

Groundbreaking thinking for groundbreaking equipment – A ZERO CARBON SOLUTION

DCS members were privileged to get an insight into (quite literally) groundbreaking patented technology when they visited the JCB engine plant at the company's dedicated facility in Derbyshire (UK) in July.

The pioneering one hundred-million-pound initiative to develop super-efficient hydrogen combustion engines is JCB's zero carbon emissions solution for construction and agricultural equipment. The chance to visit the facility and witness first-hand how the technology is progressing was too good an opportunity for DCS members to miss.

Providing a detailed presentation, the unveiling of the engine for closer inspection by the group and a factory tour, principal engineer for J C Bamford Excavators Ltd, Tom Beamish, explained the rationale behind the project. "We considered electric for some time but electric only gains some savings, we need carbon free fuel to get to zero emissions. This is part of our efficiency drive to provide customers with more cost-effective machines and less fuel costs, having scrutinised existing machines to identify all the wastage in machine systems."

Beamish explained that the thinking behind the move to hydrogen was born out of trials with other technologies. JCB's commitment to reducing emissions goes back almost 25 years and the latest diesel engines are designed to comply with European Stage V regulations have already delivered a 97 per cent reduction in NOx emissions since 1999 and a 98 per cent reduction in particulates. In addition, JCB's drive to reduce fuel consumption means today's JCB machines use fifty per cent less fuel on average than those manufactured more than a decade ago. This has saved sixteen billion litres of fuel – equivalent to 53 million tonnes of CO₂.

The company has also been at the forefront of electric technology development to meet customers' demands for zero carbon products. However, while battery electric is suitable for smaller machines which do fewer hours and typically use less fuel, larger machines have a higher energy requirement. This would result in larger batteries, which would take longer to charge, making them less suitable for machines which work multiple daily shifts and do not have the available downtime to recharge.

As a result, JCB has concentrated its development of electric machines on its compact range, including the 525-60E Loadall telehandler and the 19C-1E mini excavator – the world's first electric mini excavator. As the company examines future fuels which deliver zero emissions, it has considered a range of possibilities. In its search for a mobile fuel which can be taken to the machine, ensuring maximum uptime and fast refuelling, HVO, biogas, E-fuels, ammonia, and hydrogen have all come under the microscope. Interestingly, JCB engines have been approved for use with HVO since Stage IIIB/Tier 4i engine legislation came into force.

As many alternative fuels require the production of hydrogen to make, it became clear that using hydrogen in the first place made sense as it is a clean zero carbon fuel which

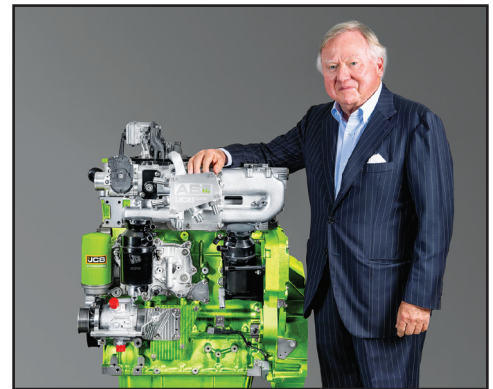
can be produced from renewable energy. As part of its hydrogen development, JCB also investigated its use in fuel cells and in July 2020 unveiled the construction industry's first ever hydrogen powered excavator – a 20-tonne 220X. Beamish explained that, following several trials, JCB concluded that fuel cells are too expensive, too complicated and not robust enough for construction and agricultural equipment. The answer therefore became clear.

Prototype JCB hydrogen engines are already powering backhoe loaders and Loadall telescopic handlers. JCB has also made a breakthrough in proving the wider appeal of hydrogen combustion technology by installing one of the super-efficient hydrogen engines into a 7.5 tonne Mercedes truck – a retrofit which was completed in just days. JCB has also unveiled its very own designed and built mobile refuelling bowser to take the fuel to the machines remotely wherever they are being used. The bowser has enough hydrogen gas to fill sixteen hydrogen backhoe loaders and can be transported either on the back of a modified JCB Fastrac tractor or on a trailer.

Same power, same torque – zero carbon, zero compromise
Using and adapting established engine technology with readily available components, hydrogen is combusted, and power is delivered in the same way as a diesel engine. Thus, the prototype backhoe loader, fitted with the new hydrogen motor, can do everything its diesel-powered equivalent can do. The technology is also less complicated than hydrogen fuel cell technology. Nothing but steam is emitted from the tailpipe resulting in zero CO₂ at point of use.

The new hydrogen engine is constructed using the same diesel engine architecture; thus, it still fits in the same machine and is the same weight. The additions are hydrogen tanks and a refuelling point. They can also be built on the existing three engine production lines offering another advantage for the company.

JCB developed their first hydrogen



engine in just six months and Beamish said the next stage will be production scale up. The plan is for the engines to go to market at the beginning of 2024 with the most pressing barrier to overcome being availability of hydrogen.

Beamish was clear that this is "brand new technology and not a conversion," so there are some ongoing challenges such as: air compression, spark ignition and steam management – all areas that JCB engineers are working to solve.

