BP The Original Loader – THE FUTURE TO ELECTRIC TRUCKS

The BP electric side loader represents a compelling alternative to the diesel: Euro 1 million/year of operating costs savings for a fleet of 100 trucks. The BP electric side loader delivers the same performances as the diesel but at lower cost, lower emission, lower noise and higher reliability. The BP electric side loader is the most advanced of its gender available in the market today. Suitable for indoor and outdoor operation under all weather and ground conditions the BP electric side loader operates continuously for 10hrs/day without requiring battery recharge or change enabling the user to drive the truck continuously for at least one full shift.

HT5EL: 5 ton electric AC side loader loading steel frames on truck at a logistic warehouse site

The 4 good reasons to go electric

1. LOWEST COST OF OWNERSHIP

Analysis of the operating and maintenance costs difference between a 5ton electric and a 5ton diesel hydrostatic side loader shows that for 1500 working hrs the electric side loader operating cost is about Euro 10k less than the diesel equivalent.

2. RELIABILITY

The electric side loader is intrinsically more reliable than the diesel and it requires less and lower level maintenance.

3. EMISSIONS AND NOISE

The electric side loader has zero emissions and negligible noise levels. To reduce the emissions the diesel truck would require expensive and bulky filters and will never reach the same levels of cleanness. Moreover it will never reach the same low noise levels.

4. PERFORMANCES

The performances of the BP electric side loader are fully comparable to the diesel equivalent.

Reason 1: Lowest Cost of Ownership

Analysis of the operating and maintenance costs difference between a 5ton electric and a 5ton diesel hydrostatic side loader show that for 1500 working hrs the electric side loader operating cost is about Euro 10k less than the diesel equivalent.

CALCULATION OF OPERATING COST DIFFERENCE BETWEEN AN ELECTRIC SIDE LOADER MODEL HT5EL/1200 AND A DIESEL SIDE LOADER MODEL HT5KS/1200

HT5EL-1200/AC (Electric) Battery 920Am/h

To fully charge the battery the charger absorbs about 80KW from the power supply. The cost of 1xKW is Euro 0,10 (in Italy). With a fully charged battery the HT5EL/1200 can operate for about 10 hours without interruption. Therefore the operating cost per hour is 0,10x80/10 = Euro 0,8 which gives **Euro 1.200 ,00** for 1500 hours.

HT5KS-1200 (Diesel Hydrostatic) – Engine Perkins 85hp

The diesel consumption for 1 working hour is about 6 lt or 9000 lt for 1500 hours. The cost of 1 lt of diesel fuel (in Italy) is about Euro 1,15 therefore the total cost is Euro 1,15x9000= Euro 10.350,00. To operate for 1500 hours a diesel side loader requires *in addition to the electric* :

a. About 60 lt of engine oil (4 replacements plus various refilling) equivalent to Euro 6,00x60 = Euro 360,00
b. 3 oil filters for the engine equivalent to Euro 51,36x3 = Euro 154,08
c. 4 diesel filters for the engine equivalent to Euro 55,08x4 = Euro 220,32
d. 4 air filter for the engine equivalent to Euro 33,60x4 = Euro 134,40

The above gives a total maintenance cost of **Euro 11.218,80** for 1500 hours.

OPERATING A DIESEL SIDE LOADER FOR 1500 HOURS COSTS 10.018,80 EURO MORE THAN OPERATING AN ELECTRIC SIDE LOADER

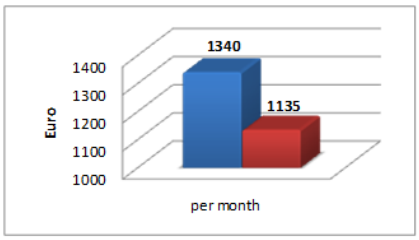
HOURS	DIESEL	ELECTRIC	DELTA
500	€ 3.858,72	€ 400,00	**€ 3.458,72**
1000	€ 7.487,40	€ 800,00	**€ 6.687,40**
1500	€ 11.218,80	€ 1.200,00	**€ 10.018,80**
2000	€ 14.898,84	€ 1.600,00	**€ 13.298,84**

Case study: 5 years lease

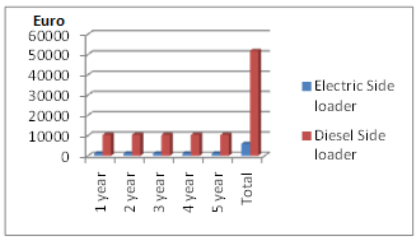
A case study of a 5 years lease is described in the tables below where the total monthly ownership cost savings of the electric truck with respect to the diesel equivalent can go from Euro 74 or 5% (in case of low 500 hrs/year usage) up to Euro 900 or 37% (in case of 2000 hrs/year usage).

