

TOTAL COST OF OWNERSHIP

DRIVERS COMPARISON

Conventional vs Hybrid
Empty Container Handler



CONVENTIONAL



FERRARI



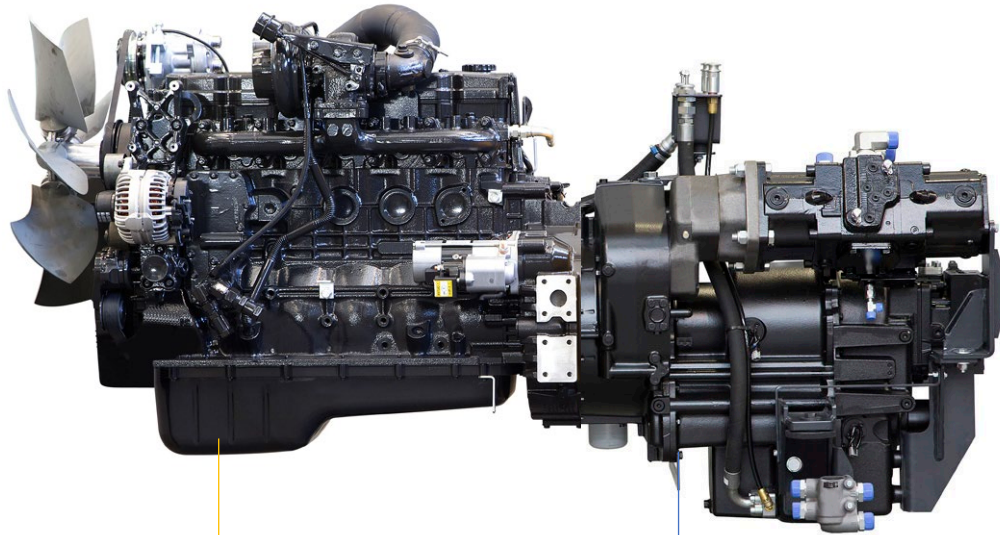
HYBRID



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL

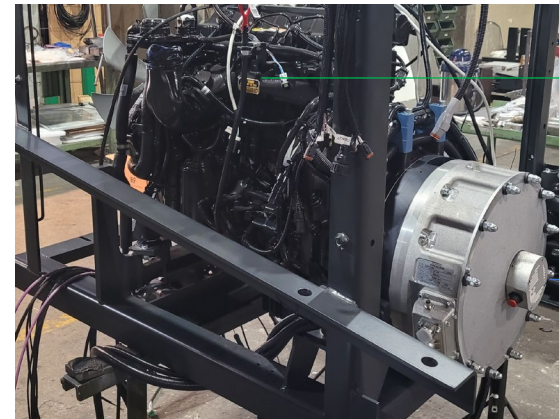


168 / 185 kW
Engine

Hydromechanical
Transmission
215 kW
Max input power

POWER UNIT

HYBRID



100 kW
Engine

65 kW
Generator



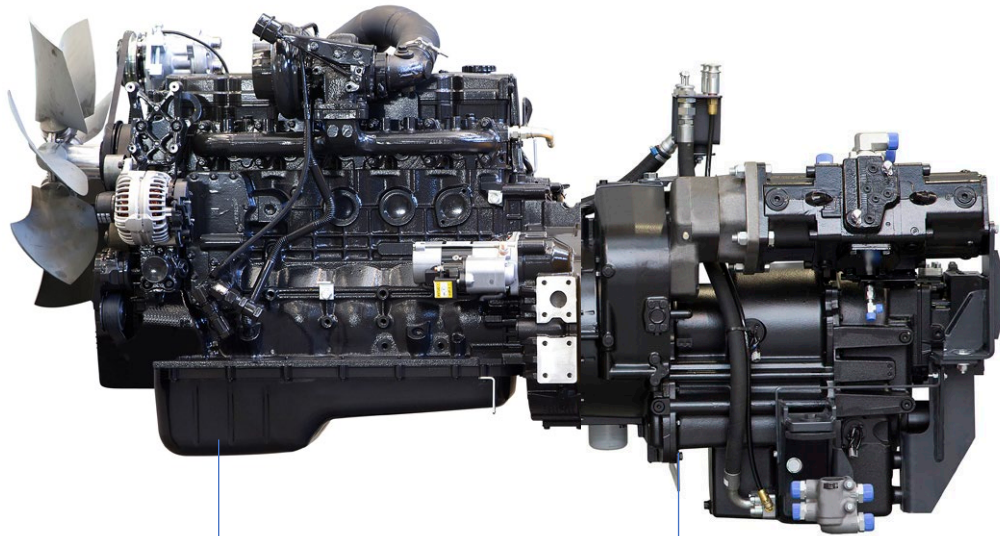
70 -100 kW
Supercap
Pack



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL



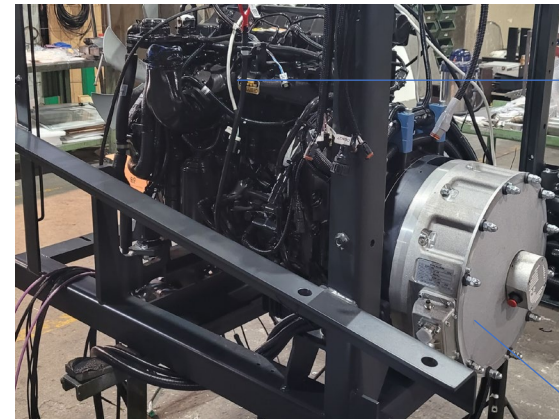
Engine

Larger Engine running at highly variable speeds. Overhaul required between 15000 & 20000 w/h.
20 litres engine oil (each 500 w/h)
Larger more expensive filter.
2 year/4000 w/h warranty

Transmission

With Torque converter and gearbox. Overhaul required between 12000 & 15000 w/h.
51 litres hydraulic oil (each 1000 w/h) plus oil filter change
2 year/4000 w/h warranty

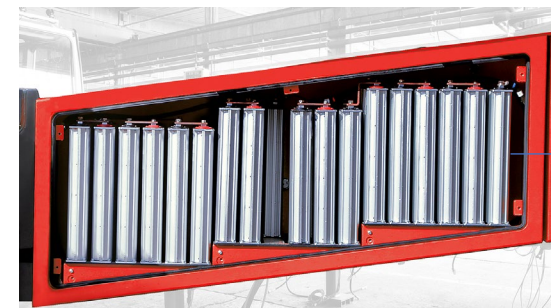
POWER UNIT



Engine

Smaller Engine running at constant speeds. Overhaul required at 20000 w/h.
15 litres engine oil (each 500 w/h)
Smaller less expensive filter
2 year/4000 w/h warranty

