

Rapid Manufacturing for highly stressed fibre-reinforced plastic parts: Motorbike Dashboard and Support made by Windform[®] XT and SLS Technology

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Abstract

The most important thing in Motorsport races is the final performance and the possibility to produce a high quality new component in a very short time. When modifications are needed, Rapid Manufacturing allows them, saving time, weight and cost even when only few parts are produced thus allowing the shape to be more complex: a big step ahead compared to the aluminium and magnesium parts used in the past which needed to be machined.

CRP Technology's RP Department developed the project of a Windform[®] XT motorbike dashboard and its support made with selective laser sintering technology in collaboration with CRP Racing.

It was necessary to produce a special dashboard to host the motorbike's electronic system developed internally by CRP Racing, which had to be light and stiff at the same time. Completely different from the original one, a new support was needed and the positioning of the exhaust servo motor had to be changed as well.

The new Windform[®] XT dashboard made by SLS has a big news indeed: it is an all-in-one ECU, DATALOGGER and DASHBOARD box!



Figure 1 – Riccardo Moretti - 2007 Road Racing Italian Championship (CIV).

The goals

The particular must be ready to face water infiltrations, vibrations, crashes, high or low temperatures and so on.

The component has to be also waterproof and stiff enough to protect the internal fragile components.

Moreover, its shape is optimized to fit the small space inside the upper fairing and the rider's view needs.

All these characteristics are important for the final performance: if the electronic components of the motorbike don't work neither the bike can work!



Figure 2 – The new Windform® XT Dashboard made by SLS

CRP Racing Department

CRP Racing has been founded in December 2006, as CRP Technology's Racing Department. Its first goal is to bring its innovative way of working into a very conservative world: the Motorcycling Racing World, as already done in other top categories, from F1 to Rally Raid and from Le Mans Series to WRC. More than 30 years of experience in Motorsport at top level allows it to jump the boundaries of the motorcycles sector, where CRP Technology mainly worked with its engineering staff.



Figure 3 – CRP Racing Team

The Racing department can obviously exploit the technical and logistic support of CRP Technology and take advantage of its Hi-Technology for the racing market.

The competitive spirit of this new reality started with the 2007 Road Racing Italian Championship (CIV). The bikes were first tested and set up on the CIV tracks and then on RS 125GP Honda Trophy tracks, with two Honda RS 125GP bikes, developed inside the Italian factory, besides designing and testing these projects on the dyno.



Figure 4 – Our rider, Riccardo Moretti, in action

Motorbike case Study: Dashboard and Support made by Windform® XT and Ls Technology

One of the projects followed by CRP Technology's RP Department in collaboration with CRP Racing has been the DASHBOARD and SUPPORT for the 125GP HONDA currently racing in the above-mentioned championships with great results.

The new dashboard used on the CRP Racing's 125GP Honda has a logger for data recording during the working of the vehicle, and has an integrated engine control unit completely "open". It was necessary to have a very powerful system for the calculations and a very big amount of channels at disposal in order to ensure the development of the whole system (bike/engine/electronics) and that's why we chose this solution.



Figure 5 – The new Dashboard and Support used on the CRP Racing's 125GP Honda

The dimensions and the weight of this system are really important. Usually, the boxes are made of Aluminium or Magnesium alloy, the ECU is fundamental for the engine performance and it really has to be protected in the better way. In order to minimize its weight and therefore its influence on the bike's balance, the characteristics of the Windform® XT material were exploited to realize ECU/DASHBOARD box and its support that fixes it to the frame of the vehicle.



Figure 6 – The Dashboard and Support

In detail the box has been realized with a of 1,2 - 1,5 mm thickness and "wraps" electronic boards.

It consists of 4 parts: the container, the cover, the rev counter serigraphy support and the internal cap.





Figure 7– Particulars of the CRP ECU

Windform® XT material was chosen because better and most performing compared to the other materials previously used such as Magnesium and aluminium.

Windform® XT allows:

- To obtain an extremely lighter part in a very shorter time, as only RM can offer;
- To realize a more complex shape of the part;
- To save money on the cost of the machined part.

