



Use of milling in place of EDM saves processing time

Advances in mould-making productivity:
Rationalisation potential with 'Production 50'

The introduction of a new manufacturing concept proved a true stroke of luck for Hans-Hermann Bosch GmbH. It helped the Swabian mould-maker reduce production time, cut manufacturing costs and even gain control of a persistent quality problem.

“Show us your process and we’ll cut your production time by half!”

“Show us your process and we’ll cut your production time by half!” With this self-assured claim, the specialists from Hitachi Tool Engineering Europe GmbH (HTE) surely must have encountered an initial measure of scepticism among tool and mould makers. But they knew what they were talking about. And they were also right: because meanwhile the Production 50™ manufacturing concept has proven itself without exception – and the brand has even been legally trademarked.

Such a drastic reduction in production time yields a significant cost reduction and has attracted the attention of the industry. But how does the European tool division of the Japanese technology corporation Hitachi manage to take its customers’ production processes, which have matured over the course of many years, and turn them inside out in a way that slashes process times by half? Simply put, Production 50™ challenges the customer’s status quo. To this end, an application

engineer from Hitachi Tool first assesses the actual status at the customer’s site. The application engineer then uses that information as the basis for developing the right optimisation proposal.

Beside his own know-how, he also has the benefit of a database that has grown over the course of 25 years. This database contains a large number of documented user reports (most of which include photographic and video materials) as well as all stages and data on the machining process. Subsequently the appropriate tools are selected from among the comprehensive range of innovative tools from Hitachi Tool Engineering Europe GmbH.

Then comes the most important step of all: the implementation of the optimisation process at the customer’s facility. If possible, this involves all of the employees concerned. The aim of the optimisation process is to shorten lead times, and this, in turn, results in cost savings.

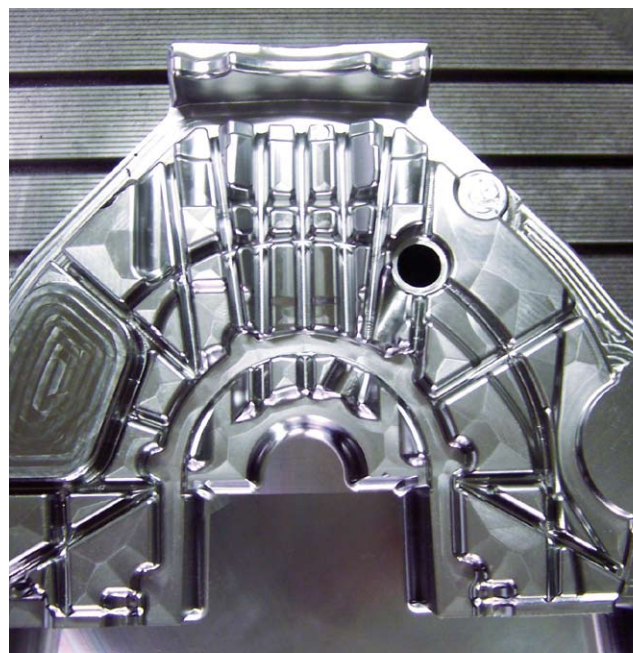
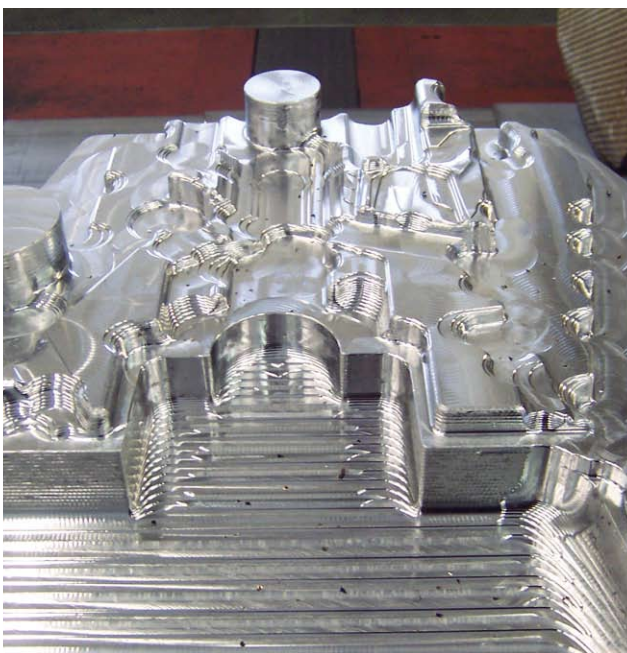
In order to clarify ‘Production 50™’ to the customer in a sustained manner, all local processes are accompanied, supported and documented by an application engineer from Hitachi Tool. In addition, all results are documented in a time-cost analysis. At the end of the process everyone involved is informed about the optimisations achieved through ‘Production 50™’, as this promotes the transparency needed to implement the process in the company in a sustained fashion.