Generator Maintenance Free
5 years- 15000 w/h warranty



SuperCap Pack Maintenance Free
5 years – 15000 w/h warranty



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL

LIFTING SYSTEM /1

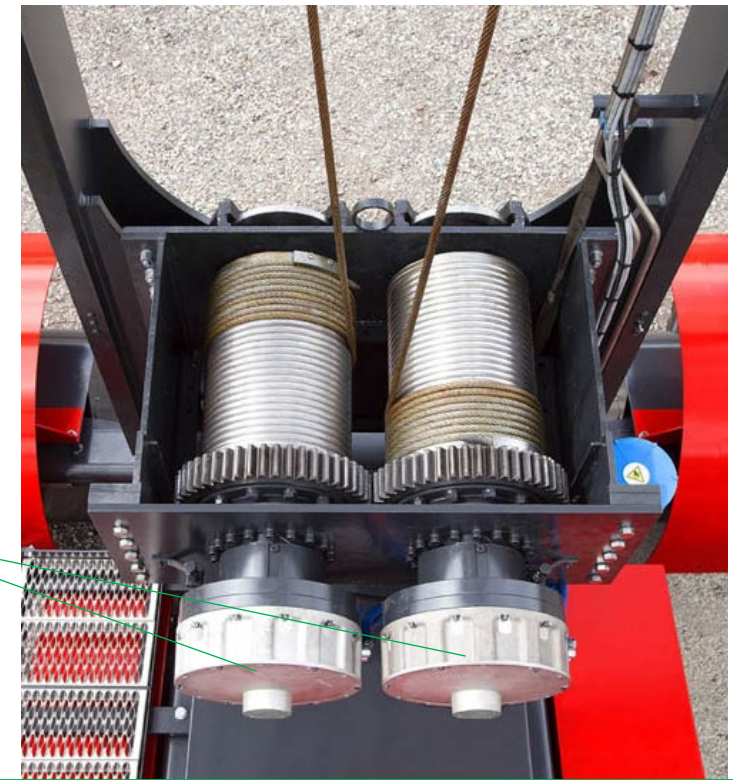
HYBRID

Hydraulic Pumps vs Electric Motors



Hydraulic Pumps power the Hydraulic Cylinders by forcing oil in high pressure (300 bar) through Distribution Valves in Conventional Liftrucks.

The lifting function in Hy-lift is instead performed by **Electric Motors** that power the Winches, having received the electric energy though the respective Inverters (Controllers)



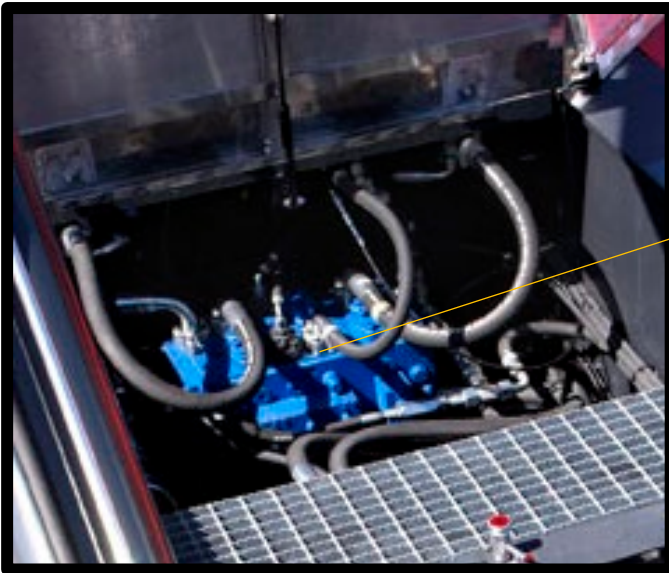
Hydraulic Pumps (VD / piston Type)

Efficiently working until 20.000 w/h, Hoses replacement at 15000 w/h , 2 Years / 4000 w7h warranty

Electric Motors (Permanent Magnets Type)

Machine Lifetime Isasting, Maintenance Free
5 Years / 15000 w/h warranty

CONVENTIONAL



Hydraulic Distribution Valve

Efficiently working until 20.000 w/h
Hoses replacement at 10,000 w/h
2 Years / 4000 w7h warranty

LIFTING SYSTEM /2

Hydraulic Distribution Valve vs Inverters

Hydraulic Distribution Valve (1) in Conventional Liftrucks is the device that sends to the Lift Cylinders the Oil in pressure that powers the them to lift the mast and the spreader.

The **Inverters (or Controllers) (2)** in the Hy-Lift are the devices that send the Electric Power to the Electric Motors Of the Winches, which pull the ropes that lift the mast and the spreader

HYBRID



Inverters (Controllers)

