17.04.07	20.04.07
Hungary	Budapest	Mach Tech	08.05.07	11.05.07
Slovenia	Nitra	Engineering Fair	22.05.07	25.05.07
Poland	Poznan	Machtool	11.06.07	14.06.07
Bulgaria	Plovdiv	Intern. Technik Fair	24.09.07	29.09.07
Romania	Bucharest	TIB	02.10.07	06.10.07
Czech Republic	Prag	HFO	May-November	

America				
Brazil	São Paulo	CIOSP	27.01.07	31.01.07
Porto Rico	San Juan Convention Cntr, Porto Rico	Medical Device Expo	01.02.07	02.02.07
United States	Anaheim, CA	MDM West	13.02.07	15.02.07
United States	Houston, TX	Houstex	06.03.07	08.03.07
Brazil	São Paulo	Feimafe	21.03.07	26.03.07
United States	Los Angles, CA	Westec	26.03.07	29.03.07
United States	Columbus , OH	PMTS	24.04.07	26.04.07
United States	Indianaplis, IN	Indiana Mfg Days	May	
United States	Portland, OR	Northwest Machine Tool Show	16.05.07	17.05.07
United States	Springfield, MA	Eastec	22.05.07	24.05.07
United States	New York, NY	MDM East	12.06.07	14.06.07
United States	Rosemont CC, Chicago, IL	OMTEC	20.06.07	21.06.07
United States	Grand Rapids, MI	Great Lakes SME	18.09.07	20.09.07
United States	Charlotte, NC	Southtec	02.10.07	04.10.07
United States	West Alllis , WI	Wisconsin Mfg & Machine tool show	09.10.07	11.10.07
United States	Valley Forge, PA	Mid Atlantic show	16.10.07	18.10.07
United States	Minneapolis, MN	MDM , MN	October	
United States	Jacob Javits, NY	Greater NY Dental Meeting	November	
United States	Santa Clara, CA	Pacific Coast Show	13.11.07	15.11.07

Australia				
Australia	Melbourne	Austech	30.05.07	02.06.07
Asia				
India	Bangalore	IMTEX	18.01.07	24.01.07
Taiwan	Taipei	TIMTOS	12.03.07	17.03.07
Singapore	Singapore	MTA	28.03.07	31.03.07
China	Beijing	CIMT	09.04.07	15.04.07
Malaysia	KL	MTA	16.05.07	20.05.07
Vietnam	Ho Chi Minh City	MTA	04.07.07	07.07.07
Philippines	Manila	PDMAEC	22.08.07	25.08.07
China	Shanghai	Medtec	28.08.07	30.08.07
Indonesia	Jakarta	MT&T	August	
Hong-Kong	Hong-Kong	Open House Tornos	26.10.07	27.10.07
China	Dongguan	DMP	November	
Thailand	Bangkok	ThaiMetalex	15.11.07	18.11.07
Indonesia	Jakarta	Machine Tool Indonesia	05.12.07	08.12.07

This table contains the information based on schedules at the time of going to print. For the latest details, please consult the company Web site, under the heading "News/events, Exhibitions" (www.tornos.com).
If you wish to meet a particular person, please do not hesitate to contact Tornos to find out detailed information about who is involved from the commercial and technical departments.

PRECISION CLEANING IN THE FIELD OF SURGICAL IMPLANTS

Bio-compatibility is a fundamental element in the cleaning of surgical implants. It is important to eliminate cutting fluids and lubricants after mechanical operations. This allows for a simplified final cleaning process and guarantees bio-compatibility. The use of A3 non-chlorinated solvents on site during the manufacturing of implants is a genuine example of modern techniques being used in the bio-medical industry.

Bio-compatibility is a fundamental element in the cleaning of surgical implants.

Surgical implants: huge growth

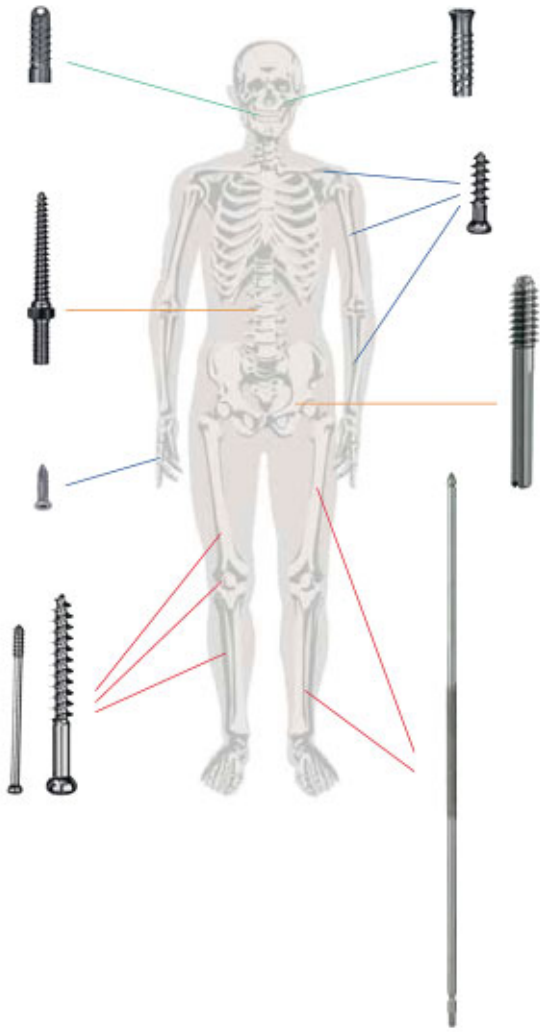
The huge growth in the demand for implants requires an overhaul in precision cleaning capacities.

Implant cleaning

In our example, cleaning is decentralised. It is carried out after every mechanical operation by removing swarf. By doing it this way, mechanical conditions are improved because no residual oil or swarf is left on the workpiece. It also avoids mixing cutting oils, when consecutive mechanical operations require the use of different cutting oils. Such a mix will often cause serious cleaning problems by mixing different pollutants.

Selecting the right type of cleaning has become complicated for several reasons. Different legislative bodies have imposed modifications to the types of cleaning techniques that can be used. At the same time, workpieces must be cleaned to an ever-increasing standard of cleanliness. Degreasing open containers with chlorinated solvents, a straightforward and efficient method but one that also pollutes the environment and is toxic for the operator, has been replaced with sealed machines which use solvents called A3 – non-chlorinated hydrocarbons – in a vacuum.

Another technology uses water based detergents to dissolve polar and non-polar soils.