COMPARISON 5 tons ELECTRIC VS DIESEL SIDE LOADER
1500 hours/year (6-7 hours/day)

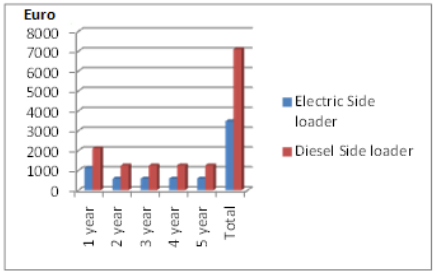
Monthly rent for 5 years leasing – 60 months -fig.1



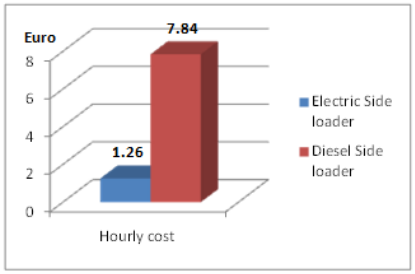
Consumption costs (electricity – gasoline) -fig.2



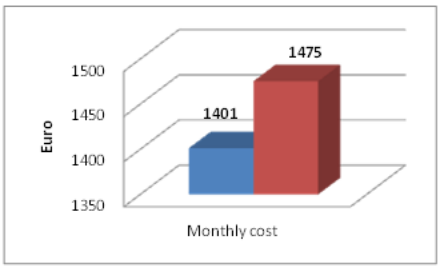
Scheduled maintenance costs -fig.3



Hourly costs [(fig. 2 + fig. 3) : 7500 hours] -fig.4

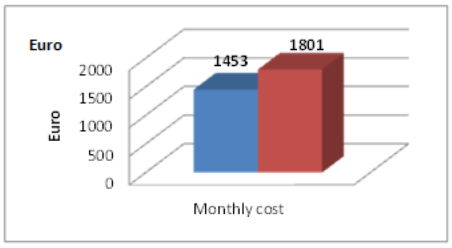


Monthly ownership cost for 5 years/2500 hours



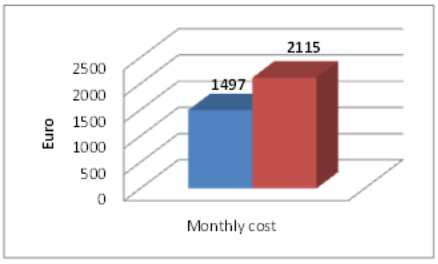
Savings: Euro 74 / month or 5%

Monthly ownership cost for 5 years/5000 hours



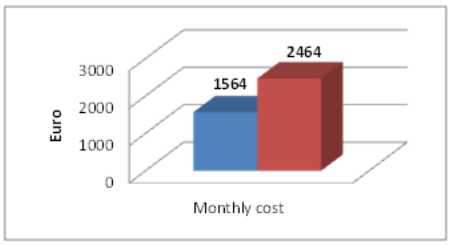
Savings: Euro 348 /month or 19%

Monthly ownership cost for 5 years/7500 hours
[(fig. 1x60 months + fig. 2 + fig. 3) : 60 months]



Savings: Euro 618 / month or 29%

Monthly ownership cost for 5 years/10000 hours



Savings: Euro 900 / month or 37%

Reason 2: Reliability

The electric side loader is intrinsically more reliable than the diesel and it requires less and lower level maintenance.

A) less leakages in the hydraulic circuit hoses/components thanks to:
- Lower vibrations
- Lower hydraulic oil temperatures (the electric does not require hydrostatic traction circuit)
- Lower pressure peaks (due to the different performances between the electric motor and the diesel engine)

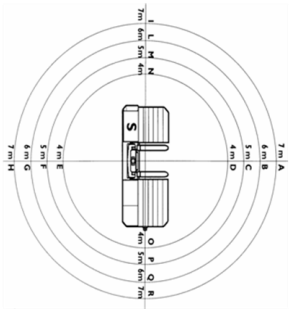
B) No mechanical failures in the lifetime of the side loader due to engine vibrations i.e. brackets and screws

C) Less consumables replacements: engine oil, fuel and air filter cartridges, hydrostatic filter cartridge

Reason 3a: Noise

The electric side loader has negligible noise levels as showed in the comparison chart below:

