Press release

Northampton, October 5th, 2020

MAHLE Jet Ignition ready to be integrated into existing production engines

- MAHLE Powertrain adapts novel MJI technology to provide reliable, consistent performance throughout normal operating conditions with no need for a second ignition source
- Cost-effective passive pre-chamber solution negates need for expensive re-engineering and offers suitability for wide range of production vehicles
- Pre-chamber ignition technology growing in popularity due to performance and efficiency benefits; now fitted to production vehicles

MAHLE Powertrain's latest development of its passive MAHLE Jet Ignition (MJI) technology can now be easily added into existing engine designs with only minimal changes to the final machining process. Continued work throughout the lockdown period means that passive MJI can now be installed as a press-in unit into engines utilising an M12 sparkplug, or larger. MPT will present the latest developments at Aachen Kolloquium this week.

"As the automotive industry seeks ways to unlock incremental efficiency and performance benefits from the internal combustion engine, jet – or pre-chamber – ignition technology is rising to the fore," explains MAHLE Powertrain's head of new technology and data management, Adrian Cooper. "We are beginning to see jet ignition being adopted into high-end production powertrains, such as Maserati's recent Nettuno V6."

MAHLE Powertrain has over 10 years' experience developing its novel MJI pre-chamber ignition technology, which enables a highly efficient combustion process using either a passive or active system, suitable for use with either port or direct fuel injection systems. "We have worked with manufacturers and pinnacle motorsport such as F1 on the integration of this technology for close to ten

years," says Cooper. "However, our recent work on passive MJI makes the technology more accessible for adoption by mass-produced engines even as a retro-fit to existing designs, as part of a highly efficient powertrain."

The passive MJI system features a small pre-chamber, which when ignited discharges extremely fast-moving, heated jets through a series of nozzles. This provides multiple ignition sites within the main combustion chamber, which leads to rapid, highly stable combustion and significantly improved knock mitigation characteristics. This enables the use of a higher compression ratio and in testing, up to a 10% reduction in fuel consumption has been measured.

"We have also used the opportunity during the pandemic to further develop the cold-start and emissions performance," continues Cooper. "Through careful development, we've been able to engineer a system that operates under these conditions without requiring a second ignition source, enabling the system to be applied to existing cylinder heads without the requirement for costly re-engineering. We have adapted an MJI-equipped production engine to start, run and perform reliably at -8 degrees C with equivalent catalyst light-off capability to conventional spark ignition. This is very encouraging, and we'll be continuing development to lower this figure substantially."

Cooper stresses that the key to maximising the benefits of MJI is to understand the vehicle manufacturer's requirements and develop the correct combustion strategy accordingly. "Our experience of integrating these systems means we can tailor MJI to many different applications, from low cost hybrid ICE to down-sized, high specific power engines or even to heavy-duty gas engines. While the engineering effort to integrate the MJI system has been simplified, other engine systems need to be further optimised in order to gain the largest benefits, which might include higher compression ratio, revised inlet camshaft profile and re-matching of the boosting system. A whole system engineering approach is the way to get the best from MJI."

MAHLE Powertrain is now working on the development of a demonstrator engine to showcase the technology's potential in applications between 80kW to 120kW.

The virtual Aachen Kolloquium runs from 5th to 7th October.
https://www.aachener-kolloquium.de/en/

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About MAHLE

MAHLE is a leading international development partner and supplier to the automotive industry. The technology group is committed to playing an active role in transforming the mobility of the future by further optimizing the combustion engine, driving forward the use of alternative fuels, and laying the foundation for the worldwide introduction of e-mobility and other alternative drives, such as fuel cells. The group's product portfolio addresses all the crucial aspects of the powertrain and air conditioning technology.

In 2019, MAHLE generated sales of approximately EUR 12.0 billion and is represented in over 30 countries with more than 77,000 employees in 160 production locations and 16 major research and development centers (last revised: 2019-12-31).

About MAHLE Powertrain

MAHLE Powertrain is a specialist in providing engineering services for the design, development and integration of advanced internal combustion engines and electrified powertrain systems. As a recognised expert in these fields, MAHLE Powertrain is engaged in the extensive research, development and application of new traditional and advanced drivelines into cost-effective, production feasible solutions for enhanced efficiency, improved fuel economy and lower emissions.

As a services subsidiary of the MAHLE Group, MAHLE Powertrain has eight technical centres strategically located in the UK, Germany, USA, China and Brazil and is well-placed to provide solutions around the globe. It operates independently of the main group when considering choice of components or technologies.