Launched at Euromold 2004, Windform® XT, last of famous Windform® family, is created for Hi-Performance market, where the carbon fiber filled marks the difference. Windform® XT, carbon fibre filled, allows the creation of high-end functional prototypes and production parts, the real challenge for the other RP materials, and so far unsurpassed, therefore leading to Rapid Manufacturing applications. Technical Data Sheets are available on line, so can be checked and downloaded at any moment

As everybody knows, Windform® XT (unlike Windform® GF) has a certain permeability and the external box and the cap are therefore being impregnated by an apposite resin, so that the Dashboard actually becomes waterproof.

To finish the product it is necessary to stick the external serigraphy on the cover: it has

an aesthetical and dashboard closing function.

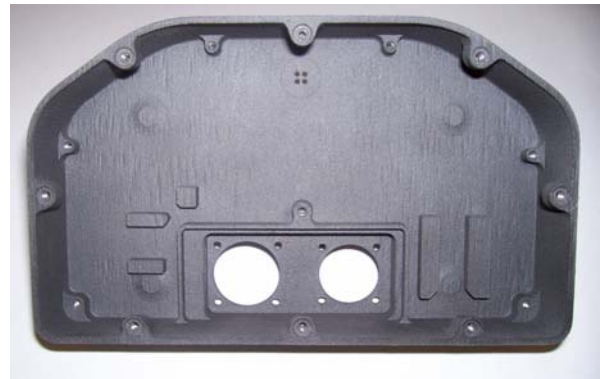


Figure 8 – CRP ECU ready to be assembled

During the 2007 Road Racing Italian Championship's race at Monza, the weather conditions were quite bad during the whole weekend. It was therefore an occasion to test the waterproof qualities of the Dashboard.

On one version, there were small water infiltrations during a practice session made under heavy rain. The weak point was the external serigraphy, especially the adhesive. In fact in case of high humidity it loses its own characteristics allowing the water to infiltrate inside the dashboard. What we must highlight is that in spite of some water inside the ECU, the official practice session could be ended anyway. Later, to solve the problem, we realized two different kinds of external covers. In the first one, we glued the serigraphy with a specific adhesive for Windform® XT, while in the second one we made a

housing to insert and stuck some Plexiglas screens from the inside.



Figure 9 – ECU/Dashboard covers

Both solutions gave positive waterproof qualities results. The dimensions of the dashboard were different compared to the standard ones and this is why we had to use a special support, still made in Windform® XT and fixed to an aluminium pipe thanks to 4 screws.



Figure 10 – Dashboard Support (front view)



Figure 11 – Dashboard Support (side view)



Figure 12 – Dashboard support (lower view)



Figure 13– Dashboard and Support on the bike

The support is fixed to the pipe by a “clamp” system, and a small pin was studied to avoid the rotation of the whole system along the axle, . This small fragile pin, in case of a crash, brakes and in spite of the hit the dashboard can move and this reduces the risk of any damage.

The efficiency of this system was checked during the winter tests, when the rider violently crashed as he was busy forcing the rhythm to verify the set up of the bike. In this case, the small pin broke itself allowing a rotation of the dashboard as predicted. The related damage was limited to the perforation of the external serigraphy without any damage to the internal hardware.



Figure 14 – Support and fixing system

As it can be seen in the pictures both the dashboard and the support are united by a mechanical fixing through screws and elicoil. This guarantees the possibility to disassemble the various components again and again.

The dashboard support also holds the exhaust servo motor and the fuel tank solenoid valve. In spite of the violent accelerations and decelerations, the support always goes on working in the right way and can even resist to the vibrations transmitted to the ECU.



Figure 15 – Complete assembly

Conclusion

The most important thing in Motorsport races is the final performance and the possibility to produce a high quality new component in a very short time. When modifications are needed, Rapid Manufacturing allows them, saving time, weight and cost even when only few parts are produced, allowing the shape to be more complex: a big step ahead compared to the aluminium and magnesium parts used in the past which needed to be machined.