

## HONDA RACING F1 TEAM: RACING TO THE FRONT OF THE GRID WITH PERKINELMER

### THE HONDA RACING F1 TEAM USES A VARIETY OF PERKINELMER INSTRUMENTATION AS PART OF ITS EVERYDAY ROUTINE TESTING AND FAULT ANALYSIS

#### **New Sporting Regulations, Honda Racing F1 Team and used oil condition monitoring**

The Fédération Internationale de l'Automobile (FIA) 2008 Sporting Regulations state that gearboxes must be used on the race car for four races. This new ruling places a direct emphasis upon the requirement for a method of periodically analysing the gearbox and engine for an indication of its wear. To do this, the Honda Racing F1 Team utilize the Optima 5300V Inductively Coupled Plasma (ICP) to analyze samples of gearbox oil taken from the dynamometer and correlate these samples to those taken trackside. By plotting the 'normal' wear of the gearbox internals and mapping the increase in wear metals, it is possible to build a profile of what levels of wear are considered acceptable and not race critical. When trackside samples fall outside of these levels and an increase in wear metals is greater than expected then a decision is to be taken whether to change the gearbox or not. This decision is critical and a gearbox change before the four race limit will result in a 5 place penalty on the starting grid.

#### **The versatility of a modern day FT-IR spectrometer**

In conjunction with the ICP analysis, the Honda Racing F1 Team use the Spectrum 100 Fourier Transform Infrared (FT-IR) spectrometer with the automated Oil Express system to check for the presence of worn seals and non-metallic debris present in the used oil. The Spectrum 100 is used very frequently for fault finding and is the instrument within the lab that is used for the widest range of activities, which can range from determining clutch plate contamination to testing cooling system flush cycle rinse outs to ensure that the radiators are properly cleaned. Small samples of fluids are often brought to the Material Testing lab, which are suspected to be contaminated. The Spectrum 100 is used in conjunction with a database of reference spectra, built up by the Honda Racing F1 Team, to establish, what, if any, contaminants are present. This information is used to help reduce the number of defects which could lead to accidents or race stopping faults.

#### **Checking the adhesive quality with PerkinElmer Instruments**

The PerkinElmer DMA is used for checking the quality of adhesives for their mechanical properties. By doing a temperature and frequency scan, the Honda Racing F1 Team use the results from the storage modulus, loss modulus and peak tan delta to determine the suitability of the adhesive for its proposed use. The Honda Racing F1 Team also uses the DMA with quartz probe and sample holder to determine the thermal expansion of temperature critical materials.

#### **The adhesive test and DSC**

Safety critical items such as suspension components have bonded joints within them, which transmit very high loads through them. It is, therefore, imperative that the structural integrity of these joints is proven. By using the PerkinElmer DSC with autosampler, it is possible for the Honda Racing F1 Team to establish the glass transition temperature (T<sub>g</sub>) of a sample of adhesive supplied to the lab by the composites department. By inspecting the T<sub>g</sub> plot, we are able to determine at what temperature the adhesive has cured, if a comprehensive cure has taken place and if the two part adhesive has been properly mixed. On rare occasions, a sample will fail the adhesive test, and so its Corresponding component is pulled out of its manufacturing path and re-cured.

When this occurs, the adhesive sample is also re-cured with the component, to give an accurate representation, and then the adhesive is re-tested. On the rarest of circumstances, the adhesive will fail its second test, and this then requires that the component is withdrawn completely from the manufacturing process, and either scrapped or re-worked. This type of testing is again safety critical as an insufficiently cured adhesive could cause the component to fail, and in the example of a suspension component, could result in failure at high speed or cornering, causing an accident.

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**Honda Racing F1 Team**

Powering dreams one lap at a time