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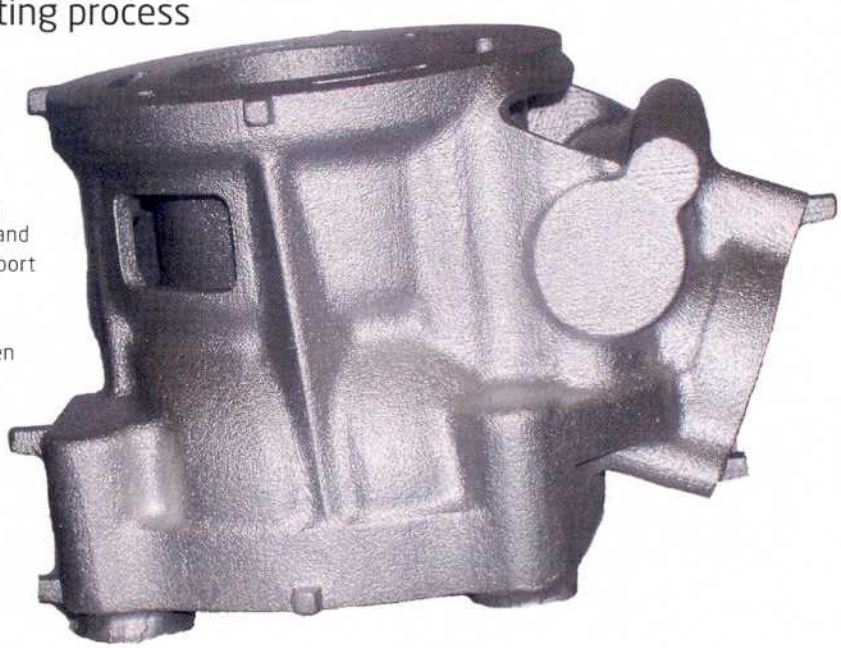
Ultra rapid casting

CRP Technology rolls out the development of a new casting process

Over the last 20 years, there have been numerous inventions and innovations in motorsport manufacturing. One of the most notable developments has been the uptake of rapid prototyping, and one of the leading suppliers in this area is the Italian firm CRP Technology. Recently, the company revealed the development of ultra rapid casting.



The high quality of this un-machined motorcycle cylinder casting is evident

The application for this new process has involved the engine on the CRP Racing Honda 125cc racing motorcycle. The Honda's single cylinder always runs at high temperatures, in some places peaking at as much as 600degC, and has to withstand 14,000 ignitions each minute. By way of a comparison, a cylinder in a current specification Formula 1 engine running at its 19,000rpm limit will only have to withstand 9,500 ignitions per minute.

Performance gains in a two-stroke engine are mainly found by modifying the intake and exhaust ports that are integral parts of the cylinder. Their geometry therefore becomes the main focus for power development in engine design. However, it is often not possible to CNC machine them as the complex shape of the last portion of the exhaust port, often with deep undercuts, means an unreachable tool path. As a result, very high-quality castings are absolutely critical in this area.

The standard manufacturing procedure for such parts is sand casting and it is possible to obtain very good results with the right equipment. The trouble is this equipment is beyond the means of most of the motorsport industry. Tools are expensive and the process requires a lengthy manufacturing time. However, using its new ultra rapid casting technology, CRP's in-house race team was able to test and validate seven different drawings and castings in only 10 months, an output almost unthinkable with sand casting.

PERFECTLY ISOTROPIC

The real novelty of the new process is that, being a low-pressure casting, the melted alloy flows in the mould very smoothly and there are no bubbles or casting porosity issues when finished. The structure is therefore perfectly isotropic and there is almost no need for any weld repair. Finally, the component is machined and fully inspected. As a consequence, this new technology has all the positive elements of rapid casting, but it's much quicker

EVOLUTIONARY PROCESS

The ultra rapid casting is an evolution of the rapid casting process that was developed by CRP Technology (details of which can be found on www.racecar-engineering.com)

The procedure

STEP 1
A disposable pattern is made using Windform PS

STEP 2
The pattern undergoes wax infiltrations (immersion and capillarity) to increase its strength and avoid potential handling breaks

STEP 3
The pattern is immersed in a plaster-like bath

STEP 4
The lost pattern is evacuated by de-waxing inside an oven

STEP 5
The alloy casting is made in a low-pressure environment

STEP 6
Pouring, cooling, reduction of the mould, and gate cutting when needed, as well as shot peening and heat treatments as necessary

CRP Racing's Honda 125 race bike uses an ultra rapid cylinder casting