The problem facing the medical sector is consists of ensuring a finish exempt of pollutants, like mineral based cutting oils or non-polar, like metal particles or salts for example.

Using detergents poses a major problem. The cutting oils quickly pollute the detergents which rapidly become inefficient. Using oil separators and automatically dosing the detergent ingredients improves the situation. The new detergent does however lose some of its degreasing power. And cleaning the blind bores is often difficult during the cleaning process. At any rate, all mineral oil must be completely removed from the implants.

The non-chlorinated A3 solvent technology is able to provide a regular level of solvent quality through continuous distillation, which enables oil pollution to be maintained at a level of a few ppm (parts par million).

Current cleaning technology in the medical sector consists of using A3 solvents (hydrocarbon solvent flashpoint located between 56° and 100°C) for the prewash and detergent-based processes for the final cleaning, therefore ensuring the bio-compatibility of the implants.

The benefit of cleaning in this way is that pollution levels are considerably reduced, because all oil has been dissolved during the A3 solvent prewash.

The bio-compatibility test is carried out periodically on a sample of workpieces which have been put through the validated cleaning process.

Vacuum technology and A3 solvents

Legislation and quality standards in cleaning have resulted in efficient and non-polluting machines replacing machines which used chlorinated solvents – trichloroethylene et perchloroethylene –.

The solvents used are non-chlorinated hydrocarbons. Coming from the petrochemical sector, these solvents are a mix of isoparaffins or modified alcohol. They can be recycled by vacuum distillation and do not deteriorate over time. They leave behind a residue of a few nanometers, which is roughly equivalent to 10 mg/m^2. This qualifies as precision cleaning.

The solvent is inflammable so the machine needs to be operated in a risk-free environment. Using a vacuum in all parts of the machine ensures a completely safe working environment. This procedure has gained international approval.

Due to the volumes involved, the manufacturer has selected two types of Amsonic machines – the ECS 40 and Egaclean 4100

The ECS 40 has two washing baskets with a volume of approximately 15 litres. A tank of continuously distilled solvent ensures that clean solvent is available at all times.

The tank, the operating chamber and the distillery are held in a vacuum (100 mbar). The washing cycle is in stages:

- Immersion in hot solvent with ultrasound.
- Filtration.
- Pressurised solvent injection and rinsing with spraying ramps.
- Vapour phase.
- Drying in a vacuum of 1-3 mbar.

The cycle time is 6 to 12 minutes, depending on requirements and therefore the selected programme.

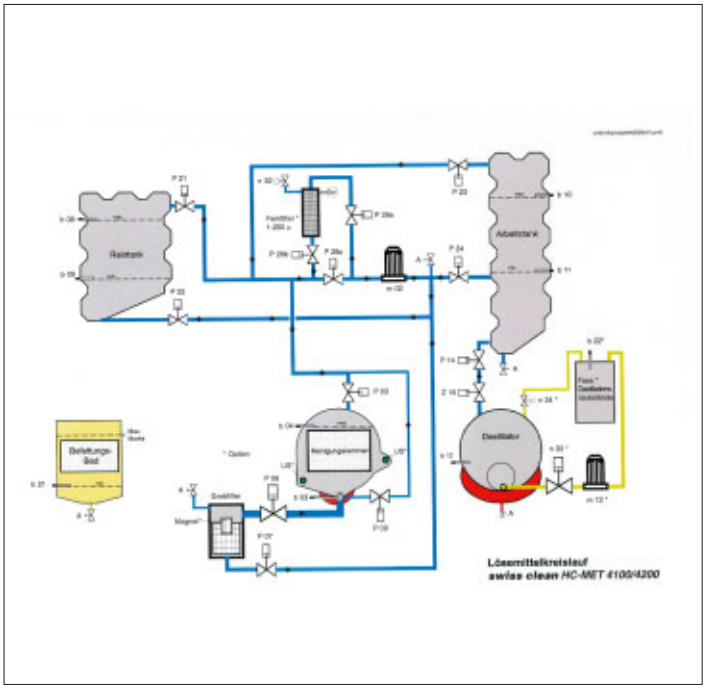
Positioning is computer controlled. The selection of cleaning programmes operating parameters is very user-friendly. Documenting the process and cleaning parameters ensures the cleaning operations and the validated process have been correctly followed and respected.

Egaclean 4100 has increased capacity and can handle baskets with a volume of 33 litres. The machine is equipped with two tanks of solvent, one containing prewash and the other the final wash, using distilled solvent. The work cycle is exactly the same as for the ECS 40 machine

The two machines provide different options: rotation, inclining the baskets from 0 to 45° or inert mode.

The ultrasonic power can be adjusted and the frequency can be selected depending on the materials used.

The cleaning quality tests have shown that the layer of hydrocarbon residue (obviously not a greasy layer) is approximately 10 nanometers, which is the equivalent of about 13 mg C/m^2. An interesting observation was that using another type of A3 solvent, modified alcohol (composed of alkoxy-propanol) enables the levels of carbon residue pollution to be reduced to approx. 3 mg C/m^2. Isoparaffin is preferred not only because the final detergent wash dissolves all carbon residue but also because it is a more effective degreaser and is more cost-effective. Modified alcohol is however superior when quality depends on electrical resistance or carbon residue content.



One of the benefits of the vacuum technique is enhanced penetration of solvent into blind bores. Another case showed that the cutting tools coolant channels (length 200 mm, diameter 1 mm) can be cleaned perfectly with A3 in a vacuum whereas cleaning with detergent does not provide this level of cleanliness.

The very good solubility of mineral oils in A3 solvent is improved further as the temperature is high. In practice, temperatures of approx. 65° to 80°C are selected.

An important factor determining the quality of A3 solvent cleaning is ensuring the distillation parameters are maintained within a narrow range of values. Determining these factors makes up part of Amsonic's know-how.

Operating costs

Investing in a cleaning machine involves more than just the purchase price of the machine. Maintenance costs, consumables (solvent and energy) and after sales service are all factors which must be taken into account before making the purchase.

Return on investment

The choice of cleaning technique was made based on offers from several manufacturers. Key factors that influenced the choice of the Amsonic EGAclean could be listed as the quality of the cleaning, the manufacturer's vast experience of A3 solvent technology, the documentation of the process on computer and Amsonic's references in the medical sector.

The cleaning quality is outstanding and maintenance of the four machines is simplified by the maintenance software. This allows for preventative maintenance and reminds the operator which part, for example the oil filters or the extractor pump, need to be replaced.

Maintenance requires a minimal amount of time. It is estimated to be an average of five minutes per day.