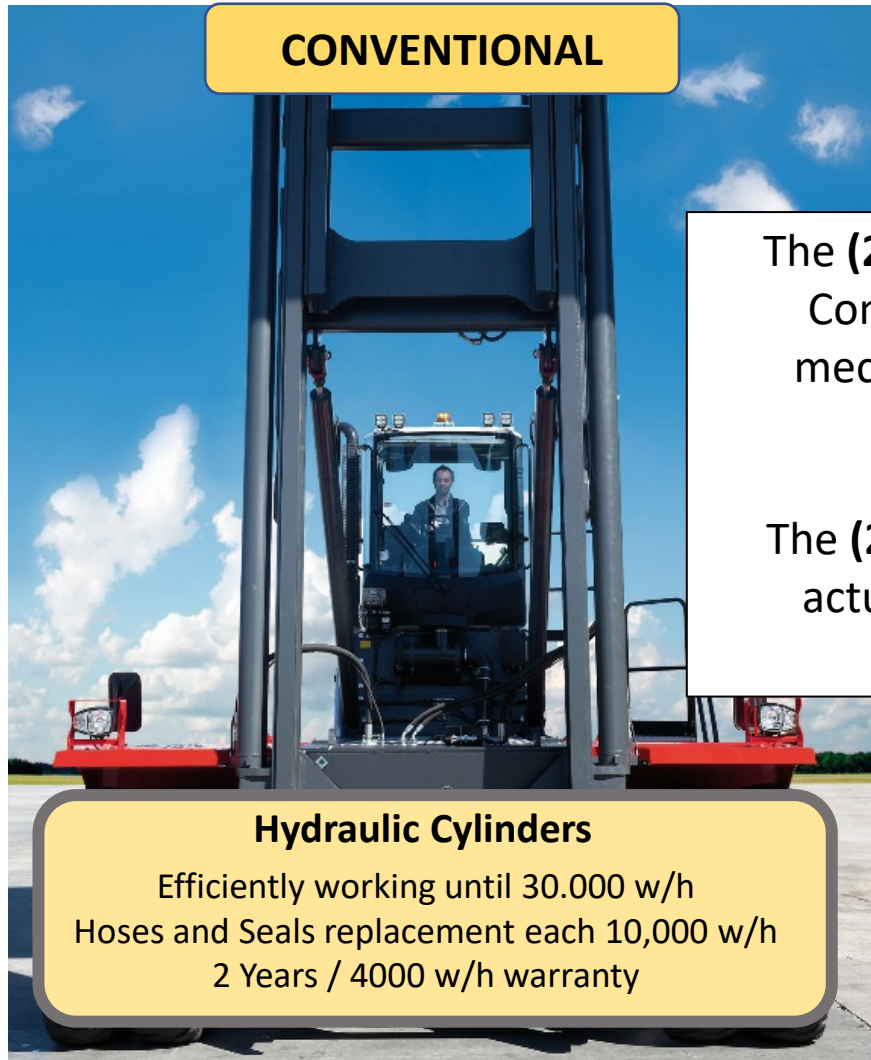
Machine Lifetime duration
Maintenance Free
5 Years / 15000 w/h warranty



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL



LIFTING SYSTEM /3

Hydraulic Cylinders vs Winches

The **(2) Hydraulic Cylinders** are the gears that in Conventional Liftrucks actually perform the mechanical action that lifts the mast and the spreader

The **(2) Winches** are the gears that in the Hy-Lift actually perform the mechanical action that Lifts the mast and the spreader

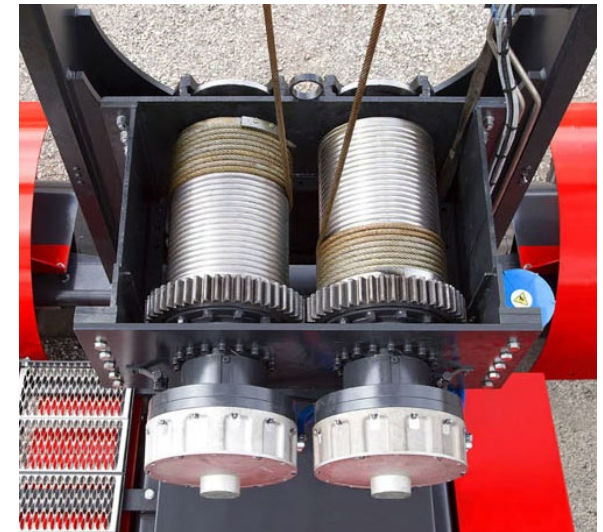
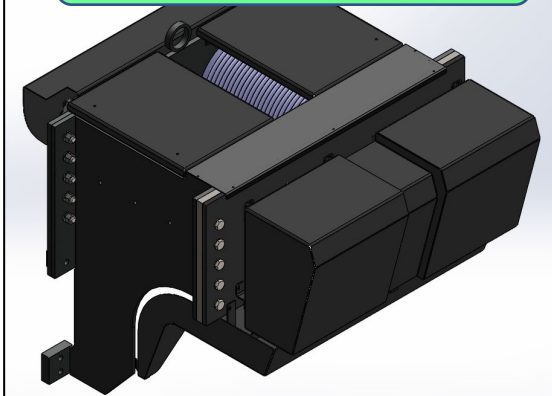
Hydraulic Cylinders