The initiative is being driven from the top. JCB chairman Anthony Bamford (pictured above) is leading the project. In a statement, Lord Bamford said: "The JCB engineering team has made enormous strides in a short space of time to develop a hydrogen internal combustion engine. The team has gone back to first principles to completely re-design the combustion process to work for hydrogen. In doing so they have achieved two major things: secured JCB's place in history as the first construction equipment company to develop a fully working combustion engine fuelled by hydrogen and steered us towards the production of a landmark fifty hydrogen combustion engines.

"The unique combustion properties of hydrogen enable the hydrogen engine to deliver the same power, the same torque, and the same efficiency that powers JCB machines today, but in a zero carbon way. Hydrogen combustion engines also offer other significant benefits. By leveraging diesel engine technology and components, they do not require rare earth elements and critically, combustion technology is already well proven on construction and agricultural equipment. It is a technology which is cost effective, robust, reliable and well-known throughout not just the construction and agricultural industry, but the whole world."

The DCS thanks JCB for this exceptional visit.



Diecasting Society National Golf Day 2023

Phew...the sun shone brightly on the Diecasting Society National Golf Day, which was held on Friday 8th September at Moor Hall Golf Club, Sutton Coldfield (UK), writes Pankaj Wara, Coleshill Aluminium.

A total of 25 golfers – comprising DCS members and their guests – started the day with bacon sandwiches and coffee. The weather was clear and warm – perfect for a round of golf. The players teed off for the morning warm-up.

The morning eleven-hole event was won by Steve Gill of Lupton & Place.

After lunch other members joined the group taking the total to 30 golfers, and the main tournament, an 18-hole individual Stableford Competition, began at 1pm.

The weather was still glorious, and despite some of the golfers having buggies, it was tough in the heat. Thus, by the time everyone finished the excellent course, there were some very tired golfers.

The sponsors, Coleshill Aluminium, joined all the golfers for an excellent dinner – despite the heat of the evening, diners still managed a very good treacle sponge and custard!

After dinner, Andrew Evans, managing director of Coleshill Aluminium, presented the prizes with incoming Diecasting Society president John Swift, Group MD Alucast Limited.

It is noted that the trophy can only be won by a Diecasting Society member – so the winner of the tournament and recipient of the trophy was DCS member Mike Dines, Tandom Metallurgical Group.

The Society thanks Coleshill Aluminium for their generous sponsorship of this event. Coleshill Aluminium has supported and sponsored this event for the last sixteen years and the Society is very grateful for their continuing support and for enabling Pankaj Wara to be involved in its organisation.

As always, Moor Hall Golf Club provided an excellent course for the competition, with the grounds looking magnificent. The staff also looked after everyone taking part very well all day.

DCS member David Rowbottom had the thankless job of scoring the cards for



Winner of the morning event Steve Gill of Lupton & Place (centre) with Andrew Evans from Coleshill Aluminium and Diecasting Society president John Swift of Alucast Ltd

the competition and we thank him for undertaking that onerous task.

Finally, we thank ICME and Annie Gough for all their hard work behind the scenes in the organisation of this very successful event.

The DCS is grateful that members support the National Golf Day and numbers have improved this year, thanks to participating members bringing along customers and colleagues.



Coleshill Aluminium has agreed to sponsor again in 2024, which is booked for Friday 6th September 2024 at Moor Hall. Well done and thank you Coleshill.

RESULTS

Longest Drive – Steve Gill
Nearest the Pin – Steve Gill

Morning Event – 11 hole
1st Place – Steve Gill
2nd Place – Duncan Willetts

Afternoon Event – 18 hole Stableford
1st place and trophy winner – Mike Dines
2nd Nick Uttley – (non-member)
3rd Peter Nagle – (non-member)
4th Duncan Willetts – (non-member)
5th Steve Gill
6th Rudi Hercik
7th Alan Overton (non-member)
8th Dave Austin (non-member)



Andrew Evans of Coleshill Aluminium with trophy winner Mike Dines of Tandom Metallurgical Group (centre) and Diecasting Society president John Swift, Alucast Limited

Join the Diecasting Society

Membership is open to both individuals and companies who have an interest in the manufacture of die cast metal products. That interest might be as a foundry or a supplier to a foundry.

Each member receives the *Diecasting Society Newsletter*, and reduced rate attendance at all the Society events, both technical and social. Annual membership is £45.00 for an individual member and £235.00 for companies (which includes four reduced rate places for named employees at the company). The cost for a student or trainee is just £8.50.

To start enjoying the benefits of membership email: dcs@icme.org.uk or visit www.dcsoc.org.uk

CALENDAR OF EVENTS 2023

We are pleased to announce the following will be taking place this year.

Thursday 19th October
Coventry Transport Museum – Museum Guided Tour
DCS Members: £30.00,
Apprentices/Under 21: £20.00
Price includes buffet lunch.
Limited numbers, please book

November – date TBC
Aston Martin – Works Visit
Gaydon, Warwickshire
Limited numbers, please book

Thursday 7th December
A Night at the Dogs – Social Event
Perry Barr Stadium,
Birmingham
Further details and ticket price tbc

*For more information about all events email: dcs@icme.org.uk
Please note that booking is essential*