Solvent quality levels remain high through continuous distillation. Respecting the distillation parameters avoids having to periodically change the solvent. Only distillation losses (approximately 5% of the volume of oil used in the machine), need to be replaced, which reduces consumption. Solvent never needs to be replaced, because it can not become acidic – unlike chlorinated solvents where this is a common occurrence.

Operating costs for the EGAclean 4100 machine (less fixed costs).

Base: 8h/day 220 days/year	Unit costs	Consumption	Total cost		
Solvent	2 €/l	200 l	600 CHF	400 €	461 USD
Energy	10 kWh	0.12	2112 CHF	1408 €	1625 USD
Maintenance hours	33 €/h	5 min/day	913 CHF	608 €	702 USD
Maintenance parts	1600 €		2400 CHF	1600 €	1846 USD
Waste disposal	53 €/container	4 containers	320 CHF	213 €	246 USD
Total			**6345 CHF**	**4229 €**	**4880 USD**

Emissions

New legislation, particularly Germany's «31. BImSchV» aims to limit VOC (volatile organic compounds), in order to reduce greenhouse gases. Amsonic A3 machines are particularly environmentally friendly. Measurements carried out by an independent laboratory have provided the following results.

VOC emissions

	Emissions in mg C/m³
Amsonic	21
Average reading of competitor machines	889

Cleaning with A3 solvents uses isoparaffin, which is compatible with virtually all cutting oils. Solvent at high temperatures in a vacuum means that EGAclean technology provides perfect cleaning of the complex structures of implants.

The automation of the process, very low operating costs and safety of production all provide return on investment.

SERVICE INCLUDED…

For a machine-tool manufacturer, service is a determining factor in how the business is viewed by its customers.

The very finest products may require service support … and if that service is not delivered to a high standard, then the fact of being the best in terms of quality ceases to mean anything at all. To understand in greater detail what is involved in quality assurance, and above all to actually see what is done on the ground to achieve it, DECO Magazine went to meet Mr. Sipos, the man in charge of Customer Services at Tornos. On a regular basis, DECO Magazine will now be keeping you informed on this subject!

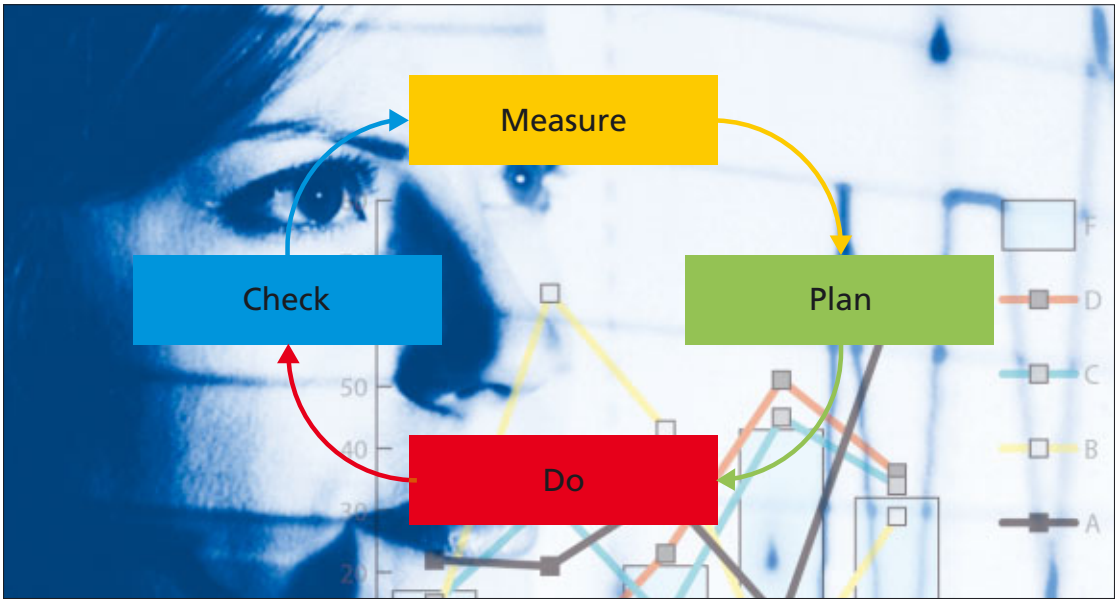
Sandor Sipos, head of department and member of the Tornos management committee.

DM (DECO Magazine): Mr. Sipos, how do you judge the quality of your service delivery?

Ssi (Sandor Sipos): In order to judge something, you absolutely have to be able to measure your performance. To do this, we work with the concept known as QLP (Quality Leadership Process) which essentially involves adopting a systematic approach which requires us to measure, plan, execute and inspect every one of our activities. Without a systematic approach of this kind, it is impossible to evaluate performance and/or changes to those performance levels.

DM: Is all this work carried out solely within your own department?

Ssi: Absolutely not, we conduct measurements outside as well as inside this department. For example, in 2004, we started a phase of global internal



The QLP process, a never-ending process which aims for continuous improvement!