Efficiently working until 30.000 w/h
Hoses and Seals replacement each 10,000 w/h
2 Years / 4000 w/h warranty

Winches

Efficiently working until 20.000 w/h
Maintenance Free
2 Years / 4000 w/h warranty

HYBRID





TCO COMPARISON – Conventional vs Hybrid ECH



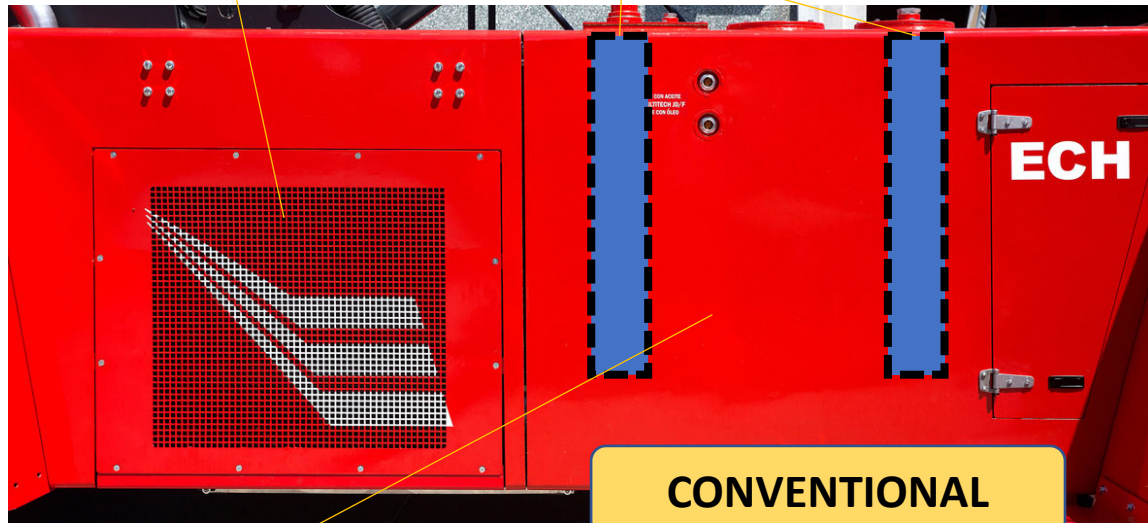
LIFTING SYSTEM /4

Hydraulic Oil & Filters

Very large Hydraulic Oil Cooler High Working Intensity

2 x Very large Hydraulic Oil Filters on the Return line

2 x Very small Hydraulic Oil Filters on the Pressure line



CONVENTIONAL



HYBRID



480 Litres Hydraulic Oil Tank
Hydraulic Oil Working Pressure = 300 Bar

High Oil disposal cost

Hydraulic Oil & Filters
600 Litres total oil in the system to be replaced every 4000 w/h
Very large filters to be replaced each 1000 (or better 500) w/h

Hydraulic Oil & Filters
250 Litres total oil in the system to be replaced every 20.000 w/h
Very small filters to be replaced each 1000 w/h

