

lifted off the heavy goods vehicle onto a pallet. It then carries the pallet at a speed of 15 m/min along the configured route to the individual set-up and machining stations. Besides the four stations in the machining centres, the 2,500 x 5,000 pallets also serve the two manoeuvrable set-up locations and the two storage locations. Each pallet can carry a weight of up to 35,000 kg.

The pallet system ensures that all movement and work operations on the same workpiece are carried out on just one pallet. This makes a considerable contribution to reducing non-productive time. A Siemens Sinumerik 840D in automatic operation handles the transport control system.

Portal machining centres

Three T 25 50 R 50C portal machining centres handle the roughing and semi-finishing work on the press tools. BMW acquired one of these three machining centres in 2000. In 2006 DST carried out a retrofit on it in order to integrate it into the production cell. The two new machining centres were ordered especially in order to build the production cell. The basic data for the three machines are now identical with just a few exceptions. The portal machining centre achieves its high rate of productivity due to its extreme rigidity and high damping action. This is down to the cast design of the main components, a thermo-symmetrical ram-type structure and hydrostatic guides on all the linear axes. These provide outstanding damping characteristics while also maintaining a high level of rigidity.

The rack double pinion drive system gives a high level of precision on the X and Y axes as well as excellent surface quality. At each axis position it guarantees identical rigidity conditions along with outstanding axial dynamics. An extra benefit is the low level of manual reworking. The "load-bearing" machine components are specially tailored for "rough" machining cast and forged peripheral zones and for high-performance finishing. These are the column, the cross-rail, the cross-slide, the ram and the table. Since they are constructed in GG or GGG it is possible to guarantee economic results throughout a long service life.

Machining centre with overhead gantry

The Droop+Rein multi-functional high-speed FOG machining centre with overhead gantry was designed for semi-finishing contours and primarily for finishing tasks. Between 2002 and 2006 it made the models of the outer shell for future car bodies. It underwent a retrofit carried out by the DST experts in order to be able to carry out its tasks in the new toolmaking concept. The main emphasis here included the restructuring of the pallet changing system, together with the integration of a 2,500x5,000mm pallet clamping table, the adaptation of the tool and spindle changer to the new position, and the adaptation of the cooling system and the panelling.

By speeding up constant masses regardless of the size and weight of the workpiece, the FOG achieves speeds of 50 m/min on the X and Y axes and 30 m/min on the Z-axis.

It is especially designed for high contour precision and produces outstanding surface quality. Its high level of path dynamics greatly reduces machining times. The Fidia C20 system handles the machine controls. A video camera monitors the process. The three Droop+Rein series T portal machining centres are also deployed here.

BMW plans to optimise its concept even further in the future. As the upgrade partner, DST has already exceeded the imposed target specifications with machining times cut by half, and the floor space requirement reduced by 30%. For the future, further design expansions and optimisations must ensure that productivity increases even more over the next few years in a tool making production cell that is already automated as far as is possible.



The pallet carriages link the individual work stations.

Technical features

Machine type		FOG 3265 K	T25 50 R50 C	T25 50 R50 C
Construction type		Overhead gantry	(Retrofit) Portal	(new) Portal
Travel lengths	X mm	6,500	6,000	6,000
	Y mm	3,200	3,500	4,000
	Z mm	1,500	1,500	1,500
Drive power	kW	35	50	50
Speed	rpm	20...24,000	20...6,000	20...6,000
Torque	Nm	48	2,400	2,400
Feed motion	mm	5,000 x 2,500	5,000 x 2,500	5,000 x 2,500
Weight of workpiece max.	kg	35,000	35,000	35,000

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Information and news from Dörries Scharmann Technologie GmbH

Heading new technologies

EUROMOLD

Hall 8.0
Stand J40
3.-6.12.'08

The world's leading tool and mould-making trade fair, will be taking place in December for the fifteenth time in the shape of EuroMold. Dörries Scharmann Technologie GmbH (DST) is exhibiting in Hall 8.0, on stand J40. Centre stage will be taken by DST's product ranges Droop+Rein and Mecof, which supply premium tool-making machines.

