



Dodge engineers had three objectives for R6P8: greater power, increased coolant flow, and weight reduction

Sixth sense

After almost two years of design and development, the new R6P8 NASCAR Sprint Cup engine from Dodge Motorsports has finally made its race debut

WORDS BY GRAHAM HEEPS

➔ Having taken stock of key competitors Chevrolet and Toyota, both of whom introduced all-new engines to the NASCAR Sprint Cup in 2007, Dodge and its teams have been busy readying a replacement NASCAR engine for the R5P7, which has served the marque since it returned to top-flight stock-car racing in 2001.

The new motor – known as R6P8 – is the sixth generation of the R block and eighth version of the P-type (polysphere chamber) head. Kurt Busch's Penske Dodge Charger was the first car to race with the engine and scored third place at Lowe's Motor Speedway on October 11th.

Dodge began work on R6P8 in November 2006 in order to get key parts approved by NASCAR in September 2007. That in turn opened the door to the engine making its race debut in 2008, but in partnership with the manufacturer the Dodge teams have spent most of this year doing durability and performance development work.

In the design phase, Dodge took the lead and provided the resources to create the CAD models from which the components are manufactured. "The teams supplied their input,

ensuring we were considering all of their needs," says David Eovaldi of Dodge Motorsports Engineering (NASCAR).

"For this engine, Dodge took the lead to validate components and test durability," he adds. "However, each team has the responsibility to test the engines under their own prescribed durability metrics. Dodge receives feedback on the results of these tests and addresses the issues as necessary." Dodge also helps the builders in key engine performance areas such as exhaust port and intake manifold. "Each team has experts in

In October, Kurt Busch's #2 Penske Dodge Charger took R6P8 to third place in only its second race start



this area who can create the best port and manifold designs to complement their engine packages," Eovaldi explains. "We do work in this area and offer alternative designs for the teams to evaluate."

Working within the tight rule constraints prescribed by NASCAR, Dodge engineers had three objectives for R6P8: create greater power potential; increase coolant flow; and reduce weight. To help meet them, 'R6' has a lighter block and heads than its predecessor; the distributor has been moved to the front of the engine, potentially reducing spark scatter and improving accessibility; and several external oil lines have been replaced with passages internal to the head and block.

Dodge has also achieved its goal on cooling. "One of the biggest changes we've made is to provide more coolant flow through the engine," says Eovaldi. "We also have several orifices in the system that allow the teams a high degree of tunability. They can direct the water where they feel they need it the most."

Indeed, the flexibility to meet the demands of different builders is another key feature of the engine. "We've tried to make it as robust as possible, providing as much

design freedom to the teams as we could," he says. "For example, each engine builder may have slightly different oil flow requirements, so in the block and head designs we've provided adequate gallery sizes and room for restrictors. This means the engine builders can create their own oiling systems and adjust pressure and flow where they need it most."

Also designed into the engine is a cable-driven fuel pump drive from the back of the cam (electrically powered pumps are not permitted). The rear of the block, the bell housing and camshaft were all designed for a cable-driven pump that is located on top of the fuel cell. This feature is also available on the R5P7, but was not part of the initial design.

In terms of parts, the new powerplant has little in common with the R5P7. NASCAR's new guidelines call for a right-bank-leading engine, whereas the current R5P7 engine is left-bank-leading. "This change alone drove an entirely new design," says Eovaldi.

Material choices were also restricted: cast iron for block; aluminum alloy for cylinder heads and intake manifold. "There is freedom, however, in the grade of material you choose," he says. "For example, other manufacturers have gone with CGI for the block, but we're using a high-grade cast-iron, still with a lot of CGI's structural capabilities, but it's lighter and a bit cheaper. Likewise you can specify different alloys for the heads and intake manifold – 319, 356, or 354 for example – but nothing exotic."

The rules place further limitations when it comes to key dimensions. The teams decide the final bore size and thus engine capacity, although in most cases they will go with the 4.185in bore and 358ci capacity maximums for the Sprint Cup, balanced against the longevity demands of a block that needs re-honing on each rebuild. A further NASCAR constraint applies to the 4.50in bore spacing. "Dodge has never had an issue with the current R5P7 bore spacing of 4.460in for size or cooling," states Eovaldi. "NASCAR still controls the maximum bore diameter, so using this larger bore spacing was not an advantage for us.

"But even though this was an increase to the bore spacing by 0.040in, the overall length of the R6 was reduced by more than 0.5in over the R5 block," he reveals. "We reduced the overhang on the front and rear face of block, and thinner walls and removal of the skirt were big factors in reducing the block weight. Weight in the head was also reduced with thinner cast walls, as well as making the entire head casting narrower." ❖



Business law specialist Ronaldo Sallows answers your questions

Q My leased factory, which housed combustible material (plastics and raw materials), partly burned down last year during a fireworks display, and the cause is still being disputed. The insurers think the date is suspicious. Apart from this issue, I cannot supply my existing orders for which I have long running contracts. What's the story?

A Your insurance agreement is *uberimmae fidei*, which basically means 'of utmost good faith'. As a result of this term, you may find you are not covered for your losses if you have not disclosed to the insurer all material facts, deliberately or otherwise, whether you think they are facts or not, and those facts may have meant that the insurer might not have offered you insurance in the first place or you are implicated in a fraud. Those losses would include re-building and other related costs, rent and loss of profits. There may also be a criminal investigation, for which your director's liability insurance is unlikely to pay your costs. As a result, you may have claims coming at you from your landlord for rent payment and dilapidations, and from counterparties to your contracts, depending on whether the contracts can be deemed to have been terminated by an "act of god" or, as it is also known, *force majeure* and having pre-agreed consequences set out in the contract. Although a little late for you in this particular case, businesses need to study their insurance terms and cover very carefully and have their lawyers negotiate agreements, including leases, with detailed *force majeure* clauses. An act of god that you have not addressed in an agreement does not necessarily mean you will be freed without monetary consequences, because default laws relating to *force majeure* are very complex and tend to be harsh. • See also *Disaster recovery*, page 26

Ask Ronaldo

Ronaldo Sallows will be taking a break from his column in 2009, but can still be reached via motorsport@ukintpress.com