July 2013

Added value with greater production depth

emco group
Designed for your profit

The Head of Mechanical Finishing at finova, Gregory Junker (right) and skilled worker Jamal Akkouh are impressed with the lathe control unit's ease of use.

finova

Founded in 1994 from its predecessor company finova Feinschneidtechnik GmbH, finova is part of the Mendritzki Group, which supplies high quality cutting tools to the automotive industry, domestic appliance manufacturers, agriculture and environmental engineering companies. The parent company Mendritzki is represented at five locations in Germany. At the finova facility in Remscheid, the experts process coil widths from 50 to 400 mm and material thicknesses of 1.5 to 13 mm taking into account the geometry of the parts. In finova's core competency field of fine blanking, the company has fine blanking machines with a total output of 1600-7000 kN. Approximately 100 people are employed in Remscheid.

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Requirements profile

- Machining of fine blanks at high repetition accuracy
- Dry turning for a perfect surface quality
- High performance automation for up to 600 clutch plates in the storage
- Virtually unmanned production due to highly automated processes and large buffer store

Fine blanking experts to expand their machining portfolio

High precision machining of sheet metal parts is the field of competence of specialised suppliers for the automotive, mechanical and plant engineering, and electrical industries. finova Feinschneidtechnik GmbH in Remscheid, Germany, offers expertise in the high-quality cutting process of fine blanking. In combination with subsequent machining, finova impressed a demanding gearbox manufacturing customer with quality at a marketable price. The experts at finova use an VT 160 vertical lathe for machining fine blanks. The Remscheid-based business users say that their choice was driven by economic and technical quality reasons, and point to the clutch plate as a case study.

Twelve fine blanking systems demonstrate finova‘s expertise and technical focus.