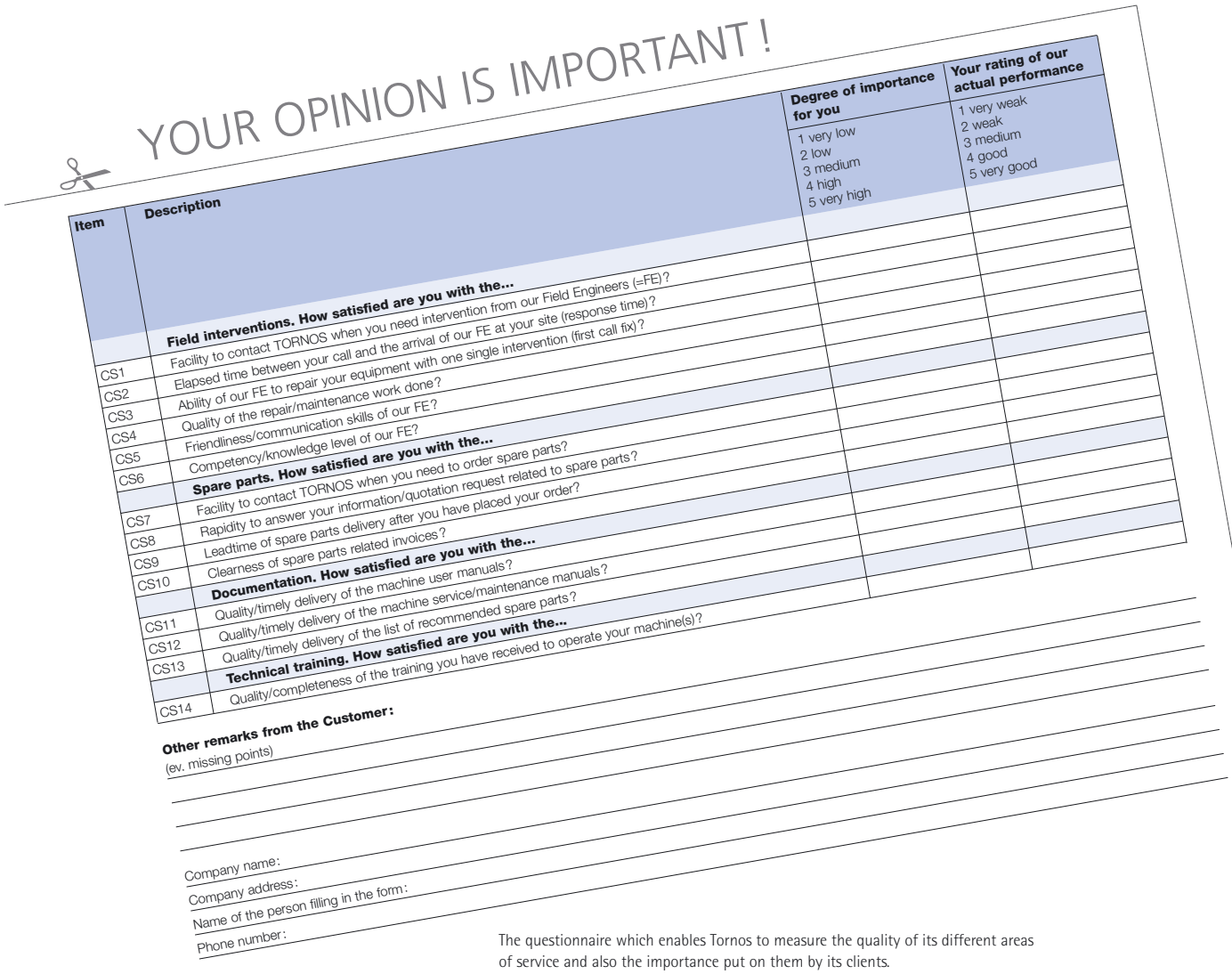
inspection with the help of a working group made up of our staff and other specialists. We discovered plenty of potential for improvement, then planned and implemented appropriate courses of action. Specifically, on completion of this phase, we increased our staffing level within the After-Sales Service and within the Swiss Hotline service. We also improved the training available to our specialists, in order to make them all more multi-skilled.

With regard to spare parts, we have rethought our approach to inventory with a view to making it independent and to have it managed outside the scope of any other constraints. This insight has also enabled us to create two new posts for trainers at our Moutier site. With regard to the subsidiaries, here too we have increased our staffing levels.

DM: You took this action and…

Ssi: Of course, we then immediately embarked upon an inspection phase to see if we had taken the right action. After about two years of successive improvements, we decided to implement what I call the «ultimate benchmark», a true reality check! In late 2005, we decided to conduct a survey of our customers in early 2006.

Finally, I have the results before me. We may be able to deliver a service within two days, but is that fast enough? How well are we doing when compared to the competition? Even more important, are we meeting our customers' expectations? This survey was completed recently and the answers we received have enabled us to instigate further measures.



YOUR OPINION IS IMPORTANT !

Item	Description	Degree of importance for you 1 very low 2 low 3 medium 4 high 5 very high	Your rating of our actual performance 1 very weak 2 weak 3 medium 4 good 5 very good
	Field interventions. How satisfied are you with the…		
CS1	Facility to contact TORNOS when you need intervention from our Field Engineers (=FE)?		
CS2	Elapsed time between your call and the arrival of our FE at your site (response time)?		
CS3	Ability of our FE to repair your equipment with one single intervention (first call fix)?		
CS4	Quality of the repair/maintenance work done?		
CS5	Friendliness/communication skills of our FE?		
CS6	Competency/knowledge level of our FE?		
	Spare parts. How satisfied are you with the…		
CS7	Facility to contact TORNOS when you need to order spare parts?		
CS8	Rapidity to answer your information/quotation request related to spare parts?		
CS9	Leadtime of spare parts delivery after you have placed your order?		
CS10	Clearness of spare parts related invoices?		
	Documentation. How satisfied are you with the…		
CS11	Quality/timely delivery of the machine user manuals?		
CS12	Quality/timely delivery of the machine service/maintenance manuals?		
CS13	Quality/timely delivery of the list of recommended spare parts?		
	Technical training. How satisfied are you with the…		
CS14	Quality/completeness of the training you have received to operate your machine(s)?		

Other remarks from the Customer:
(ev. missing points)

Company name:
Company address:
Name of the person filling in the form:
Phone number:

The questionnaire which enables Tornos to measure the quality of its different areas of service and also the importance put on them by its clients.

DM: How did you go about this, and how did you select your indicators?

Ssi: To answer the second part of your question first, there is nothing revolutionary per se about the service performance indicators we selected. These indicators are used by many companies. For example, delivery lead times for spare parts, speed of on-site deliveries to customer sites, the time required for acceptance testing of a machine on a customer site, etc.

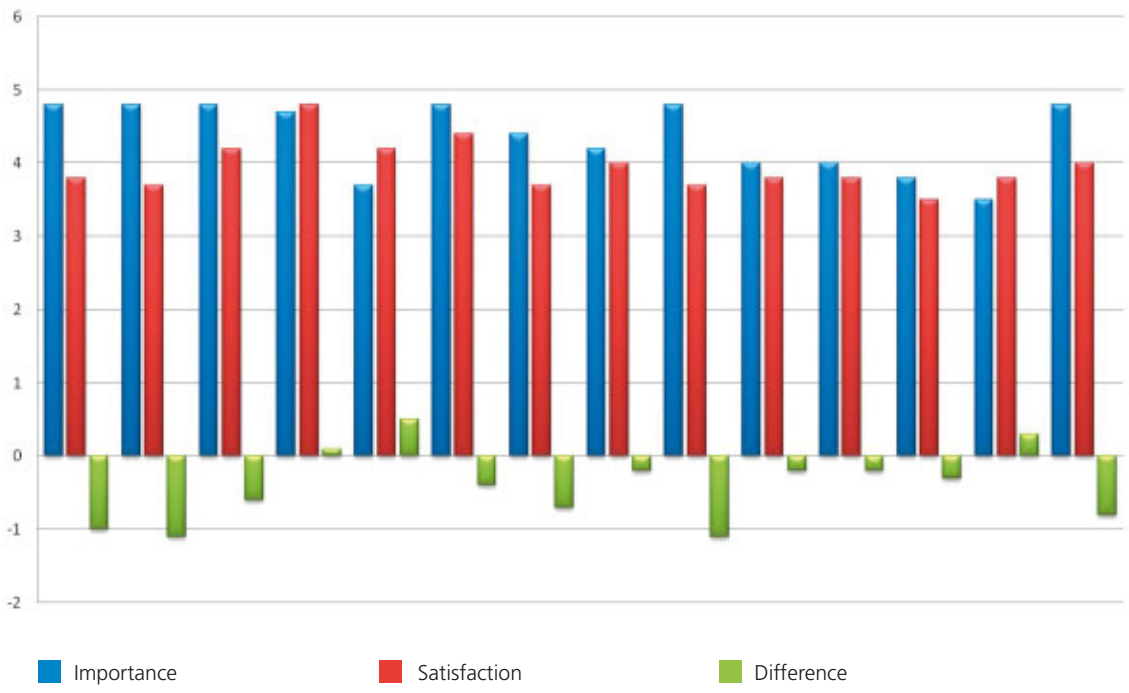
Each question we asked was based on two criteria; firstly, the importance of the question for the customer, then secondly the level of satisfaction experienced. This enabled us to confirm that the points considered most important by our customers are also those on which we place the greatest emphasis. That's some good news to start with.