Significant savings potential for process times

Markus Fischer, technical manager with HTE, addresses this point: “More and more manufacturing operations in Germany are taking a closer look at their production processes from a commercial standpoint. In so doing, they often uncover significant savings potential – and we all know that time is money. Although tool costs also play a role, they are relatively low when compared with machine-hour rates in the range of 50 to 75 euros ...”

Fischer then cites an example of a ‘Production 50™’ application where a prod-

PARTNERSHIP: Together with Hitachi Tool, and thanks to Hitachi’s “Production 50™” programme, Hermann Bosch GmbH has been able both to reduce machining time for this slide and to improve the overall cost picture tremendously (left: after roughing; right: completely finished).





HIGH EFFICIENCY: Direct milling shortened fabrication time versus EDM by 25 per cent. In so doing, the precision achieved – 0.02 mm to 0.04 mm for all dimensions – was well within the required tolerances.

uct costing analysis led to production cost-savings of 50 per cent over the use of conventional tools. He adds: "Shortening production times frees up machine capacities, which means new orders can be accepted without hesitation. It also eliminates the need to place costly third-party contract manufacturing orders in order to overcome time constraints. And beyond that, shorter lead times make our quotations more attractive to our customers!" Especially during hectic times, that's one competitive edge that certainly can't be overestimated!

In the case study below, the guiding principle of 'Production 50™' was: "Milling instead of EDM – wherever possible and useful." To this end, HTE created a comprehensive range of solid carbide cutters, which now comprises 1,122 different designs with the corresponding length/diameter ratios (in some cases up to 50 x D) ranging from Ø 0.03 mm up to Ø 20.0 mm.

Hitachi Tool also offers a range of indexable insert tools, which is ideally suited for 'Production 50™' applications, enabling the user to achieve the final contour as fast as possible with smaller tool

diameters under reliable process conditions. This tool programme also makes it possible to perform roughing operations during the '2nd shift' under reliable process conditions, which ultimately results in higher machine utilisation.

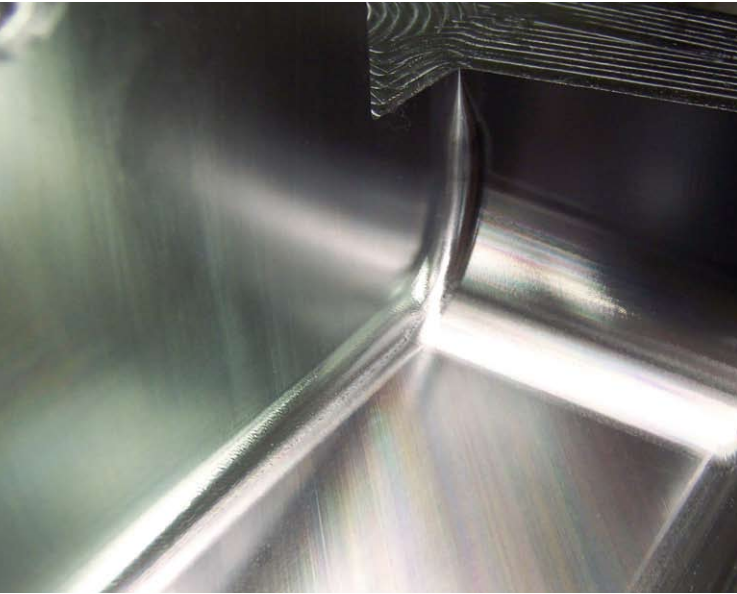
Tool change and good CAM programming

During the implementation of 'Production 50™', the application engineers from Hitachi Tool provide extensive support. After all, it takes more than just getting the customer to replace tools and adjust cutting values to succeed. Instead, they have to abandon well-trodden routes and make use of new technologies. HTE has extracted the required know-how from numerous technical application reports over the past 25 years and entered it all into a database that their experts can access as needed.

Here's what Markus Fischer of HTE has to say about it: "As our application engineers have previous practical experience of their own and continue to learn every day from our customers' challenging projects, nearly every one of our employees is also able to provide CAM program-

ming support. If they lack solid knowledge of the existing program, at least they generally know where they can find the appropriate assistance. The actual milling program is always generated together with the customer's CAM programmer on the customer's own software. In so doing, the programmer acquires valuable know-how that they can also use in the future. That's important because good CAM programming is always half the battle."