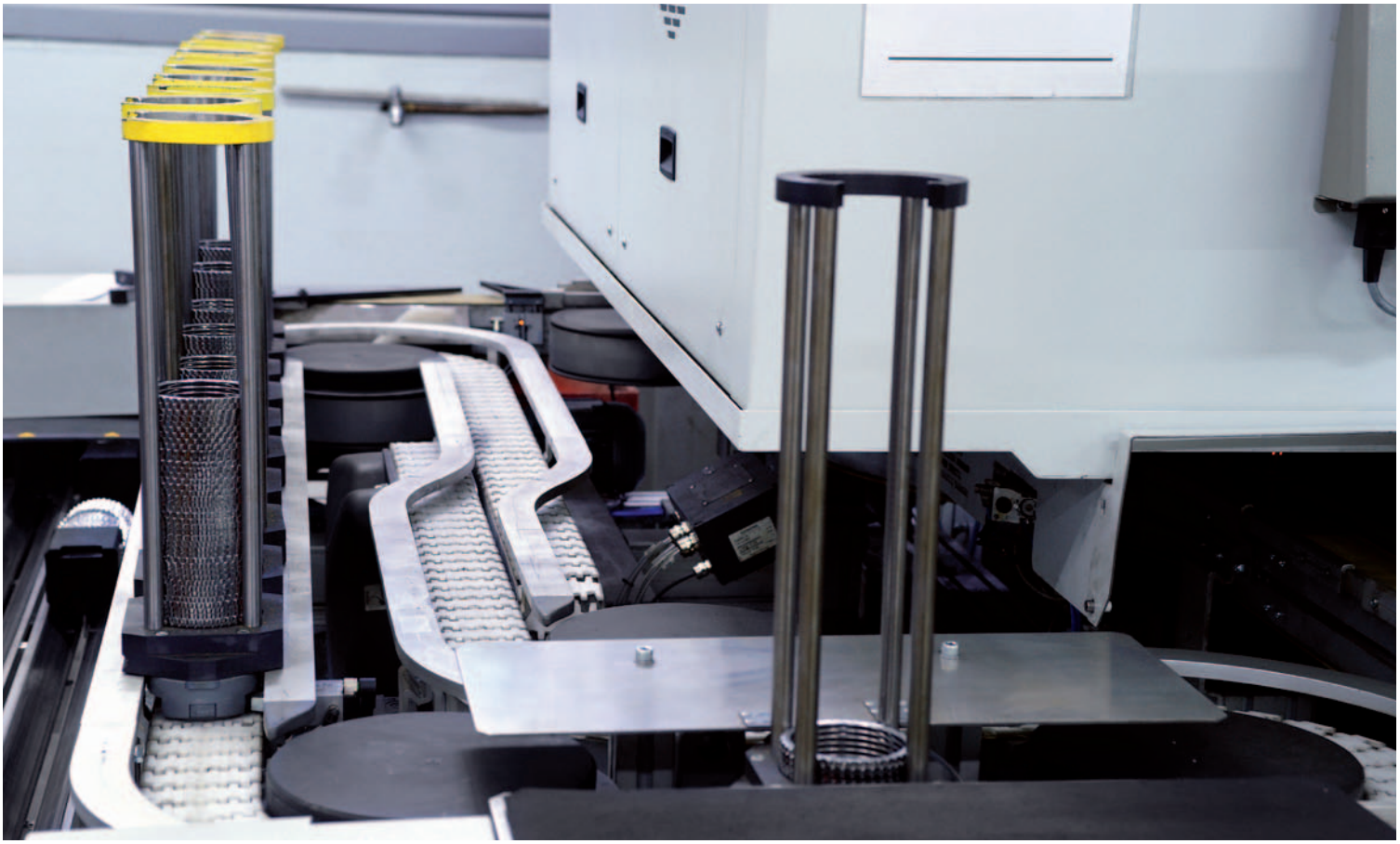
Two processes in one: Fine blanking

Automotive suppliers in particular pose challenges to the skills of the fine blanking experts. The requirement is for increasingly narrow smaller tolerances and complex component geometries. In combination with metalworking and machining processes, the process of fine blanking can implement these requirements more economically than, for example, simple machining of forged or cast parts. Fine blanking experts distinguish between two types of forming. They cut and emboss at the same time in a single process step. Oblique cuts and embossing of dog points are possible (see the “Fine blanking” box).
The process owners at finova identified the trend towards intelligent combinations. “Fine” and “innovative” are programmatic components of their logo. They fulfill their promises with a consistent focus on quality and a high degree of automation in production. Fine cuts in sheets of up to 7 mm thickness are characteristic for their program. The typical materials are hardened and non-hardened steels, but also other copper- and aluminium-based materials. The quantity of 32 tonnes of metal worked per day pays tribute to the company‘s high productivity.

The Remscheid-based experts‘ application for a lucrative contract with a major gearbox manufacturer put the question of investing in a machine for turning on the agenda midyear 2011. “One thing in our favour was our experience and knowledge of robot cutting, fine blanking and finishing of clutch plates,” project manager Jens Müller recalls. The technical management expert looks back with satisfaction on the project, as a result of which they not only meet the highly demanding customer requirements, but now work more parts with less machines. An essential component of this success is the company‘s cooperation with lathe-building partner Emco.

Preparing and implementing an investment

“Previously, our current client had the clutch plates manufactured in a complex process - turned and milled from the blank and then polished. The gearbox manufacturer expected the same quality from us but in a more efficient production operation,” said Jens Müller. Market research followed, as a result of which three lathe suppliers were short-listed at the end of 2011. “Emco was not initially our favourite, but they presented us a coherent solution and were capable of implementing it within the given tight time frame - finally winning out with the scope of supply they offered and the short lead time,” says Jens Müller. And as Gregory Junker, Head of Mechanical Finishing, adds: “The technical specifications and performance data of the VT 160 are just what we need. What convinced us in particular was our experimental machining at Emco with documentation and



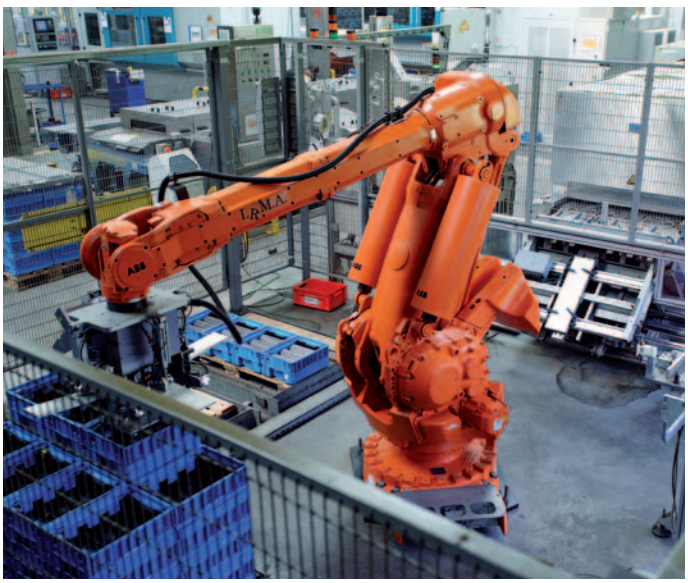
The feed and discharge units integrated in the machine buffer up to 600 clutch plates.

