MAHLE Powertrain has integrated a 48 V eSupercharger into their latest downsized engine, along with a conventional exhaust driven turbocharger for high speed, full load performance.

This represents a new development in engine boosting technology by hybridisation of the air intake system, making the electrical charging device a fundamental part of the enabling technology. The eSupercharger is, in this application, no longer simply a transient device, but also a key contributor to the low speed steady state engine performance.

This eSupercharged engine has been installed in a demonstrator vehicle developed by MAHLE Powertrain. The 48 V platform used in this application comprises a 3-cell advanced lead acid battery pack, a DC/DC converter to maintain the state of charge of the 12 V battery (which supports the existing 12 V systems), the eSupercharger and a 10 kW BISG (belt integrated starter generator). The latter provides continuous electrical power to the eSupercharger, even when the 48 V battery is depleted. The combination of a heavily downsized gasoline engine, together with the 48V hybridisation applied to this demonstrator vehicle, is expected to yield a combined CO2 reduction of 25 % over the NEDC.
MAHLE eSupercharged Downsizing Engine

Benefits

- 48V hybridisation with electric supercharging
- Energy recuperation via a belt-integrated starter generator
- Extremely high specific power & torque
- Excellent transient response & driveability
- Increased levels of downsizing possible
- Greater CO2 reduction potential

Summary

MAHLE Powertrain’s eSupercharged downsizing demonstrator vehicle provides very high specific output and improved fuel economy. This vehicle employs mild hybridisation with a 48 V battery, electric supercharger and 48 V belt starter generator (BSG). This provides excellent transient response at low speed for enhanced driveability, coupled with reduced CO2 emissions over legislated drive cycles. The BSG enables energy recuperation during deceleration and braking to maintain useful energy levels in the battery.

Technical Specifications & Targets

**Technical specifications eSupercharged Downsizing Engine**

<table>
<thead>
<tr>
<th>Torque curve</th>
<th>Vehicle Targets</th>
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</thead>
<tbody>
<tr>
<td>BMW</td>
<td>Emissions target: 25% reduction compared to baseline</td>
</tr>
<tr>
<td></td>
<td>Emissions target: EU6C</td>
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<tr>
<td></td>
<td>0-100 km/h: 6.4 s</td>
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<tr>
<td></td>
<td>Maximum Speed: 155 mph / 250 km/h</td>
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<tr>
<td></td>
<td>Kerb Weight: 1,545 kg</td>
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