11 years of experience were not without challenges

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Creating the "Need for Speed"...

In 1995 the first prototype casting was made without using a pattern. After many trials and working with smaller and less intricate parts the continuous efforts of convincing potential customers succeeded. The first engine developing company gave ACTech a go to set-up a cylinder head raw part within a maximum lead time of 3 weeks after receiving CAD data, of course without charging the pattern.
ACTech succeeded to create a brand-new "need for speed" never seen before. To be totally convinced, our customer cut the parts into small slides to verify our claim. The manufacturing of castings with properties fully comparable to the mass production seems to be the door opener to reduce costs and time for new developments especially in the automotive industry.
After 11 years of growth ACTech today offers a wide range of prototype casting capabilities. Over 200 employees are involved in manufacturing prototype castings for customers around the world from our 6,500 sqm. facility to answer the demand from the automotive industry's increasing need for faster new product development accomplished in less time.

Patternless procedures

Having a pattern to set-up the mold seemed to be the most important advantage to accelerate the development in the past. Today, it is no longer trendy to cut lead times for pattern work by using modern techniques like high speed milling. Most of automotive companies focus on smarter process chains to push their products faster to the market. Cutting development time in half is the goal. Therefore, having different patterns for all necessary development loops in connection with a lot of parts not usable for the further improvements is not a key factor here. The use of patternless procedures like Laser-Sintering of Croning®-sand or Direct Mold Milling® allows to set-up molds up to 2.5 meters within a few days after finalising the design work for the mold. Also, this techniques create unlimited possibilities for changes during the manufacturing process. Split lines can be redefined to cover tighter tolerances which can not be reached by sand castings on the traditional way. Gating and risering systems can be improved to reach a quality of the casting that even meets the demands of aerospace industry. Additionally, the manufacturing of different casting variations at the same time with only a minimum of the pattern costs is possible now. However, the customers used all the given possibilities intensively during the previous approx. 10 years and came back with tighter tolerances, higher material demands and more versions at the same time of course again in connection with the need of a further reduction of lead time of the prototype parts to half.

Challenging threats

"Reduce the wall thickness, stiffen the structure and improve the design to have a more lightweight part at the end."
This sentence echoes in the ear of every student if he attended engineering classes at university. But sometimes even a really good approach cannot be realised because mass production will feel limited due to different reasons then. In this case showing the real benefits of brand new design can break the ice on the customer side and push the supplier to develop new or modified techniques to implement new and more sophisticated designs.
Imagine the unbelievable result of a turbocharger housing having only half the weight as compared to a regular one. Even if the turbine housing seems to be only a small part in the entire car structure, however, it is a very important one of course. The time necessary for heating the steel case determines the total output of nitrogen oxide because the catalyst cannot work without having the proper temperature. The gas exhaust could not deliver enough thermal energy as fast as necessary

because the material of the turbine housing took too much energy during the first minutes after a cold start. Improved design to keep the turbine housing strong enough lead to wall thicknesses of about 2 millimeters. Today, the mass production cannot cover tolerance requirements resulting from this design improvements. But the goal was set to achieve it within the next month to reach lower nitrogen oxide output and connected with less total weight of course less fuel consumption. By the way: using less steel for the manufacturing process will be a nice benefit for the purchaser taking into consideration the ever increasing material prices for steel.

Thinking about the fact that the power output of modernly designed engines lead to higher injection and combustion pressures than ever before changing the material from aluminium to grey cast iron will cover the load on the casting. However, without substantial changes in design the weight will be more than doubled. At the end of redesigning of an aluminium engine block to grey cast iron, wall thicknesses between 2.0 and 2.5 mm are the results, like the new Volkswagen Golf GT shows. Before passing this challenging task on a mass production foundry to cast over 100,000 parts per year, all technical parameter have to be met. Continuous improvements of the casting along with keeping the possibilities of the foundry in mind will be the demanding task for the prototyping company. If the prototyping company offers the development of the new product design or manufacturing techniques together with fast and cost efficient prototyping capabilities as well, then the mass production will need less time. Producing prototypes at the beginning is, of course, not cheap. but producing prototypes with mass production approach and conveying the results of testing to an improved design can avoid much more expenditures after the start of production. Just to illustrate: compare the costs of a single prototype engine with the expenditures for changing a whole toolset for the mass production ...