As an example, one success story is that of the Droop+Rein installation for the tool-making department at the BMW Group Dingolfing plant. The tool-making line there has been completely restructured. This has made it possible to save half of the processing time and to reduce the surface space requirement by 30%. As BMW's refurbishing partner DST exceeded even BMW's own specifications. The main focus of the upgrade centred on four machining centres. Two new machining centres have been incorporated into the process management system for the complex components flow system. Moreover, two high-quality, proven machining centres from the Dingolfing-based mould-makers' own stock form part of the cell.

Mecof is a pioneer in 3-D contour machining. Today three machine series in particular are responsible for the advance in quality:

- **AGILE CS500**: a column milling machine – always at the latest state of technology and performance;
- **AIRONE**: a vertical high speed milling machine equipped with linear direct drives, with overhead gantry for high-precision machining of medium-sized workpieces;
- **DYNAMILL**: a vertical high-speed milling machine with overhead gantry, which is highly valued by Mecof customers for machining large workpieces.

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DST

Dörries
Droop + Rein
Scharmann
Berthiez
Mecof

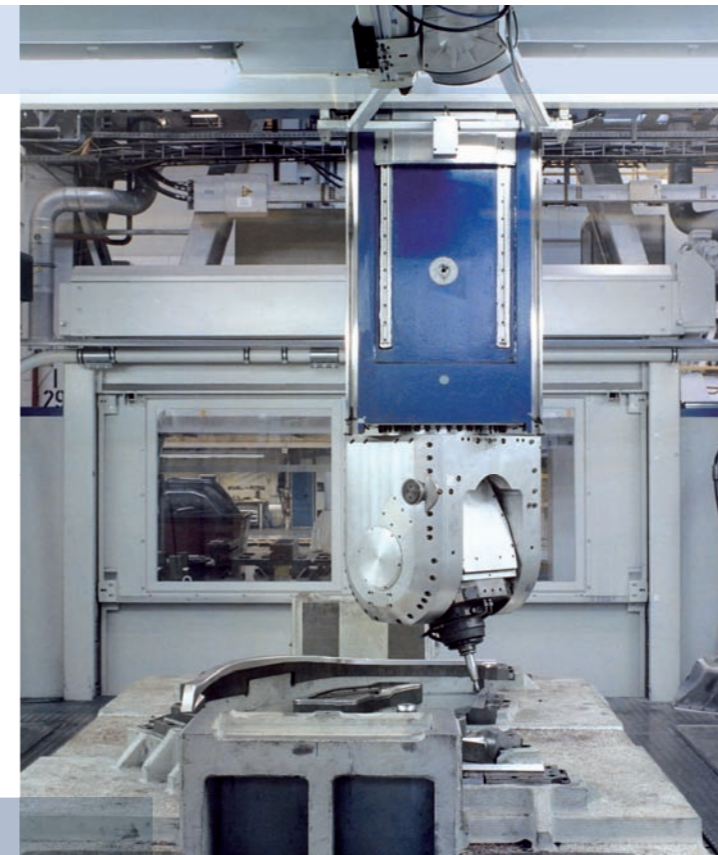
Drastic reduction in non-productive time

Machining centres included into the structural change concept

The complete reconstruction of the tool making production line at the BMW Dingolfing plant was five years in the making, while production continued without a break. The result so far: machining times have been cut by half, and the surface space requirement has reduced by one third. One reason for the success of this concept is the new pallet system which has been in operation for about a year. It is the result of the co-operation between the specifiers at the BMW tool making plant and DST. The BMW tool makers drew up an innovative concept for an openly structured, flexible flow of parts. As general contractor, DST implemented its customer's specifications. At the centre of the new concept are four machining centres from the Droop+Rein product range. Two new machining centres have been incorporated into the process management system for the complex components flow system. Moreover, two high-quality, proven machining centres from the Dingolfing-based mould-makers' own stock form part of the cell. The DST experts retrofitted these existing machining centres with CAM (computer-aided manufacturing) functions, among other things.



The workpiece – what will become a press tool – goes through every set-up and machining process on a single pallet, right from the incoming goods unit to the outgoing goods unit.