measurement data. Process stability and capability are essential to us. At a 80 percent utilisation level, and given the required availability, we need a reliable machine that must also be easy to use. We wanted our qualified lathe operators and later the semi-skilled staff to be able to get to work immediately without lengthy training." finova took delivery of an application-specific and customised machine from Emco's standard program. In the spring of 2012, the automation-capable solution, rounded off with a tool monitoring solution, went into operation in Remscheid, in the form of the VT 160. "Problems that originally arose with workpiece feeding were quickly eliminated in collaboration with Emco. And we also cooperatively solved tasks related to the mechanical swarf removal with blowers. Also, the clamping pressure in the three-jaw chuck is now nicely set up," as Stefan Schratzbach, Head of Maintenance reports. The part must be clamped securely, thus avoiding permanent marks or deformation caused by the contact pressure. The experts at finova point to out-of-true turning accuracy showing a maximum deviation of three hundredths of a millimetre.
Following this good experience in operations, the satisfied users ordered a second VT 160, with which they have worked equally successfully after commissioning. "If we need a third machine for higher capacity, we will order from Emco again, because we know that everything works," said Jens Müller.

The workpiece in turning

The clutch plates from high-alloy, hardened or unhardened 16ManCr5 steel are created in four operations: fine blanking, turning, grinding and sharpening, followed by surface finishing. All of the processing steps need to be dry, that is, they need to be performed without cooling lubricant, to completely eliminate the risk of corrosion attack on the still uncoated surface. The requirement to wear gloves for handling is another measure for the highly sensitive motor vehicle function part. If a single clutch plate gives causes for complaint, the customer returns the entire batch of 20,000 units.
The four machining operations and the necessary machinery are selected and matched in line with technical, qualitative and economic criteria. The first production step, fine blanking, creates the basic shape with the main dimensions from the endless sheet metal strip (coil) that is fed in. Subsequent turning creates the hot plates, the inside diameter with contours within the required tolerance, and additionally a detection groove and bevels and curves. After examining the tolerance of the inside diameter in particular, at a measuring station specially set up for this purpose, the flat outer surface is then ground. The sharpening of the outside teeth completes mechanical processing. Cleaning and preservation systems are integrated between the processing systems in the process flow.

The required high volumes, the high output of the fine blanking machine, and the accuracy requirement determine the lathe's specifications. Compared to the two vertical turning machines by another manufacturer already deployed by finova, the Emco machines generate over twice as much output. To achieve this, the manufacturing experts from finova intensively and successfully collaborated with those from Emco and its workpiece handling partners. They include IMR Fabrikautomation, an authorised FlexLink system partner, who Emco brought in as a general contractor. FlexLink has a standardised modular system for conveying technology. The 3D standard elements it contains can be easily replaced in case of wear and as needed.



The industrial robot sorts and palletises the clutch discs with single workpiece accuracy for shipment to the customer.

Performance and utility values

The turning centre essentially consists of the workpiece feed and discharge systems and the Emco VT 160 vertical lathe. It can store up to 600 clutch plates on its feed side. After separation, a device conveys the clutch plate to the pick-up station on the lathe. The three-jaw chuck then grips and clamps the plate and moves it into the machine to the main spindle. The pick-up system removes the need for additional loading equipment; it thus simplifies interlinking and accommodation to individual customer circumstances.
A pneumatic workpiece equipment monitoring device checks for precise workpiece clamping and alignment in the chuck. All machining movements on the X and Z axis are carried out by the main spindle. The workpiece arrangement allows the swarf to drop freely; this is additionally supported by an air stream from the ball-type nozzle on the cleaning blower. Individual operations take place so quickly that they can no longer be followed or distinguished by the human eye. An easy-to-use tool-breakage monitoring system with automatic adjustment of the monitoring parameters guarantees process assurance with a short machining cycle of just 0.2 seconds. After turning the three-jaw chuck feeds the clutch plate to the discharge device. It can also buffer up to 600 clutch plates. In combination with the feeder and automated sequences during the machining process, this allows virtually unmanned three-shift operation.
Gregory Junker goes into more detail on this aspect: “A skilled machine setter controls and monitors machining with the four lathes and also handles tool changes. The setter instructs another employee who is responsible for charging and discharging the lathe.”
Talking about productivity, Stefan Schratzbach, who is responsible for maintenance, at finova explains: “We can reliably manage five hundred workpieces in dry machining with a single cutting insert.”
Sales Manager Stephan Klein points out another reason for the purchase: “We can reduce downtime in parts feeding to half. In addition, benefits of an easy, virtually unmanned operation reveal.”
Following Dipl.-Ing. Herbert Bremer, product manager and key account manager at Emco explains the benefits from the vertical lathe manufacturer‘s point of view: “The combination of a compact design, a small footprint and an automated workflow guarantees the VT 160 a leading position in its class.”
The welded steel constructions of the rigid, vibration damping machine bed, and the isostatic design of the machine meet strict user requirements. This also applies to the thermo-symmetrical construction of the headstock. High stiffness within the workspace allows large distances between the guideways on the carriage system and a large linear carriage.
In line with its corporate philosophy of continuous innovation, finova‘s manufacturing experts are already preparing the next steps: Complete documentation with CNC-marked parts including camera-based optical recording will supplement current 100 percent testing.

