



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



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

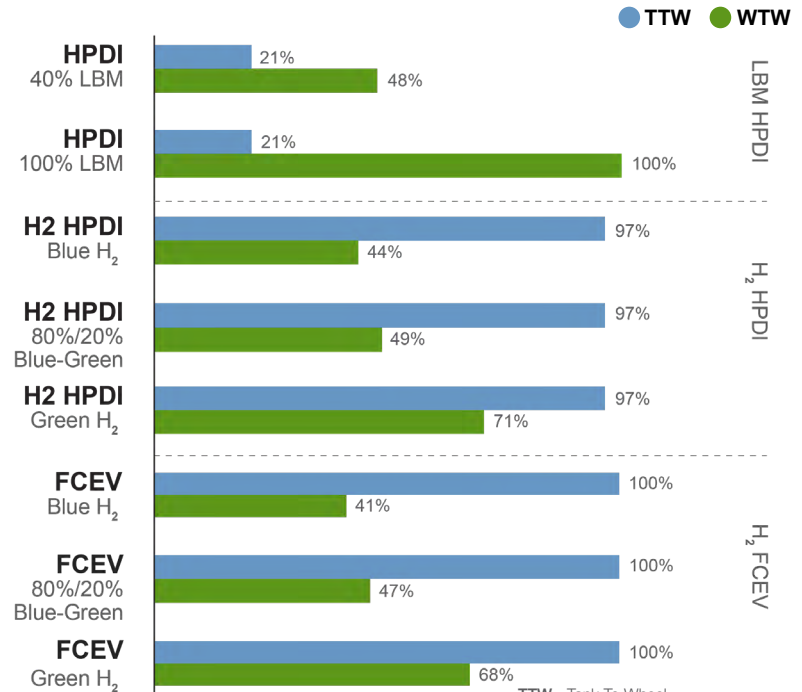


HPDI with 40% biomethane (LBM) delivers the same life cycle CO₂ reductions as fuel cells using blue/green hydrogen blends, and can deliver zero WTW CO₂ with pure biomethane



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

HPDI technology, with either biomethane or hydrogen, delivers industry leading CO₂ reductions for long haul road freight



TTW - Tank To Wheel
 WTW - Well To Wheel, including fuel source and manufacturing emissions

COST



H₂ HPDI offers far greater CO₂ reductions for every Euro of public and private investment, compared to fuel cells

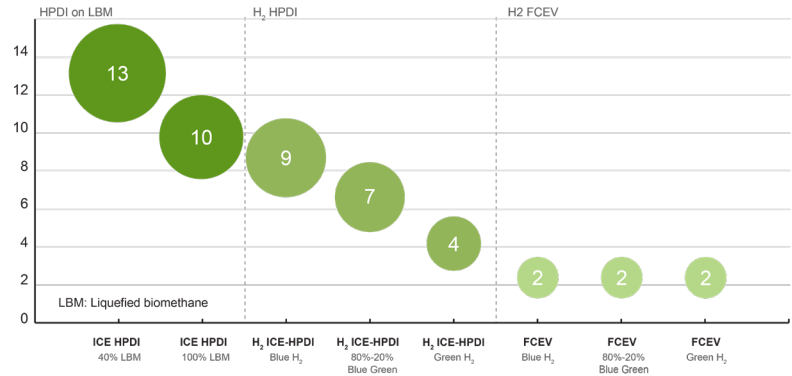
Based on today's HPDI engine technology, H₂ HPDI avoids reliance on the sensitive and expensive minerals used in fuel cell catalysts and batteries, resulting in far lower cost base than fuel cells

The marginal cost of the additional NO_x reductions that come from using fuel cells far exceeds the societal cost of NO_x emissions



HPDI solutions are more cost effective than fuel cells for CO₂ abatement

Tons CO₂ reduced per €1,000 invested
WTW CO₂ - includes fuel source and manufacturing emissions



MARKET READINESS



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

The rapid scaling of production means that HPDI can be quickly deployed, stimulating the demand for hydrogen, and accelerating the reduction of cumulative GHG emissions

PERFORMANCE



PRACTICAL

Vehicle performance is critical for fleet managers, who are limited in the compromises they can make to advance sustainability



EFFICIENT

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



COST EFFECTIVE

H₂ HPDI delivers higher performance than spark ignition H₂ ICE: significantly higher efficiency and power density; lower operating cost



ROBUST

H₂ HPDI is a robust solution that doesn't require extremely pure hydrogen to run, unlike fuel cells

WESTPORT FUEL SYSTEMS AT A GLANCE



TIER 1

Automotive Supplier



MANUFACTURING

7 Global Locations



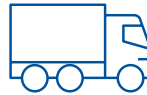
RENEWABLE

Alternative Fuels



70

Countries (Sales)



>100

Global Distributors



1400

Patents & Applications



<https://wfsinc.com/>

Westport
Fuel Systems