20 Litres Hydraulic Oil Tank
Hydraulic Oil Working Pressure = 90 Bar

No Oil disposal cost

CONVENTIONAL



LIFTING SYSTEM /5

Chains vs Ropes

Steel Chains

Costly to buy and costly to change. They also last much less than steel wire ropes (6000 w/h max)

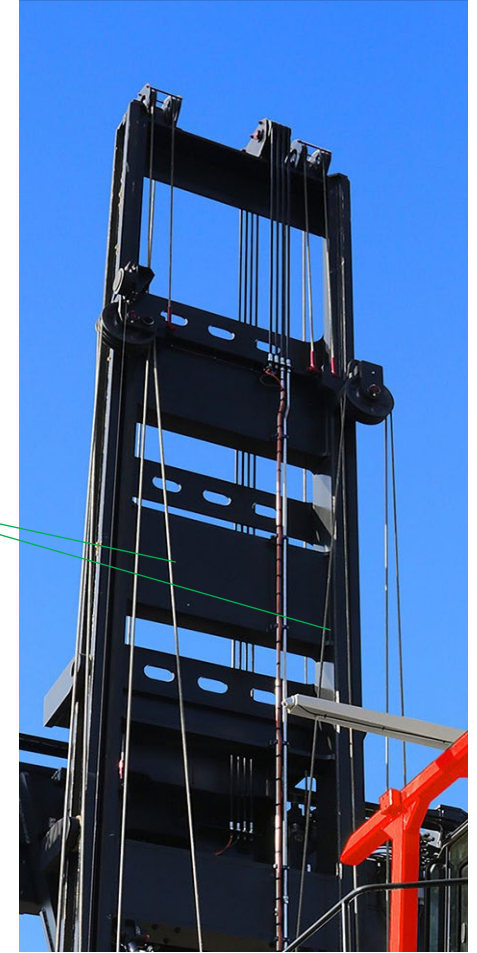
Steel chains also work with steel rollers which eventually have to be replaced and which are also quite costly and require lots of labor to be replaced

Wire Ropes

Considerably cheaper than steel chains and lasting much longer (up to 12000 w/h) thanks to less friction and more even wear. They are also much simpler and cheaper to replace.

Wire ropes run on cheaper, maintenance free plastic pulleys that are also easy to replace

HYBRID



Wire Ropes are 6 times cheaper than Steel Chains over the course of 20,000 w/h exercise



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL



With Differential & halfshafts that Have to be replaced each 8000 w/h

Requires 53 Litres of Oil to be replaced every 1000 w/h

DRIVE AXLE

HYBRID



Requires 18 Litres of Oil at the hub reducers to be replaced every 2000 w/h

Gearless Axle
No Maintenance Required



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL

FUEL CONSUMPTION

HYBRID

Conventional ECH Truck Type	Application Typology	Avg. Fuel Consumption
6 High Single Stack	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	9,0 Litres/hour
6 High Single Stack	50% Stacking / 50% Driving (12 lifts = 24 cts / hour)	12,0 Litres/hour
8 High Single Stack	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	11,0 Litres/hour
8 High Single Stack	50% Stacking / 50% Driving (12 lifts = 24 cts / hour)	15,0 Litres/hour
7 High Double Stack	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	13,0 Litres/hour
7 High Double Stack	50% Stacking / 50% Driving (12 lifts = 24 cts / hour)	17,0 Litres/hour

Hybrid ECH Truck Type	Application Typology	Avg. Fuel Consumption
6 High Single Stack	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	4,0 Litres/hour
6 High Single Stack	50% Stacking / 50% Driving (12 lifts = 24 cts / hour)	8,0 Litres/hour
8 High Single Stack	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	7,0 Litres/hour
8 High Single Stack	50% Stacking / 50% Driving (12 lifts = 24 cts / hour)	10,0 Litres/hour
7 High Double Stack	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	8,0 Litres/hour
7 High Double Stack	50% Stacking / 50% Driving (12 lifts = 24 cts / hour)	11,0 Litres/hour