'Production 50™' thus comprises no pre-fabricated, one-time solutions, but rather provides sustainable means to help customers help themselves. A large number of field reports testify to the fact that this concept genuinely strikes a chord with the customer. We spoke with Gabriel Sailer, head of the CAM department at the Swabian mould-maker Hans-Hermann Bosch GmbH (H. H. Bosch). The range of services offered by H. H. Bosch comprises 3D CAD/CAM design and mould making by means of milling and EDM technology. Sailer comments: "Our first joint project with Hitachi Tool involved the production of a slide mould element (see figures on the first page of the double-page spread). We really needed drastic improvement here. We had



QUALITY IN THE DETAILS: Excellent surface finishes were obtained along the contour of the slide, as these photos also show. The time required for subsequent polishing work was reduced by 50 per cent as a result.

a problem with tremendously long run times when we used EDM to machine the mould contours, and the rate of electrode consumption was also far too high. The resulting wear caused scatter in the final actual dimensions ranging from 0.15 mm to 0.2 mm. That was unacceptable ..."

Faced with these challenges, H. H. Bosch decided to try 'Production 50™'. Together with the experts from HTE, first the individual operations and then the complete sequence of tools were scheduled in the roughing / soft machining phase. In particular, it was important to determine how far the work should proceed in this area prior to machining the harder parts of the mould. Then the complete sequence of the tools for the hard machining phase was specified. After that, they then turned to the task of programming with the customer's own software (Tebis). And finally the cutting data and assignments were defined along with the machining strategy (multi-axis machining, re roughing, semi-finish and finish).

Lots of praise for the advisors

Sailer remarks: "With this application we found ourselves in uncharted waters.

Hitachi Tool gave us outstanding support, valuable know-how and guidance with all of the applications. Together we laid the cornerstone for faster programming in this field. From roughing to finishing, from indexable tool to miniature tool, the entire sequence was completely documented. That made a very positive impression on us. There were no cutter fractures – the tools used proved to be extremely resilient and are still in use today. Very good surface finishes were obtained on the contour ..." – CAM manager Gabriel Sailer also praises the high reliability of the process and the fact that it requires relatively little operator intervention. The following details about the Hitachi tools used will likely be of interest to specialists:

Integration of current technology, new tools and long useful lengths / EMB, EPDB, ETMP

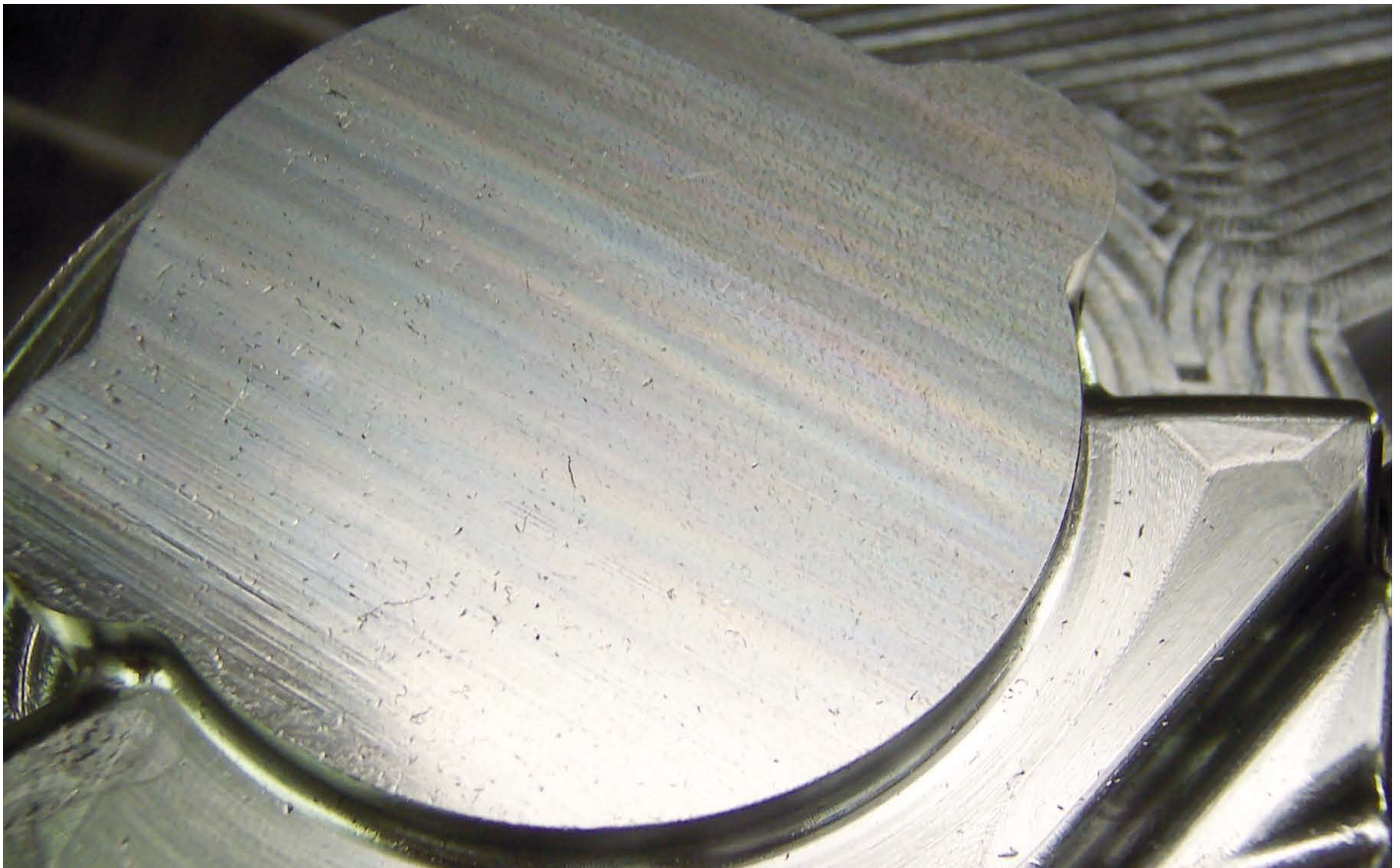
Effective machining / positions CEPB, run times of more than twelve hours at high feed rates with ETMP.