DM: So everything was OK then?

Ssi: Our selection criteria were certainly the right ones, but the answers we received demonstrated that there is still plenty of scope for us to improve what we do. As with our in-house studies, we immediately introduced our QLP system to avoid losing time over any of the information received.

DM: Allow me to pick up on the QLP and ask what you then went on to plan, and what action you took as a consequence?

Ssi: Delighted to oblige. Even though the service we provide is not just a function of our manpower, we have gone on to recruit some new members of staff. Two in Switzerland, two in Germany and three in France. With regard to technical specialists, we have also reinforced our Hotline in Germany with two new people, and one new addition in Switzerland.



Graph showing importance and satisfaction. A valuable tool which concentrates effort where its most needed.

Our logistics flows have also been improved. The new solution for spare parts in Germany enables customers to submit orders by 16:30 CET, and to receive their parts the next day (obviously providing that they are in stock).

DM: And before this?

Ssi: Before this restructuring, the latest order submission time for next-day delivery was 14:00. We have therefore gained two and a half hours for our customers.

DM: That does not seem like much…

Ssi: Yes and no! In cases where a machine is down, this enables customers to gain an entire working day. Those 2 hrs 30 mins cost us approx. SFR 100 000 per annum!

DM: What do you bill to your customers?

Ssi: We don't!. We decided to bear the costs of this improved service entirely within the company.

DM: You quoted manpower earlier. How do you manage what these new people do with their time?

Ssi: That's where the real difficulties lie. By definition, breakdowns cannot be anticipated in advance. If only we could go out to all our customers before breakdowns occur ... but this simply isn't feasible! For example, one of our Italian technicians might fall ill. We need to replace him! It is certainly true that our team is international and multi-skilled, and we can «plug holes», but this is always to the detriment of our other activities.

It is not realistic to have a pool of technical staff on payroll with nothing to do with their time.

DM: You therefore «juggle» with your technical staff to deal with shortfalls, but are there any other areas to which you need to pay special attention?

Ssi: First of all, I would say that the «juggling» act you mention is still the exception rather than the rule. We have a good-sized pool of technical staff, so can address most issues we are called upon to face. The fact that we now measure everything means that we are now better able to plan our activities.

There are of course other means at our disposal when it comes to offering more to our customers. For example, since you mentioned delivery lead times, we are now able to measure the time taken from receipt of an order to delivery of the goods. However, what can you do if one our customers takes two whole days to identify the actual spare part required? This is a two-day period during which dissatisfaction can arise, and of which we have not even been informed!

DM: You presumably work hard to resolve issues like this?

Ssi: We currently have several projects on the go, but it is too early to speak of them at this time.

DM: Would you allow me to come back in a few months to ask you about them then?

Ssi: I would be delighted: we are currently in a phase of continuous improvement and there will always be some interesting new information to share with you.

DM: Finally, I would like to ask if the survey you have been conducting is now completed?

Ssi: Yes, this phase is now complete; which of course means that we are now taking the action we judged to be necessary. Obviously, we will continue to ask for feedback from our customers. Incidentally, I always let customers know that the door is always open, and that their views on what we should be doing are always welcome at any time. This open approach is the only way we can ever hope to improve.

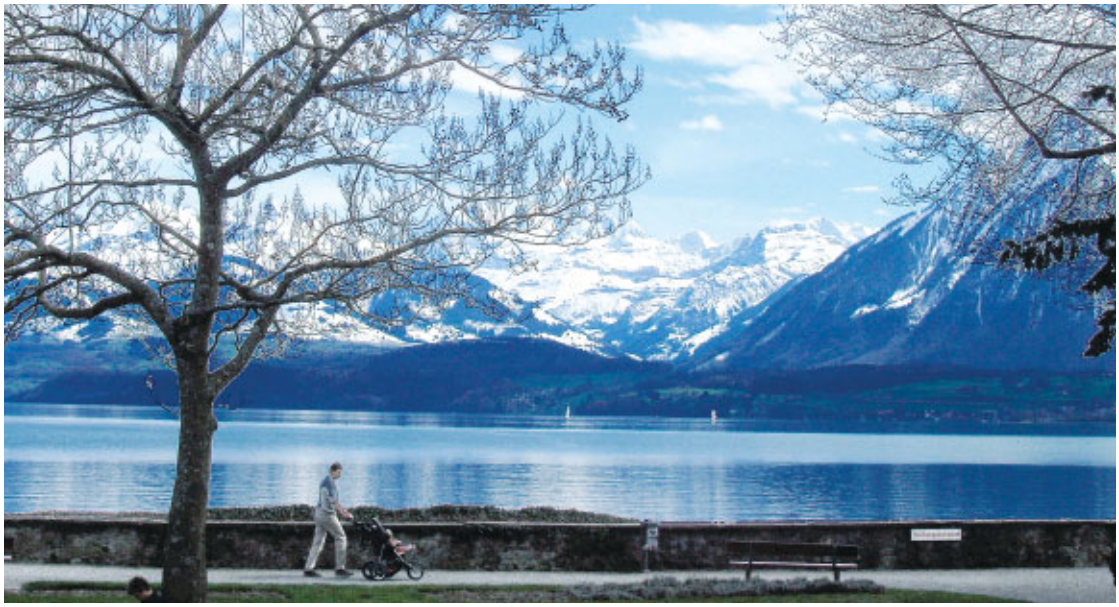
DM: Then we have a date to meet before our next edition. Without unveiling too much today, we shall be talking about spare parts.

