

5-Axis Machining Training at Böhler Edelstahl GmbH & Co KG



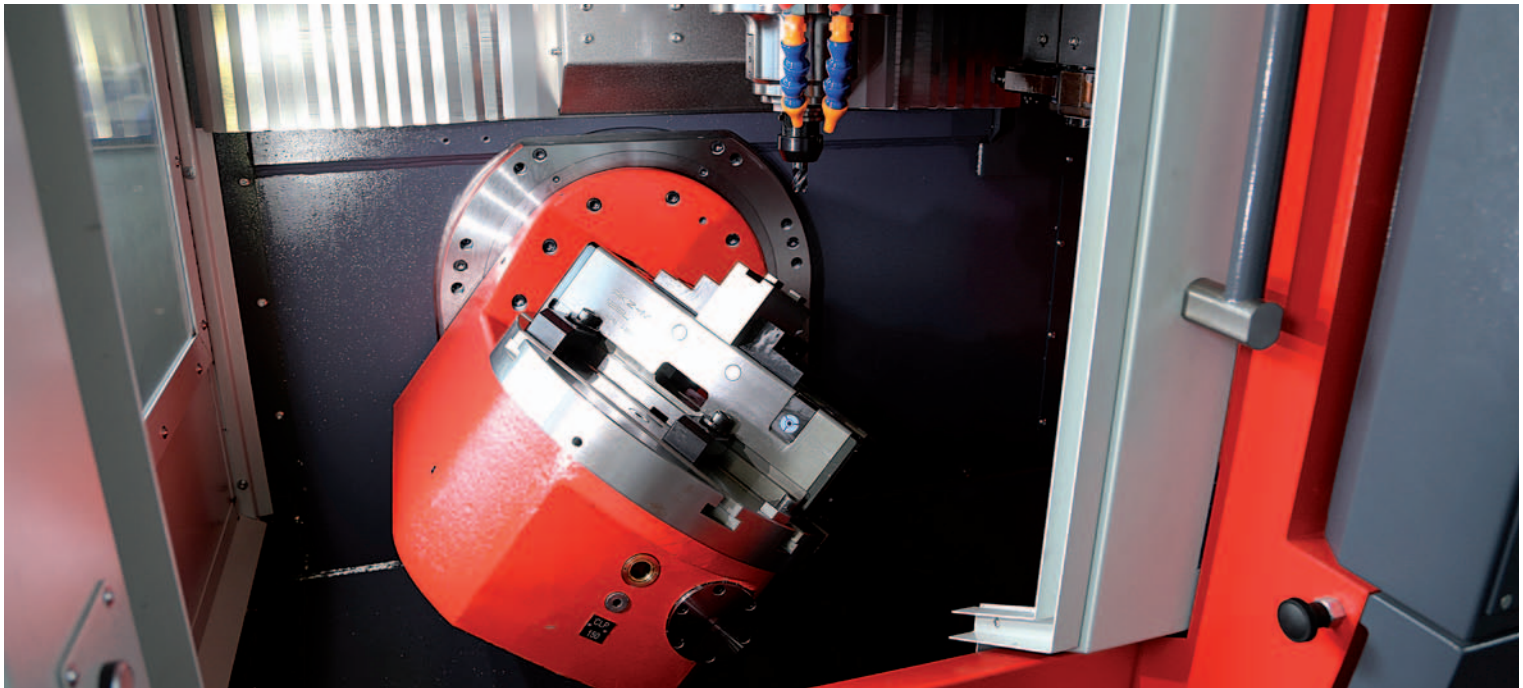
The new Emco Maxxmill 350 supplements the CNC machine equipment during apprenticeship training. Featuring 3+2 axes the modern system is perfectly suited for experiencing hands-on training content.

Böhler Edelstahl

Modern apprenticeship training requires the use of modern machines, too. In order to keep up with the latest state of technology, the training workshop at Böhler Edelstahl GmbH & Co KG has been counting on a new Emco Maxxmill 350 since autumn 2015. Böhler Edelstahl GmbH & Co KG, a member of Voestalpine's Special Steel Division, has been training apprentices since as early as 1928. Apart from the company's own 170 apprentices, the training centre also primes the future specialists of five further locations of the company group as well as those of one external company. A total of 250 apprentices are trained on an area the size of approx. 2,500 m². Eleven technical professions in different areas such as metal technology, electrical engineering and material technology are currently offered. Industry-oriented apprenticeship training is the training centre's guiding principle. It is of crucial importance to us that our apprentices swiftly gain hands-on

experience with the machines, and especially with the control technologies. Owing to the fact that these are identical or similar to those used at the companies, it is easier to integrate the new specialists into the active production process and quickly employ them efficiently,' something that engineer Richard Vadlja, training officer at Böhler Edelstahl GmbH & Co KG, is sure of.