Test methodology: 7.5 m from the center maximum diesel rpm – electric motor rpm



Standard Diesel sideloader	Standard Electric sideloader
Point A 79 dba	Point A 63.8 dba
Point H 77 dba	Point H 63 dba
Point I 75 dba	Point I 64 dba
Point R 82 dba	Point R 72 dba
CAB 81 dba	CAB 66 dba

Reason 3b: Emissions

The electric side loader has zero emissions. According to EEC directive 002/88/EC diesel engines have instead to comply to a series of norms: Stage III/IV emission standards for industrial engines were adopted by the European Parliament on 21 April 2004 [Directive 2004/26/EC] and for agricultural and forestry tractors on 21 February 2005 [Directive 2005/13/EC]. Stage III standards are phased-in from 2006 to 2013 while Stage IV will enter into force in 2014.

- STAGE 3B Until 2013

Cat.	Net Power	Date	CO	HC	NO_x	PM
	kW			g/kWh		
L	130 ≤ P ≤ 560	2011.01	3.5	0.19	2.0	0.025
M	75 ≤ P < 130	2012.01	5.0	0.19	3.3	0.025
N	56 ≤ P < 75	2012.01	5.0	0.19	3.3	0.025
P	37 ≤ P < 56	2013.01	5.0	4.7†		0.025

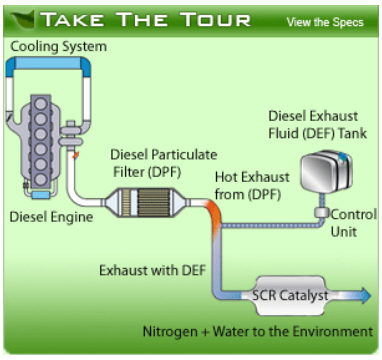
† NO_x+HC

- STAGE IV Compulsory from 2014

Cat.	Net Power	Date	CO	HC	NO_x	PM
	kW			g/kWh		
Q	130 ≤ P ≤ 560	2014.01	3.5	0.19	0.4	0.025
R	56 ≤ P < 130	2014.10	5.0	0.19	0.4	0.025

These norms are going to become more and more stringent over time challenging truck manufactures to have to adopt expensive solutions to reduce emissions such as:

- EGR (Exhaust Gas Recirculation) system. EGR injects a portion of the exhaust gas back into the cylinder, mixing it with fuel and air
- Selective Catalytic Reduction (SCR) - an emissions-reduction technology with the ability to deliver near-zero emissions of nitrogen oxides (NOx)



In both EGR and SCR cases the disadvantages are multiple:

- higher heat ratio that has to be drained by the cooling system meaning larger radiators
- additional antiparticle filter
- additional catalytic filter (in case of SCR)
- an UREA tank for the SCR solution is required

We expect a major reliability gap between electric and diesel and increased maintenance cost. And due to emission standard requirements the cost spread and the reliability gap is going to increase in the future:

1. The requirement to fit larger radiator filters and UREA tank will increase the complexity of the sideloader and the accessibility will decrease. For this reason we expect higher maintenance time in comparison with the time that is required today.
2. Due to the higher temperature inside the bonnet or inside the chassis area where the engine and filters are located the reliability of the components will decrease and openings to drain the heat maybe required. These openings will increase the noise emission of the sideloader.
3. The required maintenance time will increase: periodic cleaning of the filters and UREA refilling for the SCR system will be necessary.

Reason 4: Performances

The BP HT5EL 5ton electric AC side loader is the most advanced of its gender available in the market today. Equipped with sealed AC pumps and motors it can operate indoor and outdoor under all weather and ground conditions. It provides for easy access and maintenance to the electronic system. It operates continuously for 10hrs/day without requiring battery recharge or change enabling the user to drive the truck continuously for at least one full shift. This unique result is achieved thanks to the combination of 4 factors in the BP design:

1. One single 20kW electric motor (instead of 2x10kW power greedier motors adopted by other manufacturers)
2. Differential system on the rear axle (instead of 2 wheel motors adopted by other manufacturers)
3. Co-designed integrated BP-ZAPI electronic loopback control system:
    - One single vendor for joystick, hydraulic movements control unit and inverters
    - Total hardware and protocols compatibility
    - Faster troubleshooting
    - One single SW control interface for joystick and inverters (integrated ZAPI consolle)
    - Proportional setting of all movements
    - Simultaneous movements
    - Ramps setting for each movement
    - Up to 8 electric valves adjustment
4. 3 stage 80V 920Ah battery pack: main battery located in the back plus one battery inside the front deck and one inside the rear deck (distribution of load to grant maximum truck stability).

