

NEWSWATCH

FORMULA ONE Honda fired up its 2015 Formula One engine for the first time in mid-October and posted an audio clip on YouTube:

<http://youtu.be/431h20gvm3M>

The 1.6 litre V6 turbo with associated energy recovery technology is undergoing development in Japan. Midway through next year Honda will start operations from a UK Formula One engine base in Milton Keynes. This is a new facility, into which Mugen's European arm is also moving (from premises next to Cosworth in St James Mill Road, Northampton). The 2015 power unit will be supplied to McLaren on an exclusive basis from 2015, the Woking, UK, team in the meantime using the new-generation Mercedes unit.

Mercedes AMG HPP will continue to supply Force India, in addition to the Mercedes factory team (born out of Brawn, which in turn was born out of the Honda factory team that closed at the end of 2008), and will add Williams (which is switching from Renault) to its roster. From 2014, Ferrari will supply its own team and Sauber, and will add Marussia (ex-Cosworth), having lost Toro Rosso to Renault. Renault will also continue to supply Red Bull, Caterham and Lotus, although at the time of writing Lotus had not signed on the dotted line.

TECHNOLOGY The standard two-piece rear crankshaft main seal in Chevrolet Big Block race engines is notorious for its lack of reliability and oil leaks. To address this, GST Racing Seals has brought new technology to the application. Chris Gregory of

TECHNO TOPIC: AV MOUNT DESIGN

The increasing use of energy recovery systems in professional motorsport has created a need for anti-vibration (AV) mounting to protect electrical components against the rigours of the racecar environment. To design such mounts effectively is beyond the capability of established linear FEA, so how can you go about it?

We should start by recognising that stiffness is a property of a structure that characterises its response to an applied load, and is primarily influenced by shape, material and part support. If a change in stiffness is small enough, it is reasonable to assume that neither shape nor material properties change during the deformation process. This assumption is the fundamental principle of the widely used linear FEA software, which nowadays is routinely incorporated into CAD packages.

As a specialist supplier of sealing solutions for motorsport and military applications, Race-Tec Sealing has had to develop a high level of non-linear FEA capability. It is the stiffness factor that primarily differentiates non-linear from linear FEA; seals are not stiff. Race-Tec Sealing has recently upgraded its non-linear FEA package to allow vibration isolators and shock absorbers to be simulated, allowing it to offer custom-designed AV components.

Race-Tec Sealing's Richard Kennison explained, "Over the past decade we have been developing our non-linear FEA capability in conjunction with our software provider, and numerous hours have been spent gathering the necessary performance data across a wide range of operating temperatures for the elastomeric materials being used.

"Our material testing capability has been further extended, allowing Dynamic Modulus Analysis [DMA], providing storage and loss modulus on compounds from 0.1 Hz to 600 Hz. Using Temperature Time Supposition data analysis, complete material frequency data can be created to enable a sophisticated model of a material's properties to be established.

"Using MSC Software's Marc non-linear FEA package, we prepare for the simulation by creating a 2D or 3D model of the proposed component design; the mesh is defined manually in the most critical areas. The mass of the system to be simulated is applied using a control node positioned at the centre of gravity of the system. The polynomial material model from the DMA testing is imported, enabling the simulation of the isolator's frequency response to be completed.

"The software allows for harmonic analysis based on the application's disturbing frequencies, and provides a frequency response curve. The software can also supply displacement, acceleration and velocity response if required. Maximum transmissibility of the isolator occurs at a resonance when the ratio of the disturbing frequency is equal to one of the natural frequencies of the response. The magnitude of an isolator's amplification at resonance is a function of its damping coefficient collected from the DMA testing.

"A typical example of this type of analysis is for vibration isolation mounts that support the KERS components used in Formula One. The analysis is used to fine-tune mount geometry to ensure that the isolator mount's resonance frequency does not coincide with disturbing frequencies from the engine or extreme vertical *g* events caused by kerbing or off-track excursions, ensuring damaging amplification is kept to a minimum," he said.

the company explained that its seal, "is split in only one place, so reducing to one the number of potential leak paths, and this split line is positioned to the upper end of the seal annulus, moving it well away from the oil sources.

He added, "In addition, our seal has two lips, one of which has a bonded PTFE liner [on the flywheel side] and the other being the oil control lip, which has our highly efficient HD2 Bi-Directional Hydrodynamic helix to assist in dynamic sealing.

"A third factor is that the seal incorporates a flexible metal 'stiffener' bonded into the seal body. After cutting the seal radially, this stiffener allows the

seal to be flexed around the crankshaft and eased into the engine block. When the rear main bearing holder is tightened, the whole seal is compressed, increasing the rigidity of the seal body to resist the effects of vacuum and rotation. This has enabled the seal to be run in dry-sump engines holding a vacuum at 25.0 in Hg."