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The robust rotary/swivel table offers a pitch area of $\pm 100^\circ$ in the B-axis and 360° as a pitch axis in C. For sophisticated, simultaneous 5-axis machining, the table may optionally be equipped with high-dynamic torque drives.

The eight instructors at the training centre teach apprentices the basics of metal processing using 23 conventional processing machines as well as five CNC machines for training the further processing methods. 'It is essential that these young people get a feeling for the material. That is why we attach great importance to sound, conventional training. Only then will they later be able to efficiently use the modern processing centres at the factory. During CNC training, this know-how is transferred into the processing programmes,' explains engineer Peter Gratze, CNC trainer at Böhler Edelstahl.

Since Böhler Edelstahl always strives to design their training as close as possible to the future employment scenario, attention is paid to also having the latest machine equipment at hand. 'Of course we do not only want our apprentices to understand how modern processing strategies look like, but we also want to teach the practical skills that will later be required at the factory,' as the training approach is described by Vadlja. 'That is why they are given the opportunity to practise with the company's actual components during their training,' he adds. 'In order to be able to do so, apprentices must have equipment at their disposal that comes very close to the daily production routine at the company, which is why we continuously adapt our machinery to fit the circumstances,' confirms Gratze.

Modern Vertical Machining Centre

Last year, in the course of an upgrade, it was planned to purchase a new CNC milling centre. 'When it comes to training, the paramount requirements placed on the machines are of course somewhat different than those necessary for the efficient use in everyday production,' knows Andreas Pichler, sales engineer at Emco GmbH, whilst adding 'High cutting performance is not yet paramount, but the machine must be compact and allow easy access as well as safe handling.'

'Of course we had considered different systems. In the end, however, it was the total package of Emco's Maxxmill 350 that convinced us. It offers everything that we had imagined for our new machine,' says Vadlja. 'Besides, it was in 2008 that we equipped our CNC laboratory with Emco training equipment. The offline workplaces are regularly upgraded with current cycles and the latest software so as to match the latest state of the art. The new machine is equipped with the same control, which allows us to guarantee a smooth cross-over into practice, adds Peter Gratze.