For all contacts: Sandor Sipos, ASS Manager
Sipos.s@tornos.com

swiss medtech

SUBCONTRACTOR OPPORTUNITIES IN THE CARDIOVASCULAR MARKET

By Martin von Walterskirchen and Frank Ustar
Swiss Business Hub USA



The cardiovascular device sector is one of the most significant growth areas of the medical device market. A key factor behind the high growth rate of the cardiovascular device market is the stream of new devices, including pacemakers and implantable defibrillators, coronary angioplasty catheters and stents, and prosthetic heart valves, that have provided revolutionary advances in the efficacy of treatment, resulting in strong demand and high margins.

For DECO Magazine Martin von Walterskirchen and Frank Ustar emphasize the main chances, risks as well as opportunities of this field. The trends highlited here can be applied in every company working for the medical industry.

Particularly promising opportunities for Swiss subcontractors have emerged in the field of stent manufacturing where the material, design, manufacturing and quality control aspects dovetail well with traditional Swiss technological capabilities. Of further benefit, is the increasing trend toward outsourcing by original equipment manufacturers (OEMs).

Importance of Quality Control

Recent product recalls point up the fact that quality control in manufacturing is still not at the level that is acceptable to the FDA which should benefit the quality-conscious Swiss subcontracting community. Following are a few examples of such quality issues.

The "no-deflation" condition in a Boston based company's drug-eluting stent was caused by a narrowing of the inflation-deflation lumen on the catheter shaft. The shaft has two lumens, and on the affected products, the outer one would weaken because of a manufacturing defect. When sufficient pulling force occurred, the weakened area would collapse and the balloon would not deflate. The company implemented a new laser welding process and two enhanced inspection steps. Lots that had

not been through all three were recalled. The new welding process makes the proximal balloon weld more robust. The first inspection verifies the minimum outer diameter of the catheter at the proximal balloon weld. The second monitors the parameters of the bonding process. From a quality control standpoint, this means that the 1 in 10,000 failure rate that resulted in the product recall may become unacceptable. The FDA is inspecting the company plant in Galway, Ireland.

An April 2004 FDA warning letter cited "serious underlying problems in manufacturing and quality systems" at six plants that manufacture the Cypher stent. It cited, among other things, problems with corrective and preventive action programs, insufficient investigation of out-of-specification test results, and inadequate validation of the stent-coating process.

In 2005, a company recalled 87,000 pacemakers because of potential battery failure, another one recalled 50,000 pacemakers because of potential short circuiting and a faulty switch and recalled another batch of 28,000 because of potentially defective seals which could leak and allow moisture to enter the device. The issue with the multi-link stent involves insurance of product consistency for large-scale manufacturing. These stents clearly did not meet performance and quality standards.

OEMs

The US stent market is clearly dominated by major companies such as Johnson & Johnson, whose market dominance has been further enhanced by the acquisition of Guidant Corp. Medtronic, Abbott Laboratories and Conor Medsystems.

Frequently under the radar screen of many subcontractors are the large number of smaller OEM's which provide cutting-edge stent technology. In California alone there are about fifty manufacturers of stents, catheters and guidewires and a reasonable estimate nationwide is another one hundred fifty (contact the Swiss Business Hub USA for more information on many of these companies).

Focussing on SMEs?

While the "majors" should not be ignored, a case can be made why Swiss subcontractors should also focus on SME's. Some of those reasons are:

- U.S. startup companies often provide even more cutting edge technology than the "majors"
- the process of dealing with SME's is often less bureaucratic than that of the "majors"
- identification of the appropriate contact persons is usually easier in the case of SME's
- venture capita providers may offer assistance in making contact with their portfolio companies
- dealing with startup companies may provide a back-door access to large OEM's since most start-ups are ultimately acquired by the "majors"
- Entering into a business relation with U.S. stent SME's, not unlike dealing with a major manufacturer, requires:
- an understanding of the customer's business (technology needs, phase of business development, intellectual property protection processes, regulatory issues)
- a clear conception of nature of the relationship (transactional, preferred supplier, strategic alliance)
- an establishment of common objectives, mutual trust building and professional communication.

Outsourcing Trends

The trend toward outsourcing of various manufacturing aspects of stent production, in some cases even research and development, has accelerated considerably over the course of the past ten years. There are four major outsourcing trends which shape the business environment of medical device manufacturers:

- need to reduce cost as the result of margin pressures arising from group purchasing organizations and government payees including new reimbursement programs such as the pay-per-use concept
- creation of an end-to-end supply chain which requires device manufacturers to focus on what its core intellectual property is on one hand and which are the core processes involved in business execution, namely product development and marketing as opposed to manufacturing

- the proliferation of diagnostic and monitoring devices and their increasingly widespread use outside of medical facilities by millions of consumers are necessitating a shift in the concept of design and manufacturing that is more in line with that of consumer electronics
- there is an increasing need by device manufacturers to ratchet up the number and rate of product development and commercialization which puts higher pressure on research and development spending.

How do OEMs choose Outsourcing Partners?

One obvious criterion for choosing a subcontractor is cost reduction. The subcontractor usually buys in larger quantities and can pass the savings on to the customer. In some cases, a cheaper manufacturing location may generate cost savings provided "everything else is equal." Since this is rarely the case, locating a supply base in a low-cost country may not always be beneficial. Transforming fixed costs into variable costs is another way in which device manufacturers try to reduce overall cost. Transferring inventories or disposing of machinery and equipment are examples, and in some cases, contract manufacturers have taken over such assets and incorporated them into their own processes. For these and other asset transformations to occur, the nature of the relationship between the OEM and subcontractor must have reached an advanced stage involving product management, R&D and finance.

Achieving operational efficiencies is another important factor in choosing an outsourcing option. Subcontractors are often better at managing and controlling material requirements than OEM's. Providing engineering talent for complex operations is another task that often exceeds the capabilities of many medical device startups and outsource partners are therefore a logical source for such talent.

Achieving maximum manufacturing and operational efficiencies is another benefit that outsource partners can bring to the table since this is one of their unique selling propositions. By contrast, the OEM's main focus is on research and product development.

Repair and remanufacturing are other services that subcontractors perform more efficiently and cost effectively than OEM's and are often included in a supply chain management contract.

