Robotics

BMW
Case study: Foundry/Precision casting

The sleek BMW cars that grace the world's motorways can't fail but impress even the non-automobile enthusiasts among us. These sophisticated machines become even more impressive when you witness how the engine parts which power them are made. And BMW's light-metal foundry in Landshut, near Munich, southern Germany is responsible for producing many of these vital engine components.

Blocks of metal, predominantly aluminum or alternatively magnesium, are cast, processed and machined at the southern German plant to produce BMW engine parts. These components are then delivered to BMW Group automobile and engine plants worldwide. The light alloy components produced at the Landshut works are used in almost all of BMW's range of vehicles. The plant employs some 3,300 workers and around 1,350 of them work in the foundry.

"Production in Landshut focuses on cylinder heads and compound crank cases for the BMW 2-, 4-, 6-, 8-, 10-, and 12- cylinder engines, as well as car body parts," says Johann Wolf, vice president of the light-metal foundry, vehicle components and systems.

The foundry employs a range of methods to produce the engine components. Molten aluminum is held in gas-heated furnaces until needed at the casting machines. Casting of transmission cases and cylinder blocks is done on high-pressure die casting machines. More complex cylinder heads and engine blocks, meanwhile, are made using the low pressure, semi permanent mold process.

ABB robots, predominantly IRB6600 models, play an important role in nearly every part of the foundry. "ABB robots are used in die casting, lost foam, core handling and cleaning shops at Landshut," says Wolf. "Robots are used to help with production and with the unloading of cores from the mold in the casting process." ABB robots have been used in various applications at the plant from about 1990. BMW selected ABB robots, in particular, as they are "recognized products in this field with well understood maintenance requirements" according to Wolf.

The robots operate with ease amid high temperatures and where chemicals are in use, handle large numbers of components and carry parts that are too heavy for humans.

The foundry would need far larger floor space for the employees if they were to carry out their work manually, says Wolf. Workers in the aluminum foundry value the roles that ABB robots play in the core handling process. Herr Heinz Hayer, a team leader in charge of a group of 29 people producing cylinder heads, praises his robotic work mates. "The robots are more efficient and reliable than people," he says. "They never get sick! The robots currently work 21 to 22 hours per day, five days per week. They can also do dangerous work. We used to lift individual pieces by hand but that was dangerous as they could fall." Hellberg Ewald, who paints the white foam molds that are used to produce the new

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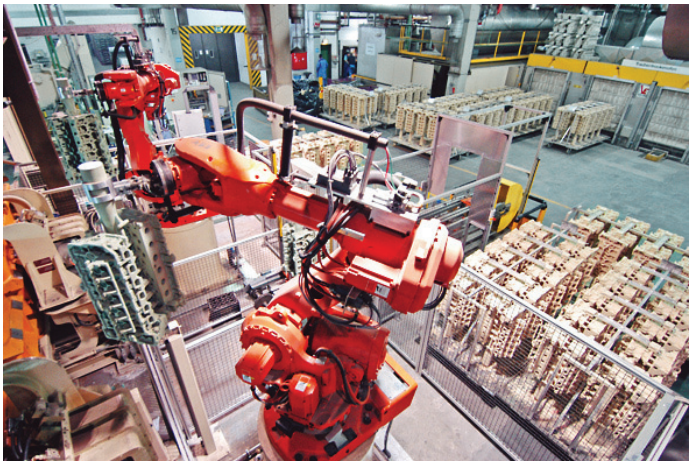
six series cylinder heads, is equally as positive about how ABB robots help him in his work. “The robots are an enormous advantage,” says Ewald. “We couldn’t do it without robots. The workload would be 20 percent to 30 percent higher without robots. It would be an enormous job as we would have to do everything by hand.

Industrial robots may be more reliable, versatile in extreme working conditions and willing to work around the clock but Wolf doesn’t expect them fully to replace human workers at the foundry. “What’s decisive is a high degree of flexibility,” says Wolf. “Only humans are able to react to altered conditions and to unforeseen situations. Only humans possess such a high degree of sensory perception. It is currently not foreseeable that industria l robots will possess such capabilities.
” In the meantime, the BMW foundry is striving ahead with new foundry applications. Aluminum is predominantly used in the core handling process but magnesium also plays a key role in the foundry’s production. BMW has invested 110 million euros to extend its pressure-casting operations and build a new magnesium foundry covering an area of more than 10,000 square meters. The new foundry houses five furnaces capable of casting a total of 7,500 kilograms of magnesium per hour. The first casting using magnesium took place on 21st January 2004.
The Landshut plant not only makes use of innovative technology thanks to ABB robots, it also has become an innovator itself. BMW has made a breakthrough in technology by developing the world’s first composite crank case made of magnesium with an aluminum insert for the straight-six engine. This makes the BMW Group the first manufacturer of a water-cooled combustion engine fully exploiting the substantial weight benefits of magnesium. This means the weight of future cars can be reduced. And that equals lighter and therefore more fuel-efficient BMWs powering down our motorways in the future.

Benefits of using ABB robots:

- Able to carry out tasks in dangerous working conditions
- Reduced risks of accidents at work
- Able to work in difficult working conditions,such as high temperatures and where chemicals are present
- Guaranteed accuracy for repetitive tasks
- High availability
- Reliability



BMW Foundry in Landshut, Germany

- Established in 1990
- Produces light alloy components for almost all of BMW’s range of vehicles
- Production focuses on cylinder heads and compound crank cases for BMW 2-, 4-, 6-, 8-, 10-, and 12- cylinder engines
- Production aims are 300,000 cylinder heads per year and 500,000 crank cases
- Processes some 35,000 tons of light metal alloy each year
- Employs around 1,350 workers in the foundry.

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