The performances of the BP electric side loader are fully comparable to the diesel equivalent.

	Diesel 5ton	**Electric 5ton (*)**
Capacity	5000 kg	5000 kg
Overall length	4450 mm	4290 mm
Overall width	1980 mm	1980 mm
Platform height	835 mm	870 mm
Outer turning radius	3950 mm	3900 mm
Inner turning radius	750 mm	700 mm
Travel speed (with / without load)	16 / 18 km/h	14 / 16 km/h (**)
Lifting speed (with / without load)	0,27 - 0,28 m/s	0,24 - 0,28 m/s
Mast in/out speed (with/ without load)	0.30 - 0.34 m/s	0.30 - 0.34 m/s
Gradeability (with / without load)	15 / 25	14 / 21
Engine / Electric Motors	Perkins 804D.33T - 62kW	Best Motors (ZAPI) - 20kW AC (80V 920Ah battery)
Transmission / Controls	Sauer Danfoss	ZAPI

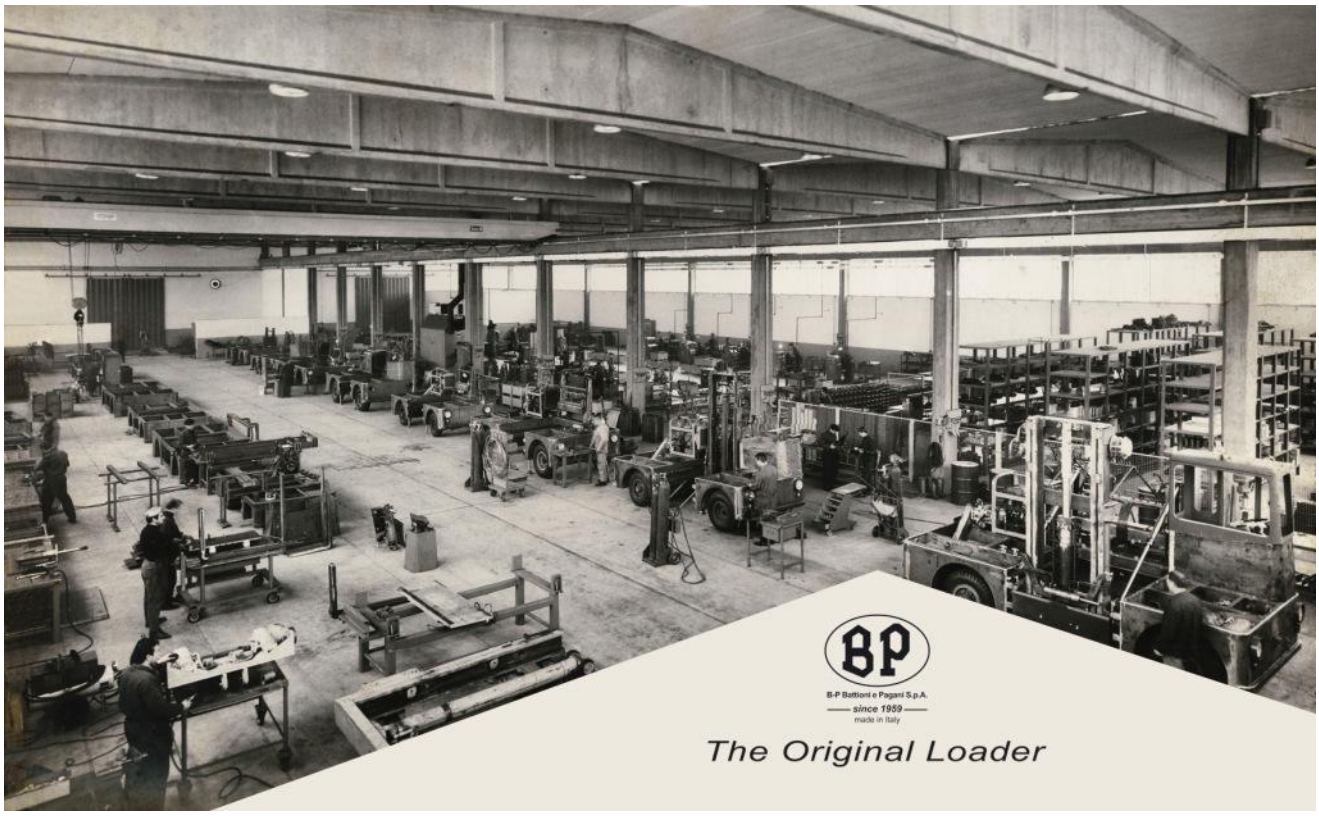
(*) data refers to controls settings for battery duration of 8 to 10 hrs
(**) can be increased however it would consume more battery power