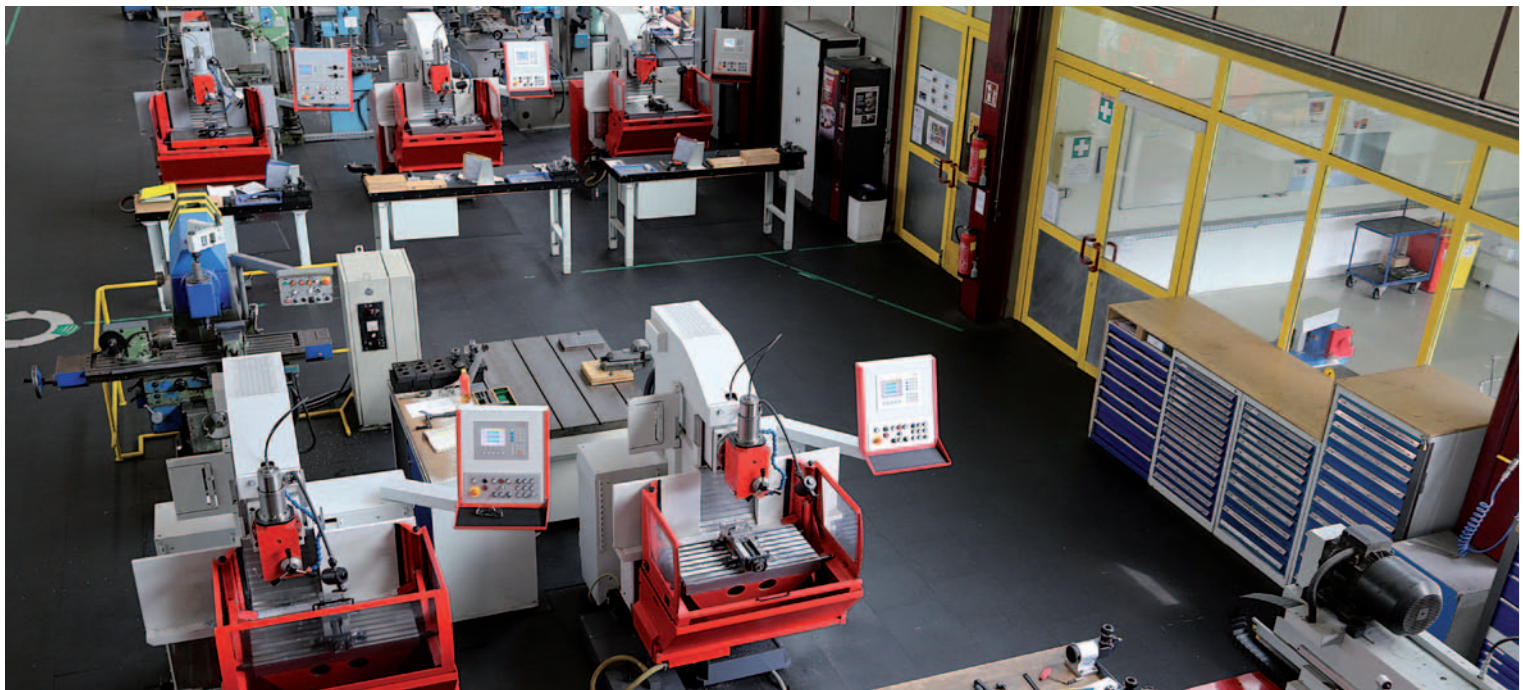
Compact Performance

The new Maxxmill 350 fulfils the most excellent prerequisites for apprenticeship training. And by no means does the small footprint of only 1630 x 2300 mm imply that the machine must dispense with anything. Despite the small form factor, the machine comes with a travel of (X/Y/Z) 350 x 250 x 300 mm. The robust rotary/swivel table offers a swivel range of $\pm 100^\circ$ in the B-axis and a turning range of 360° in the C-axis. The B- and C-axes have been designed as pitch axes.

'As an option, the machine can be equipped with high-efficiency torque drives. This allows for an easy upgrade to simultaneous 5-axis machining. The tool magazine offers space for 20 tools with ISO 30 adapter, whilst tool changing takes no more than 2 seconds. Thanks to a maximum expansion level, it is possible to include a magazine with up to 50 tool pockets. As an option, you can also choose a motor-driven spindle with 24,000 rpm instead of the common mechanical spindle with 12,000 rpm,' explains Pichler the features of the machine. 'We deliberately did not select the maximum options. Whilst this is not necessary for training, we wanted to provide a good average when it comes to performance, because that is what the new



The 20-pocket tool magazine and the Heidenhain touch probe for workpiece and tool measurement supplement the machine equipment to ensure work-related training.



Böhler Edelstahl's training centre relies on Emco machines, also when it comes to conventional processing.

colleagues will encounter at the factory,' explains Gratze. 'Nevertheless, we opted for a few helpful supplements: the Heidenhain 3D touch probe for workpiece and tool measurement, the electronic handwheel, the programmable compressed-air supply and the rinsing pistol, for instance, are equipment features that apprentices will later frequently encounter when working at the factory. Learning how to handle these features is simply necessary and must absolutely be mastered', continues Mr Gratze.

Conventional Training as a Basis

As mentioned above, Böhler Edelstahl attaches great importance to sound basic education. 'In order for the apprentices to become familiar with the handling of the different materials, training with conventional processing machines must naturally also be included in the curriculum.'

'These machines, too, should be equipped so as to promote teaching. For us this includes a robust construction, good reliability for both the users and the teaching staff as well as the required precision so that we are also able to teach the fine details for the production of high-quality parts,' knows Vadlja.

'Hence we are proud that we could make our contribution in this area, too. A total of seven conventional processing machines come from Emco, five of which are Emcomat FB-450 L machines. These are machines that have really been designed for universal use, thus providing perfect prerequisites for giving apprentices an understanding of the entire skill set required for milling,' knows Pichler.

Great cutting performance (continuous speed adjustment, driven by a 10 kW / 13 kW motor) and high processing accuracy are among the highlights of these machines. For exact positioning of the axes and increased rapid traverse speeds, the FB-450 is equipped with a ball screw and linear guides in all of the three axes. It features an X-axis travel of 450 mm.