Logistics support is another service that subcontractors are often called upon to manage, especially in an international context. When materials have to be sourced from different parts of the world an understanding of international logistics traffic is critical in order to achieve the lowest total landed cost.

For a subcontractor, it is important to be aware of what the OEM's level of understanding of the above considerations is, and to what degree a common strategy is possible that reduces operating risk for the OEM. Subcontractors should also be aware that venture financiers have their own philosophy regarding the level of control that OEM's should maintain over their various business aspects, and they may base their funding decisions on that philosophy.

A controversial aspect of outsourcing is research and development which in the past was immune from outsourcing but is increasingly being viewed as one way to free up resources and speed up the entry of new products into the pipeline.

Stent Manufacturing

While no definitive number of different stent models on the market are available, one can estimate that 100 outside of the U.S. and a roughly equal number are being produced and marketed in the U.S. Classifications usually rely on disease etiology such as coronary or peripheral but do not allow for a framework in which to deal with manufacturing of the devices. The following overview is based on a classification provided by Stoeckel et.al[1] which permits a closer analysis of materials used, manufacturing methods, geometries and enhancements. Subcontractors need to be aware of all of these elements of the end product when approaching stent OEM's with proposals. In cases where an OEM submits a request for proposal, some or all of the above elements will be specified.

[1] A Survey of Stent Designs, D. Stoeckel, C. Bonsignore and S. Duda, in Minimal Invasive Therapy and Allied Technologies, 2002: 11(4) 137-147

Machining

The processes for manufacturing stents are strongly affected by the material to be worked on and the structure of the design. The majority of stents, both coronary and vascular, are produced by laser cutting, usually by means of Nd: YAG lasers which allow kerf (cut) widths of less than 20 microns. Balloon-expandable stents are usually cut in the crimped condition and therefore require mainly post-cut surface treatment. Self-expanding nitinol stents can be cut either in the pre-or post-expand condition and require deburring in either case.

Since laser cutting produces a heat zone along the edge of the cut, waterjet cutting has been used as an alternative cutting method. Photochemical etching is another method used to produce stents.

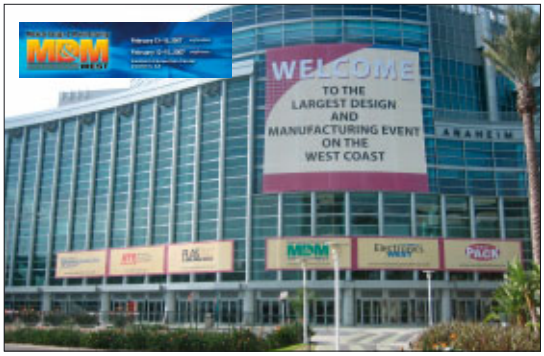
Micromolding is gaining momentum for producing plastic parts with microfeatures. Injection molders have been producing these parts for a long time by optimizing their processes and equipment through trial and error. Microscale features with high aspect ratios require forward looking mold-building techniques. These techniques include micromachining, micro EDM, microstereolithography, and laser ablation. Tight tolerances for plastic parts with microfeatures require advanced measurement technology. The resolution and accuracy of the measuring equipment should be able to capture the part-to-part variation within a micron. Vision-guided contact measurement systems are needed for accurate measurement of parts. Contact measurement systems with touch probe sizes in the order of microns are required for part inspection. Statistical process control, with the help of sensor technology, should be employed to minimize inspecting quality into the part. Nanoindenting and atomic force microscopy inspection techniques are being evaluated for that purpose.

Nanotechnology is expected to make inroads also into stent/catheter development mainly in the form of coating of the substrate. In 2005, the device maker I-Flow Corp. received FDA clearance for the company's ON-Q SilverSoaker regional anesthesia delivery catheters. The catheters are treated with SilvaGard, a nanotechnology-based silver coating made by AcryMed (Beaverton, OR). The nano-based silver makes the devices impervious to infection-causing bacteria. The FDA is still studying many issues related to the application of nanotechnology to medical devices which affect the operation of subcontractors and tracking those developments will be important for the competitiveness of many subcontractors which focus on the medical device market.

In tube manufacturing plastic nonbraid or braid tubing material, or metal hypo tubing have been the designs of choice, however, none of these tubes encompass all of the qualities a designer might desire.

Recommendations

In order to maintain future competitiveness, subcontractors must be prepared to cooperate closely with coating specialists to stay ahead of the developments in nano-coating methods together with the developing FDA regulations in this area, to cooperate in the enhancement of MR-compatible materials and stent designs, have expert knowledge of the characteristics of stent materials including manufacturability, be able to advise OEMs early in the design phase of potential pitfalls in choosing materials or designs which may create problems in manufacturing and have in-house expertise in computer simulation complementing the building of physical prototypes. The differentiation between drugs and devices is increasingly breaking down and technologies which combine both provide trendlines along which subcontractors must orient themselves. Even Trade shows such as the Medical Design & Manufacturing Shows



in the U.S. are starting to recognize the importance of that crossover by setting aside show space dedicated to such technologies.

Lessons for and from high precision turning

No wonder to see that quality and innovation are two of the most important aspects in medical applications. Both drive the stents industry and every other part of the medical market to higher requirements. In general the trends of increased quality control and outsourcing to companies focused on machining or having a specific know-how are exactly what the high precision turning industry faced on other field of activities, for instance in the automotive industry.

There are a lot of potential for every high precision turning company.

FLY ME TO THE MOON: TORNOS REVITALIZES MIDWEST HYDRAULIC SHOP

When Michael Butler, President of DuAll Precision, Inc. in Addison, Illinois, saw the Tornos Swiss style turning centers at IMTS in 2002, he knew the technology would transform his business. DuAll was already a very successful machine shop; nonetheless, their cumbersome multi-step manufacturing process needed an overhaul. The Tornos DECO was the technology DuAll Precision needed to shift their machining approach of hydraulic parts from their cam-centered process to a modern, streamlined single-setup operation. They knew Tornos Decos would help them be more profitable; and they were right.

Michael Butler and Leonard Lanute from Tornos.

Michael Butler, President of DuAll Precision, Inc.

Mark Michalik, DECO programmer.

"Tornos is going to play a very major role in this company's future"

Michael Butler, President of DuAll Precision, Inc. in Addison, IL

Mr. Butler, who started his career with mathematics and computer science degrees, moved from a desk job to making parts. «The first time I made parts with my own hands, I really enjoyed the process. I began producing parts on engine lathes. That was probably my most favorite thing to do. I really enjoyed working with steel." Two years later, Mr. Butler bought that business – a screw machine shop – and has pursued his passion to this day. In 1990, Mr. Butler and Stanley Boksa, the company's Vice President, joined forces to form the company as it is structured today.