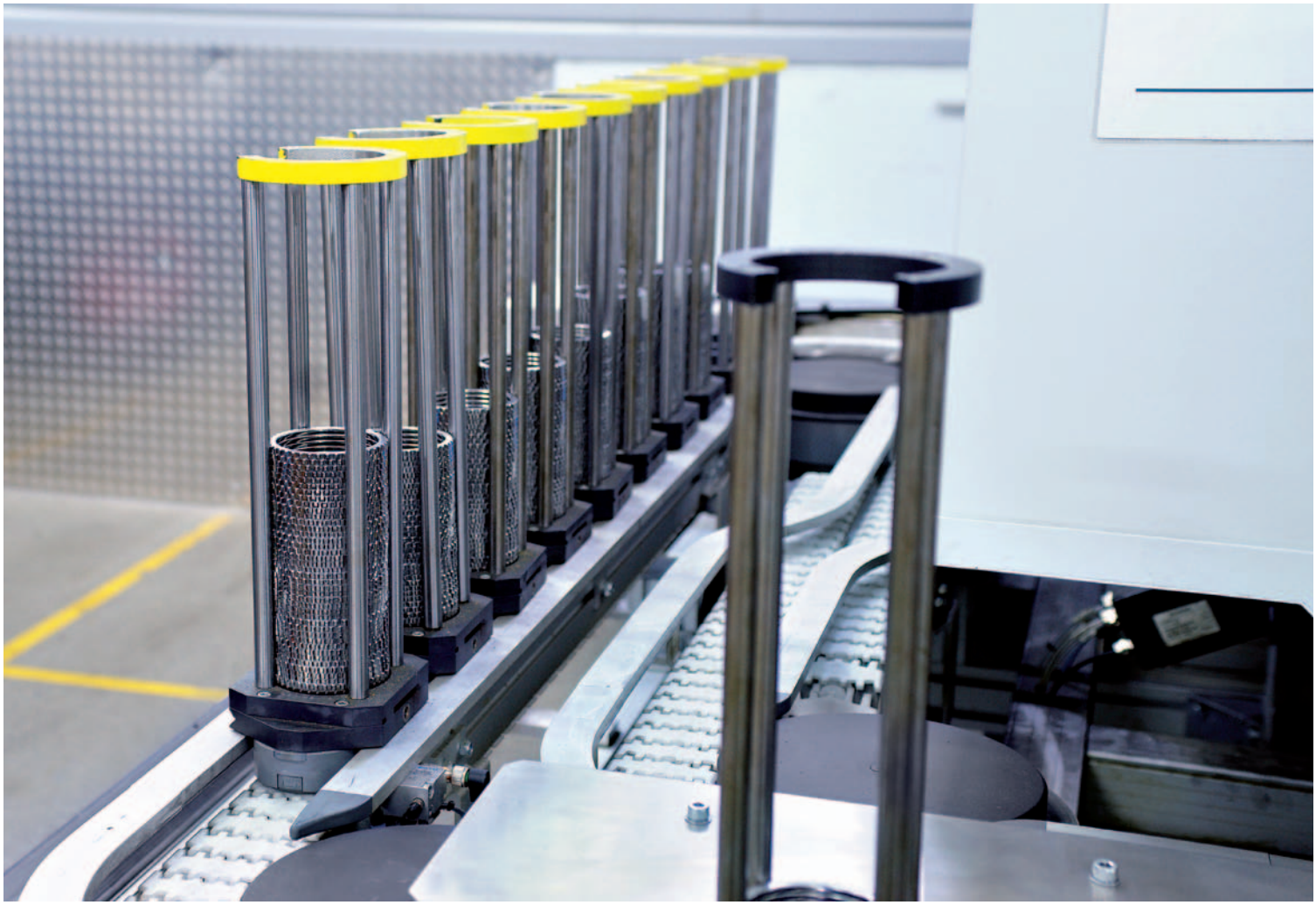
The semi-automated measuring station is due to be converted to robot operation in the near future.