Together with HTE, H. H. Bosch was able to produce the slide considerably faster and therefore at less cost. Direct

milling shortened the production time versus EDM by 25 per cent; moreover, it cut the polishing time of the milled surfaces by a full 50 per cent. In so doing, the precision achieved – 0.02 mm to 0.04 mm for all dimensions – was well within the required tolerances. And the clearances at the component circumference and the outside dimensions also turned out to be significantly more precise than with the wire EDM process they used before. Here, too, the customer was able to reduce fabrication time by about 25 per cent.

There was also at least one thoroughly desirable side effect: extended tool life of the mould inserts and of the slide insert in the casting process. This is easily explained, as the use of EDM to machine the contours causes micro-structural changes in the surface layer that reduce its strength. This is not the case with milled surfaces.

Not surprisingly, Gabriel Sailer's overall assessment is quite positive: "We're thoroughly satisfied with the results of this project. In all likelihood, we'll expand 'Production 50™' to other applications."



FINISHED COMPONENT SURFACES: Use of EDM to machine contours causes micro-structural changes in the surface layer that reduce its strength. This is not the case with milled surfaces, which means the mould now has a longer tool life.

Im Portrait:

Hitachi Tool Engineering Europe GmbH (HTE)

Hitachi Tool Engineering Europe GmbH (HTE) is the European head office of the Japanese tool manufacturer Hitachi Tool Engineering, Ltd. and is responsible for the European-wide marketing of innovative and high-quality machine tools. Established back in 1983, HTE can look back over 25 years of experience in marketing and technical support.

As one of the most innovative suppliers of cutting tools for tool and mould making, Hitachi Tool offers a broad range of cutters from \varnothing 30 μ m with distinctive cutting geometries and coatings developed exclusively in-house. With the large breadth and depth of its range of high-performance tools, such as hard metal cutters, indexable insert tools, solid carbide drill bits, tool holders and turning tools, Hitachi Tool basically covers the entire process chain.

One of the particular strengths of the company is the individual consulting and support it provides to help its customers with applications as they struggle every day against ever-increasing time and cost pressure in the tool and mould-making sector. In this context, HTE focuses on shortening process times through more efficient machining methods. Those new methods usually require the customer to adopt a fundamentally different approach as early on in the process as the programming phase, but ultimately yield altogether astonishing results.

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„Für jede Aufgabe perfekt gerüstet.“

Hitachi Tool bietet
das komplette Programm für den
Werkzeug- und Formenbau.



Durch intensive Forschung und Entwicklung, ausgerichtet auf den Werkzeug- und Formenbau, hat Hitachi Tool heute das breiteste Fräserprogramm (ab $\text{Ø}30 \mu\text{m}$) speziell für diesen Bereich. In Verbindung mit datenbankgestützter Applikationsberatung erarbeiten wir – im Team mit dem Anwender – für jede Fertigungsaufgabe die optimale Lösung.

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