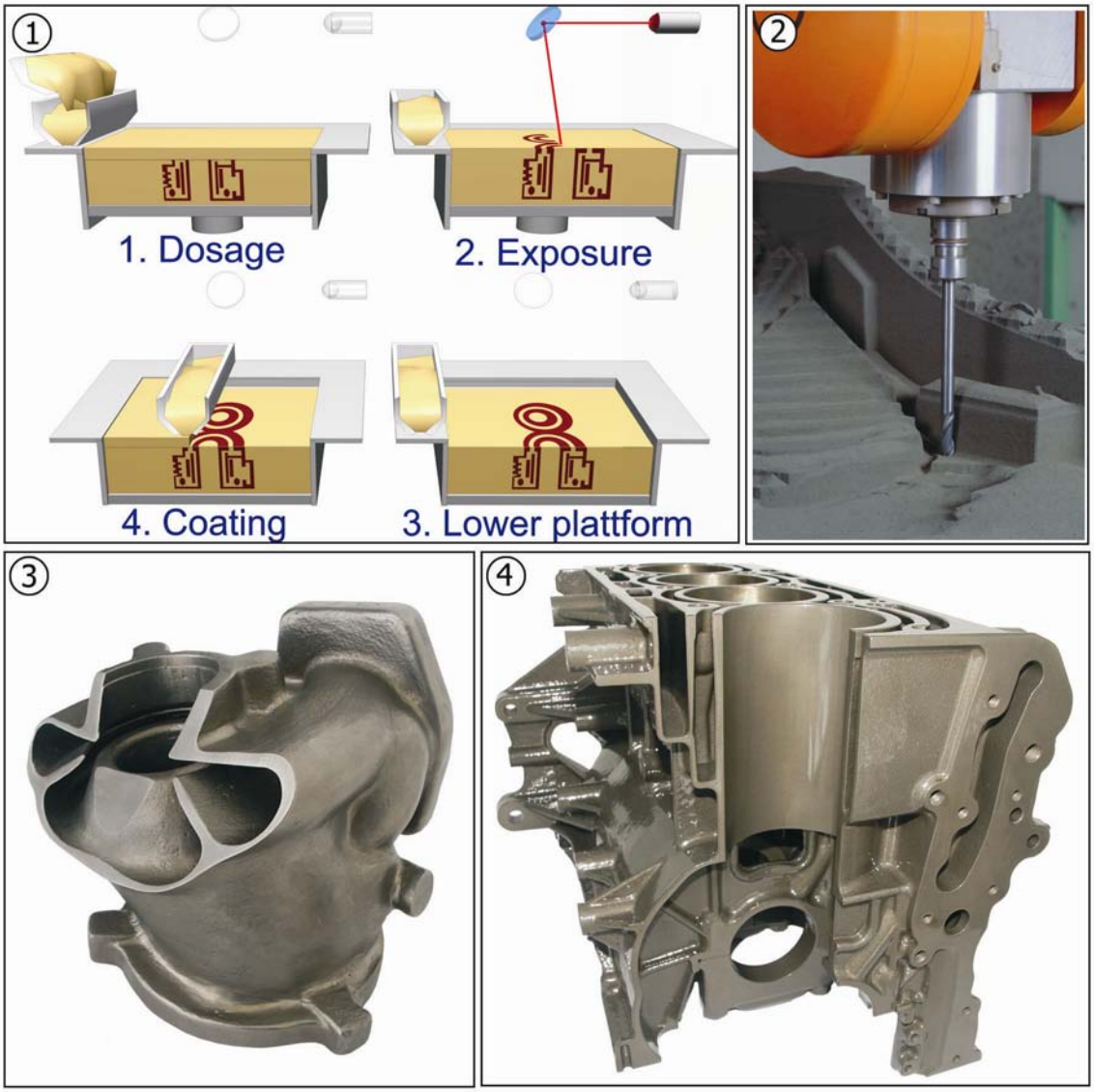
A few years ago every engineer would have been happy to receive a casting within 2 or 3 weeks after finalising the CAD design. Mostly this time-interval was not enough to create the drawings for machining. Today the designers approach is to have a casting without having a drawing because one does not want to waste time for generating drawings for parts in the development stage. Programming CNC-milling centres only by use of the CAD data will be the demand for the prototyping shop. Starting this procedure with small parts like brackets a few years ago, today the machining of cylinder heads, engine blocks or automatic gear boxes without any paper work is the state of the art in this kind of development support. And engineers always put “small” additional approaches on the top. If they are producing prototypes today, they are using a continuous improvement process while running the production. The total amount of prototype parts are not really to determine at the beginning. However, the procedures of manufacturing, testing, and improvements of course are. After completing the initial mold design, the initial batch will have less or equal to 3 parts which have to be delivered fully machined within 3 weeks. The main improvements derived from the first test results on the customer side come back within one or two weeks and initiate the second lot of castings. The second lot being again less or equal than 3. At the end a new generation of casting parts can be tested, improved and lead to the following development loop with a total time consumption of less than a month. Keeping in mind to decrease the volume per loop as low as possible will keep the costs at a minimum and shorten the lead time. The only obstacle remaining will be the standard purchasing procedure. It should be possible to solve this by a development agreement which reduces the offer and order seesaw to a minimum. In case the honest reader thinks that the author is kidding one just has to wait only few month to see the first full automatic gear boxes being developed in a shorter period of time. Coming up this year ...

Taking a look into the future...

and feel more than ever before the unlimited possibilities of Rapid Prototyping to serve everybody's design and development. Take into consideration to change your own development procedures to maximise the results from small quantities. Change your mind and start testing all properties of the finalised part before ordering the mass production tools. This will avoid unexpected cost explosions after start of production. And, of course, do not accept any limitation given by your prototyping company. Keeping in mind that all parts will be identical in representing the same mistakes, press the prototyping company to deliver in quantities less than 3 parts with lower costs and shorter lead time than the traditional way will create. And remind them to forget the sentence "lead time for pattern equipment" ...

For ACTech, one of the leading casting prototype companies world-wide, after 11 years of continuously growth new markets will be the challenge for the next month. Since 2002 the North-American subsidiary is working successfully on her market and therefore it is not a surprise to hear

ACTech is going east, too. Key customers from China, Japan and India are still using the given opportunities to accelerate their own development and keep also European customers served in well known matter regarding lead time and quality of prototype castings. For ACTech it is a new intercultural experience one the one hand, however, just in the same old business like in the previous 11 years.



>1 - Laser-sintering of Croning®-molding material
>2 - Direct Mold Milling
>3 - Cutted thin-walled turbine housing
>4 - Cutted thin-walled cylinder head