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL	EMPTY CONTAINER HANDLER	HYBRID
7 High Double Stack (2 over 6 x 8'6")	Truck Type	7 High Double Stack (2 over 6 x 8'6")
75% Stacking / 25% Driving (20 lifts = 40 cts / hour)	Application	75% Stacking / 25% Driving (20 lifts = 40 cts / hour)
13,0 Litres/hour	Average Fuel Consumption (Litres / hour)	8,0 Litres/hour
1,00 AUD / Litre	Australian Fuel Price	1,00 AUD / Litre
4.000 w/h each year	Average Truck workload x Year	4.000 w/h each year
52.000 Litres = 52.000 AUD each year	Average Fuel Consumption Per Truck x Year	32.000 Litres = 32.000 AUD each year
260.000 Litres = 260.000 AUD	Total (Average) Fuel Consumption Over 5 years	160.000 Litres = 160.000 AUD



TCO COMPARISON – Conventional vs Hybrid ECH



CONVENTIONAL POWER TRUCK

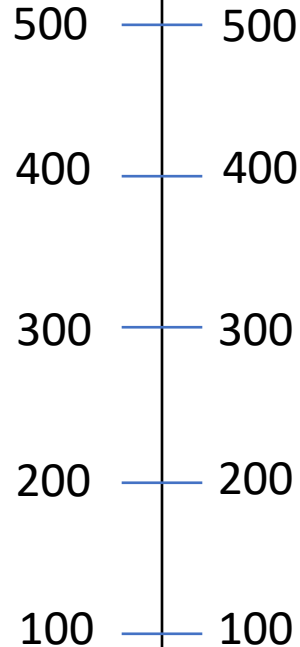


- Average cycle
- Average (Australia) Fuel cost
- 20,000 w/h life

52

RELATIVE FUEL CONSUMPTION

(over 5 years = 20.000 w/h)



**-40%
FUEL CONSUMPTION &
EMISSIONS**

HYBRID POWER TRUCK



- Average cycle
- Average (Australia) Fuel cost
- 20,000 w/h life

32

100 = CVS FERRARI Conventional ECH Purchase Cost



TCO COMPARISON – Conventional vs Hybrid ECH

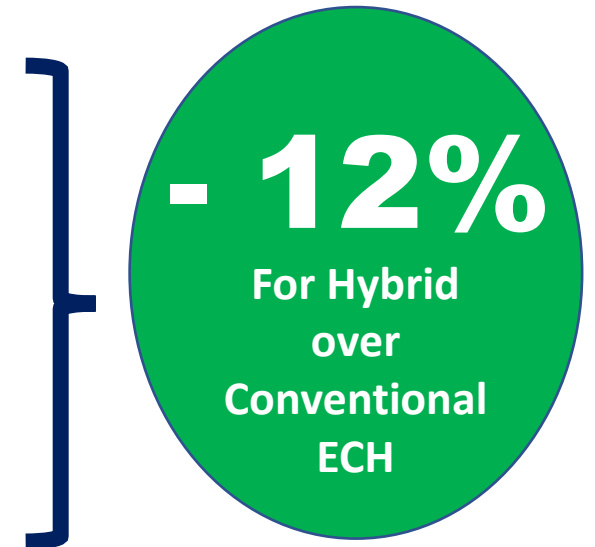


TOTAL COST OF OWNERSHIP OVER 20.000 Working Hours

(calculated on 40,000 working hours it would be – 40%)

The data collected on the field and analyze by **CVS FERRARI** show with all evidence that, the **HYBRID** ECH, as compared to **CONVENTIONAL POWER** machines has:

- about 20% higher Purchase Cost (Compared to a CVS Ferrari ECH of equivalent specification)
- about 40% less Fuel Consumption
- about 40% less Tires Expenditure
- about 50% less investment in Consumables
- about 40% less Extraordinary Maintenance





TCO COMPARISON – Conventional vs Hybrid ECH



TOTAL COST OF OWNERSHIP OVER 20.000 w/h (expressed in Relative Terms)