Thus, Gregory pointed out, this seal is effective in both wet and dry-sump engines. He said, "What we achieved in initial tests on the dyno was good vacuum sealing, a measured power increase of 12 bhp, a torque increase of up to 12 lb-ft and elimination of oil leakage. Following this success we have

now developed similar products for Small Block Chevrolets."

ERRATUM In our previous issue (*RET 73*, September/October 2013) our comparison of the Cosworth CA and the DFV V8s (pages 6 and 7) discussed the Lovell Factor – inlet valve head-based mean gas velocity (MGV). We quoted figures for the DFV and the CA, and for the TJ V10 that preceded the CA. Alas, a slip of the calculator meant our TJ data was incorrect. As we mentioned, the 3.0 litre TJ had a 95 mm bore, a peak power speed of 18,500 rpm and valve sizes ranging from 32.9% to 37.2% of bore area but we should have quoted 70-79 m/s as its MGV.

RET-MONITOR

Camless operation?

Are camshafts on their way out?

John Coxon considers this in the September/October edition of our online *RET-Monitor* (www.highpowermedia.com/RET-Monitor) which is free-to-access, – look for the "Camshaft" keyword.

"Optimised over a narrow window of engine operating range, in one way the camshaft can be used to enhance engine performance, but in others ways it can also limit it," he writes. "So when optimised at one particular condition, in the real world where engines are used at a much wider range of speeds and loads, overall the engine may become woefully inefficient. Cam phasers, to adjust intake or exhaust timing (or both) are one way to limit the damage, but to tackle the real problem – according to many – the camshaft has to be discarded completely."

While admitting that they are not totally camless, John discusses hydraulic systems before going on to talk about electromagnetic systems. "Such systems are generally based on linear spring-mass actuators, and use the principle of the potential energy exchange between two springs and magnetic coils to control the position of the armature to which the valves are attached. For such a system to be acceptable, key characteristics should offer the quickest opening and closing time for high-speed operation, an acceptable impact velocity when closing and, above all, low electrical power consumption."

John discusses typical electromagnetic systems, then says, "Clearly even these designs are not totally ideal, having fixed valve lifts, but while these systems are not yet market-ready, given sufficient impetus in the way of governmental fiscal penalties and fuel economy or CO₂ targets for passenger cars, that day will shortly come."

Want the full story? Of course you do! So don't delay – go to www.highpowermedia.com/RET-Monitor right now (it's free and massively informative).

2013/14 PLANNER
KEY EVENTS FOR POWERTRAIN PROFESSIONALS

PERFORMANCE RACING INDUSTRY (PRI) SHOW

Indiana Convention Center, Indianapolis, Indiana; *Thursday December 12; Friday December 13; Saturday December 14 2013*. Having had an eight-year holiday in the Florida sun PRI returns home to the heart of the US open wheel racing industry.

AUTOSPORT ENGINEERING 2014

National Exhibition Centre (NEC), Birmingham, England; *Thursday January 9; Friday January 10 2014*. A show within 'Autosport International' packed with the latest technology: Feel the pulse of advanced racing technology here!

ENGINE EXPO 2014


Messe Stuttgart, Stuttgart, Germany; *Tuesday June 24; Wednesday June 25; Thursday June 26 2014*. This is the definitive road-race crossover event, with a stimulating exchange of knowledge. It takes place within the context of a wider automotive technology show.

ENGINE EXPO NORTH AMERICA


The Suburban Collection Showplace, Novi, Michigan; *Tuesday October 28; Wednesday October 29; Thursday October 30 2014*. The fifth running of the North American version of the long-established Engine Expo in Stuttgart, likewise road-focused but with race relevance.

PROFESSIONAL MOTORSPORT WORLD EXPO



Cologne Messe, Cologne, Germany; *Thursday November 13; Friday November 14; Saturday November 15 2014*. Now established as a must-visit trade-only show, held at the right time to influence plans for the following season.





OMEGA PISTONS


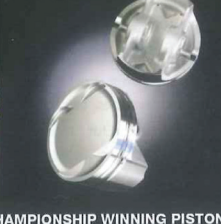


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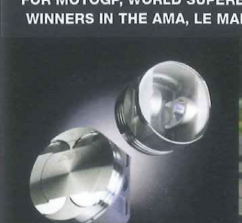




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Omega Pistons

Oak Barn Road, Halesowen
West Midlands B62 9DW

Tel: 0121 559 6778
Fax: 0121 559 6779
info@omegapistons.com
www.omegapistons.com