The tool is the workpiece

By the time that the 5, 6 and 7 series models leave the assembly line at the Dingolfing plant in Bavaria, the vehicle components for the bodywork have already passed through the pressing shop, the shell assembly unit and the paintshop at the same site. The press tools are also produced at Dingolfing. The tool making production unit works in two shift operation to supply its in-house customer – the BMW pressing shop. In this particular instance the term tool describes the workpiece itself: The die and the core press-form the metal body parts so accurately that after the pressing process the parts are ready for joining at the defined gap dimension. A variance of just 0.02 mm is permitted. The massive cast steel parts are shaped on the four Droop+Rein machines. The task

of the machining centres is to rough and then finish the pieces to near final condition. Manual workstations have been set up for the subsequent jobs such as cleaning and grinding. They are incorporated into the pallet flow. The reason for this meticulous machining process is the high level of quality requirements: These are extremely high for the three parts that must fit together perfectly – the die, the core, and the metal part of the vehicle (cavity). The end customer will be testing every vehicle supplied many times: The pressing process must always be identical, the "performance run" of 1000 pressed parts must be produced without problem, and lastly the pressed parts must be validated to the defined quality criteria.

Non-productive times reduced dramatically

Until 2002 the movement, retooling and maintenance times between the individual machining centres were relatively long. This is what brought about the typically poor ratio between productive and non-productive times for batch size 1. Following BMW's decision to invest in the new intelligent technology, they conferred with their partner DST with regard to designing the concept. Conventional rationalisation processes were not sufficient to reduce the production time for a complete car from what had been 8 months, down to just 4 months. It required fundamental changes. The aim of the restructuring project in the production hall was to make considerable reductions in both production time and in the surface area requirement. Specifically: to save at least a third of the previous amount of space required, and to cut the total time to produce a tool by one quarter.

The detailed planning that went into the comprehensive project has paid off. Since its introduction in March 2007, the floor-level pallet system has interlinked each production station into an efficient process chain within a production cell. Equipped with the latest sensor technology it also ensures that collisions – with all their serious consequences – have been all but eliminated. The result is that the retooling time alone, which previously was one hour, has now been reduced to between five and ten minutes. The electronic "brain" is in the control system and in the ProLeS software package. The open structure system provides maximum flexibility which the BMW tool makers require due to the rapidly changing vehicle types. It manages the CAD-CAM data and co-ordinates it with planning data such as quantities, cost, and budgets, as well as with other relevant project parameters; it records and archives all this data. The CAM software is responsible for converting the CAD and direct-input data. Tebis AG developed this tool especially for model-building, mould-making and tool making applications.

Automated pallet changing system

A 93-meter long, two-track rail system forms the basis of the intelligent interlinking of all the logistical and manual workstations – as well as the automated workstations – into a single production cell. The guide rails are installed below floor level, so that the factory floor remains even for pedestrian and vehicular traffic. The pallet trolleys can take two pallets. At the input station, it accepts the blank

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Technical data TCA 6

Spindle speed	15 - 6,000	rpm
Max. torque		
with clamped axis	750	Nm
with continuous axis	550	Nm
Power	30	kW (S1 100%)
Positioning accuracy of A-axis	± 185	degrees

Technical data SPAZIO 13

C-axis		
Swivel range	± 185	degrees
Speed	0 - 5,000	degrees/min
Torque	1,000	Nm
A-axis		
Swivel range	± 110	degrees
Speed	0 - 5,000	degrees/min
Torque	1,000	Nm
High-speed spindle E54		
Max. power	40,5	kW
Max. torque	35,4	Nm
Rotation speed range	750 - 26,000	rpm

Presented as a first at EuroMold will be the TCA 6, a universal milling head for machining on five continuous axes, which sets new standards for mould-making and deep working. One of the applications to which it is also suitable is for machining workpieces for the energy sector. The SPAZIO 13 is another innovation: Equipped with a high-performance motor spindle it is particularly suitable for machining workpieces for the aerospace industry, but can also be used for steel, cast-metal or aluminium moulds and for styling centre machining work (model building). The milling head can be used for conventional 3-axis machining as well as for machining on five continuous axes.



The pallet carriage, which can take two 2,500 x 5,000 mm pallets, links the individual workstations.