Enter Tornos

The plan in 2002 was to begin phasing out DuAll's conventional Brown & Sharpe single spindle screw machines and rely less on his CNC Brown & Sharpe's as well. "Almost every product that we were making involved at least 3 or 4 operations. A primary, a secondary, maybe a cross-working application, and usually heat-treating as well. We were always interested in streamlining that process. It was just a very cumbersome way of manufacturing. It was not real lean."

These are a few of my favorite things

Mr. Butler, who enjoys theater and other live entertainment, and attends shows often, received a call from his wife during the interview. She'd just scored Tony Bennett tickets online. A recent favorite was Tom Jones' show in Las Vegas. "Let me tell you, he put on the best show. It was out of this world. The guy really put himself into it."

Mr. Butler, who puts himself into his work seven days a week, talks about his business with equal passion. It's clear that Mr. Butler has a soft spot for his old Brown & Sharpes; but he has been very impressed with his Tornos Decos and is proud to show off the parts they can produce.

Close ups of finished DECO parts in heat-treat crates.

Nelson Perez, DECO operator.

"We particularly liked the high quality construction of the Tornos"

"When we discovered the Tornos equipment, we particularly liked the construction of the machine tool," says Mr. Butler. "The Tornos were very high quality. The way they were made was high precision. I personally thought that the construction of the machine tool was absolutely superior. Then we started studying how the machine tool worked. And we just saw an enormous capacity to help our production processes here."

He continues, "We like the DECO a's. They're wonderful machines; and roomy. I do not enjoy working in confined spaces. It's very difficult. We felt that the Tornos gave us a lot of room to do our setups. We don't have the frustration of extremely confined space."

And what of price?

Price always plays a part in anyone's decision, but it was of secondary nature to us. We looked at the major Swiss machine tool builders and machines. And really, price was given very little consideration at the time. We bought the machine tool we believed would best suit us. We knew we would increase our profits using this machine tool.

The decision to buy the Tornos machines was a wise one. "We produce many hydraulic cages now. Tornos opened up that market for us. Now, we have a huge backlog in Tornos business."

Two DECO Sigmas expand DuAll capabilities further

The parts we have planned to produce on the new Sigmas being installed today are a different class of parts. Not so many axes are required to make those parts. We are planning to redirect some of the work that we're producing on the 20a's to the Sigmas, because of their simplicity. The Sigmas have some qualities – the ability to go to 1 inch for instance – that are going to make them somewhat the machine tool of favor.

"There's a whole family of parts that we're running that could be done more economically on the Sigmas. We have sufficient work for the 20 A's that is more complex and requires more axes. We like the design of the Sigmas and look forward to seeing what they can do."

"We consider the Tornos software to be rather brilliant"

DuAll's head DECO programmer, Mark Michalik, likes the software too. "Mark is very enthused about it. We consider the software to be rather brilliant." When asked what he likes about the programming, Mr. Butler said, «Well, it's the ability to program a cut and be able to move it around. Tremendous flexibility. The Decos' programming is very efficient. It's led to some very interesting reductions in cycle times."

"One of the biggest advantages of the Tornos is, of course, the ability to manufacture a product in one operation"

Responding to customer emergencies is one way DuAll Precision solidifies customer relations. The Tornos machines give them an edge in a very competitive industry. "We are always looking for an opportunity to serve our customers. And when they come to us in need of a quick delivery or have a difficult item to make – we see that as a premier opportunity to serve them. With the Decos, it's very easy for us to respond very quickly to those emergencies."

Prior to acquiring their Decos, almost every product DuAll made involved at least 3-4 operations, plus heat-treat priming. So they were very interested in streamlining their process. In 2002, their business was growing very quickly, and deliveries became a real problem with large orders. Old lead times were 4-6 weeks, but the new marketing trend demanded deliveries in less than 4 weeks. The Tornos machines helped DuAll Precision go way beyond even those expectations.

"One of the biggest advantages of the Tornos is of course the ability to manufacture a product in one operation," says Mr. Butler. "And that was a tremendous marketing advantage. Now when I receive a phone call for an emergency part, I can be in production within 24 hours and can probably even provide a partial shipment to the customer in that time, certainly within 48 hours."

Tornos service beats other Swiss turning center manufacturers' hands down

We've always gotten very good service from Tornos. And solutions to our problems. That's important. That makes the difference."

When asked how Tornos' move to open a new Midwest Center of Excellence affected DuAll's decision to continue buying Tornos machines, Mr. Butler answered simply. "We're getting a nice warm fuzzy feeling."

"Tornos is going to play a very major role in this company's future"

Mr. Butler added: "We believe Tornos is going to play a very major role in this company's future. When it comes to the Swiss side of turning, we consider it to be an excellent choice. With Tornos' new focus on the Midwest, we're even more certain.

"I've always been amused in this industry that Tornos has had a great presence in the East – the Northeast particularly. They had a great presence on the West coast. And I thought that the lack of a Midwest presence was very surprising I'm glad that is changing.

"In the Chicago industry, there's a huge potential in manufacturing, especially for Tornos equipment. I guarantee you, that most screw machine shops are going to be looking for different technology. I think that Tornos' presence here is going to help their position tremendously."

A strong December finishes off with the installation of the DECO Sigmas – promising an even stronger 2007

"Things are so intense. It's been a very strange December. It seems like everybody's trying to cram their entire month of December into the first two weeks. So, it's just been incredible. December is typically a very relaxed month – customers don't usually don't want to take deliveries – they're trying to reduce their inventory before the year's end. This year, it's quite the opposite.

"I enjoy what I do. I get up every morning and I'm very excited to come to work everyday. I'm tired when I go home; but not disappointed."

With the DECO Sigmas freshly installed this December, and Tornos moving in down the street, you can be sure that for DuAll Precision, Inc., the best is yet to come.

Vital Statistics:

- 70 employees (60 full time), two 12 hour shifts.
- Cutting hydraulic assembly parts: retainers, cages, spools and pop-its in various sizes (8, 10, 12, 16 and 20 gallons per minute).
- Average number of individual runs/setups per day on the Decos: 5 or more
- Average lot size: varies between prototype work of 25 pieces on up to 50,000 parts.
- Cutting steel, mild steels and alloy steels, stainless steels, some aluminum, and some other materials.
- Since 2002, DuAll has accumulated over 600 part numbers on their Decos.
- 2 DECO Sigmas being installed at the time of this writing.
- Plus 9 DECO "a" (Eight 20 mm and one 26 mm). All of them cutting non-stop, 6 days a week.

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