The mechanical safety handwheels are ergonomically arranged and support easy and safe handling in all three axes. The swivel-mounted control panel for improved working ergonomics, the large chip shield at the front of the machine, the coolant system with external coolant tank, the right-/left-hand motion of the main spindle as well as the continuous main spindle and feed controls are just a few examples of the many features that contribute to an efficient production process.

A Consistent Solution

Since many companies of the Böhler Group use machines with a Sinumerik control, it was also the preferred control system when the new training machine equipped with a Siemens 840D sl was purchased. It fits in with the systems of the CNC laboratory, while the new processing centre constitutes an expansion of the performance of the conventional Emco machines.

'So far we have had only good experiences with the different Emco components. To us, as a traditional company, it is quite important to use national technology. On the one hand, you have the certainty that you are provided with high quality, but on the other hand, you can be sure that there will be nothing left to wish for when it comes to service and support,' confirms Vadlja the good cooperation.



'Training is measured by whether apprentices can directly be employed at the company after having completed their training. Modern machines such as the Maxxmill 350 are a material component of modern training in metal processing.'

Engineer Richard Vadlja, training officer at Böhler Edelstahl GmbH & Co KG

[Technische Daten]

MAXXMILL 400

Travel and tolerances	
Travel in X (without 100 mm extra distance for tool change)	350 mm (13.8")
Travel in Y	250 mm (9.8")
Travel in Z	300 mm (11.8")
Distance spindle nose - table (min. - max.)	70 / 370 mm (2.8 / 14.6")
Swivel range B-axis	+/-100°
Range of rotation C-axis (rotary table)	0 – 360°
Feed	
Rapid motion speed X-Y-Z-axis	30 m/min (1181.1 ipm)
Max. rotational speed B-axis	20 rpm
Max. rotational speed C-axis	25 rpm
Max. rotational speed B-axis, Torque	100 rpm
Max. rotational speed C-axis, Torque	200 rpm
Max. feed force X-axis	3000 N (674.4 lbs)
Max. feed force Y-axis	3000 N (674.4 lbs)
Max. feed force Z-axis	3000 N (674.4 lbs)
Max. acceleration X-Y-Z-axis	4 / 3 / 3 m/s ²
Swivel-rotary table	
Table diameter	400 mm (15.7")
Table-floor distance	860 mm (33.8")
Number of T-grooves	5
Groove spacing	75 mm (2.9")
Groove wide	14 mm (0.55")
Max. permissible workpiece weight (evenly distributed)	80 kg (176 lb)
Main spindle (mechanical spindle)	
Spindle speed	50 – 12000 rpm
Maximum torque	33 Nm (S6) (30.2 ft/lbs)
Maximum power	7 kW (S6) (9.4 hp)
Tool taper ISO 30	DIN 69871
Pull studs	DIN 69872A
Drive	direct with coupling
Main spindle (motor spindle)	
Spindle speed	50 – 24000 rpm
Maximum torque	38 Nm (27.9 ft/lbs)
Maximum power	16 kW (21.5 hp)
Tool taper	HSK-A40

Tool magazine	
Number of tool stations	20 (30, 50) ISO 30 30 (50) HSK-A40
Tool changing type	Changer arm
Tool management	random
Tool changing time (tool - tool)	2 sec.
Max. tool diameter	63 mm (2.5")
Max. tool diameter (without neighbouring tool)	100 mm (3.9")
Max. tool length	200 mm (7.9")
Max. tool weight	5 kg (11.0 lb)
Total tool weight supported by the magazine	60 / 70 / 100 kg (132.3 / 154.3 / 220.5 lb)
Coolant	
Tank capacity	120 l (31.7 gal)
Standard pump pressure	2 bar (29.0 PSI)
Max. operating rate at 2 bar	40 l/min (10.6 gal/min)
Pneumatics	
Min. pressure supply	6 bar (87.1 PSI)
Min. volume capacity	200 NI/min
Lubrication system	
Spindle	Grease
Caged roller ways	Oil / central lubrication
Ball screws	Oil / central lubrication
Dimensions	
Total height	2300 mm (90.6")
Floor space L x D (64.2 x 90.6")	1630 x 2300 mm
Weight	3800 kg (8.377 lb)