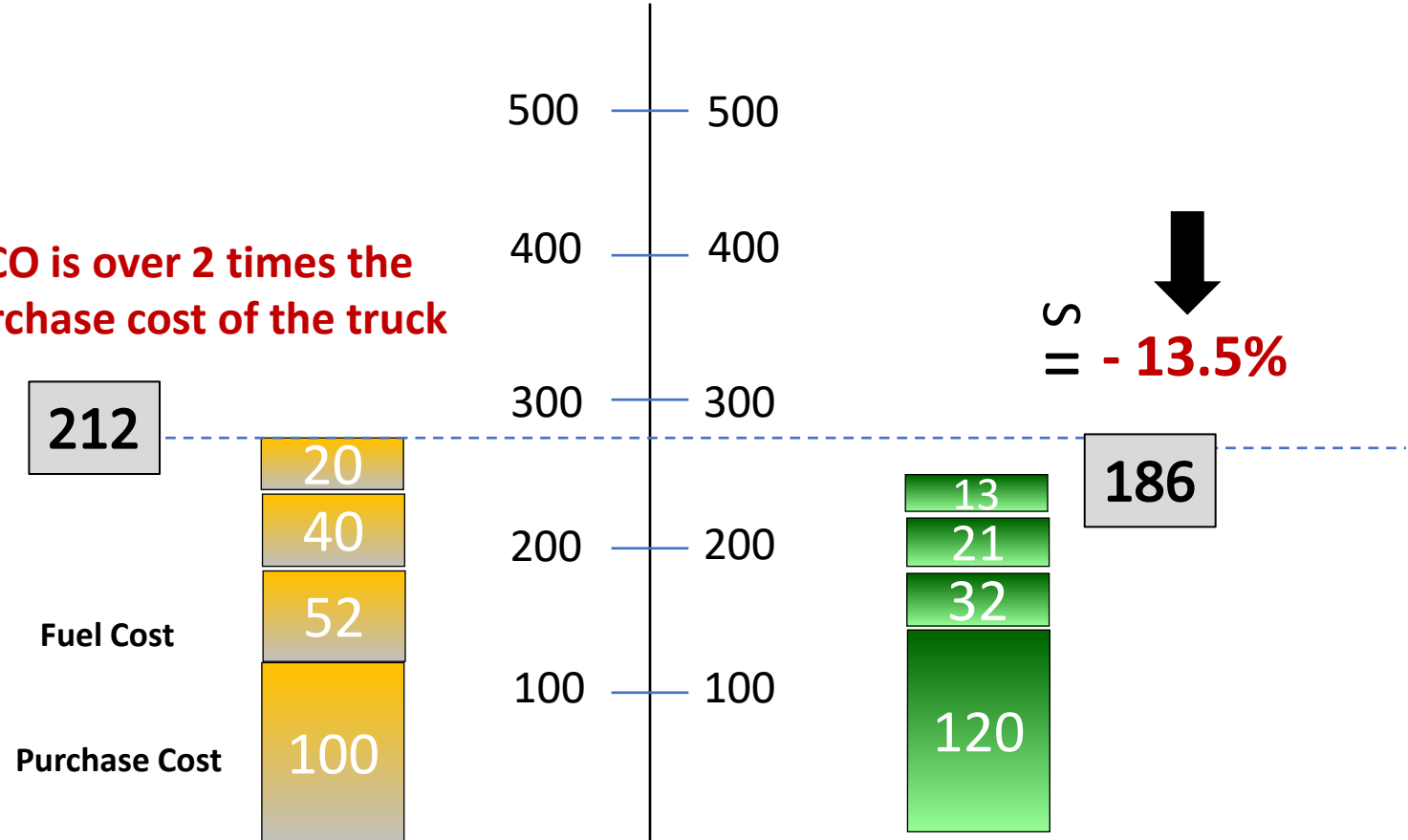
**CONVENTIONAL
ECH**



**HYBRID
ECH**



**TCO is over 2 times the
purchase cost of the truck**





TCO COMPARISON – Conventional vs Hybrid ECH