Experience and recommendations

The fine blanking experts from Remscheid sum up their experience from what is now almost one and a half years of operation.
“Anyone who knows the market like I do, knows that customer requirements are continually becoming stricter. We have a great solution in our fine blanks, complemented with turning. And we are thus well prepared for the near future,” says sales manager Stephen Small. Project manager Jens Müller adds: “Emco supports us in fulfilling our tasks with a standard machine customised for our needs, plus good service, and with a favourable price-performance ratio.” The question as to recommendations for potential users is answered by Maintenance Manager Stefan Schratzbach: “The machine farm should always be at the cutting edge of technology. Don‘t be afraid of robot cells and additional measuring cells like the ones that we are currently implementing. This is the basis for keeping Germany as a manufacturing location! And if you are looking for the right machine tool partner, you should test the claims made by sales staff on-site at the manufacturer‘s facility, preferably, taking along your own workpieces to do so. And take internal steps to ensure that you have qualified staff - with education and regular training.”

Fine blanking development, principle and function

In around 1922, Swiss precision engineers invented fine blanking; 35 years later it was used for the first time in an industrial application. This highly accurate and efficient working method, which combines punching and smoothing in a single operation, proved its value, for example, in the office equipment industry of the 1970s. While it was thin sheets with relatively simple shapes that were previously processed in fine blanking, the needs of the automotive industry as a technology driver have led to a greater variety of processed sheets - in terms of their thickness, cross-sections and sophisticated designs, as well as materials.
The principal difference between fine blanking and punching or shearing lies in the forces acting during the cutting process. In both the tool consists of a cutting insert, a guide plate and cutting die. In punching, a force (the cutting force) acts parallel to the cutting die between cutting insert and the guide plate so that the sheet metal of the workpiece drops through the tapered opening of the insert and out of the tool workspace.
In addition to the guiding plate and cutting insert and the die, fine blanking also uses an ejector. The ejector throws the cut part out of the cylindrical cutting insert back into tool workspace so that a smooth surface remains. During this process, a v-ring plate presses against the workpiece so that it is firmly clamped before cutting. Thus, in fine blanking, the cutting force, its counterforce and the v-ring plate force act simultaneously on the workpiece. The forces are transmitted by the guide plate, the ejector and the two active elements, the cutting insert, and the cutting die. What is decisive for the quality of the results is the exact interaction between the three forces.
Compared to punching, fine blanking requires a far smaller shear or cutting gap, and thus achieves significantly higher precision in chipless cutting; at the same time, forming and embossing operations can take place at the same time as cutting.



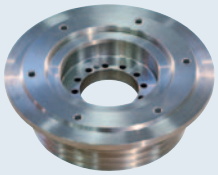
EMCO VERTICAL VT 160 VERSIONS

EMCO VERTICAL VT 160 M (ISM) – Basic machine with driven tools and integrated spindle motor

EMCO VERTICAL VT 160 MY (ISM) – Basic machine with driven tools, Y axis and integrated spindle motor

V-belt pulley
(steel)

Wheel hub
(steel)



Belt pulley
(steel)

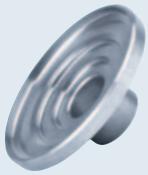


Plate flange
(steel)

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[Technical data]

EMCO VERTICAL VT 160

Work area	
Chuck size	160 mm (6.3")
Maximum work piece diameter	160 mm (6.3")
Maximum work piece length	150 mm (5.9")
Travel	
Travel X / Y / Z axis	620 / +- 65 / 310 mm (24.4“ / +- 2.51“ / 12.2")
Rapid motion speed X / Y / Z	60 / 15 / 30 m/min (2362 / 590.5 / 1181"/min)
Main spindle - ISM	
Speed range	0 – 7000 rpm
Drive power	21 kW (28.2 hp)
Torque	150 Nm (36.8 ft/lbs)
Spindle nose / DIN 55026	A5
Tool turret	
Number of tool holders	12
Tool shaft according VDI (DIN 69880)	VDI30
Driven tools	12
Speed range	0 – 5000 rpm
Drive power	6.7 kW (9.0 hp)
Torque	25 Nm (18.4 ft/lbs)

Coolant system	
Tank volume	230 litres (60 gal)
Coolant pressure standard/optional	3.7/14 bar (50 psi)
Dimensions and weight	
Overall height	2360 mm (93")
Floor space L x D (w/o chip conveyor and part feeder	2240 x 2185 mm (88 x 86")
Machine weight	3400 kg (7500 lb)

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