Heavy Duty Road Trucks - Diesel vs. Hydrogen

Hydrogen fuel cell vehicles are sustainable once hydrogen is produced from renewable energy. H2 offers a much higher specific energy than batteries and the lighter weight contributes to solving range and payload issues inherent with a 100% battery-powered propulsion. Hydrogen provides on-board energy that powers the electric engine, significantly extending the vehicle's range capabilities compared to a straight battery solution and refuelling times are virtually the same compared to diesel. Fuelcell electric heavy-duty trucks are otherwise-conventional multi-ton trucks using compressed H2 gas to generate electric power via PEM fuelcells.

The particular more attractive H2-storage route utilizing hydrogen solid state absorber systems RTMH such as Hydrolium® / H2Tank2Go® (e. g. in multitank or large-tank arrangement), has not been demonstrated yet, thus represents an important future goal. No high pressure of H2 required (<10bar).

type of truck	**MAN TGX 26.440 44to unit**	**e.g. MAN rebuilt to H2**		
power system(1)	diesel engine	electric engine & fuelcell & buffer battery		
power	295kW (401hp) @ 1900 rpm	synchronic engine 250KW constant		
fuel	diesel	hydrogen		
energy density	12 kWh/kg	16.3 kWh/kg at 50% FC-efficiency		
energy conversion	direct	3x 116,66kW = 350kW (HT-PEMFC e. g. from Toyota Mirai)		
fuel consumption / 100 km	45 kg diesel (~53 liters)	15 kg H2(2)		
tank	2nos Al-tank (300l+250l)	H2-RTMH solid state absorber		
tank volume	550 l	215 l	425 l	640 l
range	1.000 km	100km	200km	300km
tank weight (full)	~1.0to	~1to	~2to	~3to
weight H2-RTMH	no	850 kg2)	1.700 kg	2.550 kg
refuelling time	30min	~1h	~2h	~3h
investment cost	today low	today high, tomorrow medium		
maintenance cost	medium	today medium, tomorrow low		
fuel cost	today high, tomorrow higher	today high, tomorrow lower		

(1) *"Development of Business Cases for Fuel Cells and Hydrogen Applications for European Regions and Cities"* commissioned by the Fuel Cells and Hydrogen 2 Joint Undertaking (FCH2JU), N°FCH/OP/contract 180, Reference Number FCH JU2017 D4259

(2) 15kg H_2 is required to run 40 t truck for 100km (15/0.018 = 840kg) of RT-MH required to adsorb 15kg H_2

class 212 submarines, HDW, RTMH-tanks

early Daimler design

H2Tank2Go®