Hydrogen HPDI Internal Combustion Engines

Accelerating the transition to sustainable heavy duty transport
Westport Fuel Systems’ H₂ HPDI technology is a cost effective, high performance solution to support climate neutrality in the heavy-duty mobility sector. Engines optimised to run on hydrogen with H₂ HPDI technology offer many advantages over other pathways, enabling an accelerated adoption of hydrogen as part of a sustainable road freight system.

**CO₂ EMISSIONS**

<table>
<thead>
<tr>
<th>Technology</th>
<th>TTW</th>
<th>WTW</th>
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</thead>
<tbody>
<tr>
<td>HPDI 40% LBM</td>
<td>21%</td>
<td>48%</td>
</tr>
<tr>
<td>HPDI 100% LBM</td>
<td>21%</td>
<td>100%</td>
</tr>
<tr>
<td>H₂ HPDI Blue H₂</td>
<td>44%</td>
<td>97%</td>
</tr>
<tr>
<td>H₂ HPDI 80%/20% Blue-Green</td>
<td>49%</td>
<td>97%</td>
</tr>
<tr>
<td>H₂ HPDI Green H₂</td>
<td>71%</td>
<td>97%</td>
</tr>
<tr>
<td>FCEV Blue H₂</td>
<td>41%</td>
<td>100%</td>
</tr>
<tr>
<td>FCEV 80%/20% Blue-Green</td>
<td>47%</td>
<td>100%</td>
</tr>
<tr>
<td>FCEV Green H₂</td>
<td>68%</td>
<td>100%</td>
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</table>

Technologies that are commonly referred to as “zero emission” are in fact NOT zero CO₂ when assessed on a full fuel cycle and manufacturing basis.

H₂ HPDI almost eliminates tailpipe CO₂ using current technology, while longer term solutions using zero carbon ignition strategies are being explored for zero tailpipe CO₂.

With efficiency approaching or even exceeding that of fuel cells on a life-cycle basis, H₂ HPDI delivers equivalent CO₂ reductions to fuel cell vehicles, at much lower cost.

HPDI with 40% biomethane (LBM) delivers the same life cycle CO₂ reductions as fuel cells using blue/green hydrogen blends, and can deliver zero WTW CO₂ with pure biomethane.

Using technology in commercial use with bioLNG today, H₂ HPDI overcomes many of the challenges of other low carbon solutions for long haul heavy-duty vehicles.
H₂ HPDI offers far greater CO₂ reductions for every Euro of public and private investment, compared to fuel cells. Based on today’s HPDI engine technology, H₂ HPDI avoids reliance on the sensitive and expensive minerals used in fuel cell catalysts and batteries, resulting in far lower cost base than fuel cells. The marginal cost of the additional NOₓ reductions that come from using fuel cells far exceeds the societal cost of NOₓ emissions.

Vehicle performance is critical for fleet managers, who are limited in the compromises they can make to advance sustainability. H₂ HPDI uses the same technology and shares many of its components with existing HPDI LNG powertrains. As a result, H₂ HPDI can utilise existing manufacturing infrastructure, with reduced capital investments, thus expediting time to market.

H₂ HPDI delivers higher performance than spark ignition H₂ ICE: significantly higher efficiency and power density; lower operating cost. H₂ HPDI is a robust solution that doesn’t require extremely pure hydrogen to run, unlike fuel cells.

H₂ HPDI can exceed the performance of current heavy-duty diesel vehicles, while almost eliminating greenhouse gas emissions.
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7 Global Locations

RENEWABLE
Alternative Fuels

70
Countries (Sales)

>100
Global Distributors

1400
Patents & Applications

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