About BP

BP has been pioneering the Side Loader market since 1959 and it is a well known leader in design and manufacturing of lift trucks. BP produces a wide range of Diesel Hydrostatic Side Loaders from 3 ton to 10 ton, Diesel Power Shift Side Loaders from 4 ton to 50 ton, Electric Side Loaders from 2 ton to 7 ton, Diesel 4-Way from 4 ton to 7 ton and Electronic Multidirectional Forklifts from 2 ton to 4 ton. BP also manufactures customized and custom made material handling solutions for specific customer applications. BP is a ISO9001 certified company and with more than 10,000 trucks delivered to 80 countries BP is recognized for its proven track record of consistent delivery of quality and reliability to its customers worldwide.

QL-T6: 6 ton hydrostatic 4-WAY handling steel structures

History



1959 – The first Side Loader for timber loading was introduced in the Italian market. This loader represented a major innovation as it was the first of its gender in Europe designed to save space in stacking of wood panels and long profiles.
1964 – This year marked the start of export sales. By 1970 BP became a well known brand synonymous of quality and innovation all over the world.
1967 – BP opened a new manufacturing facility of 15,000 sqmt floor space in a 40,000 sqmt of land dedicated to the production of Side Loaders trucks.
1977 – BP diversified its product portfolio offering Side Loaders for container application with capacity from 20 ton up to 55 ton and small-medium capacity diesel Side Loaders trucks ranging from 2 ton up to 15 ton and became a leader in this market.
1988 – The Electric Side Loader from 2 ton up to 7 ton was launched into the market. Today BP Electric AC Side Loaders are the most advanced in the world.
1989 – BP broadened its electric portfolio introducing a Fork Lift Trucks of 5 ton capacity and subsequently of 6 ton and 7 ton.
1995 – The highly innovative Electronic Multidirectional Fork Lift ranging today from 2 ton to 4 ton was launched into the market. Eight years later the CAN BUS technology was adopted as standard control and monitoring system on all BP Electronic Multidirectional Fork Lifts.
1999 – The 4-WAY Multidirectional Fork Lift joined the BP product family and is being offered in diesel and LPG versions from 4 ton up to 7 ton.
2007 – The 2 ton Electronic Multidirectional Fork Lift joined its bigger 4 ton brother.
2009 – BP celebrates 50 years of innovation.

Quality and Reliability

HT20: fully remote controlled 20 ton side loader equipped with telescopic hydraulically tunable beam handling concrete bars

BP has always been paying a special attention to safety and reliability. BP utilizes only top quality components and systems from original world class manufacturers. BP Side Loaders and Multidirectional Forklifts are designed to comply with extra margin to the most stringent and up to date EEC reliability standards of directives 89/392/EEC (Machinery), 89/336/EEC (Electromagnetic Compatibility) and 73/23/EEC and 93/68/EEC (Low Tension) such as:

- EN 1726-1 Stability Test
- EN 1726-1 Structural Test with static overload limit of 33%
- UNI ISO 6055 Cabin Structural Test

BP non conformance cost over revenue is as low as 0.4%. BP trucks lifetime has been reaching 40 years and the value of a BP truck is maintained through the years well above market average. BP and its suppliers are UNI ISO 9001 2000 certified.

Advantages

ML-T4: 4 ton electronic computer drive multidirectional forklift operating at a indoor and outdoor wood panels warehouse

Side Loaders and Multidirectional Forklifts enable fast and safe handling of long loads providing for a multitude of advantages over conventional counterbalance forklifts such as:

- Overcoming of space limitations and restrictions
- Giving maximum visibility to the operator
- Saving space and therefore space cost
- More efficient use of warehouse available space -> reduced operating costs through increased efficiency
- Faster travel speed -> reduced operating costs through increased efficiency
- Operator and on the ground personnel safety

Side Loaders and Multidirectional Forklifts ultimately reduce handling costs, reduce warehousing investment costs and reduce operating costs.

Applications

HT6PS: 6 ton power shift side loader handling aluminum bars

BP customers can be found in the industries of timber processing; sawmill and woodworking; wooden panels and furniture; aluminum and frames; iron and steel plates; metallurgy; iron, steel and fiberglass pipes; insulation panels; concrete; plastic and PVC; painting and plating; petrochemical and many others.

B-P Battioni e Pagani S.p.A.
since 1959
made in Italy

Additional information about BP Side Loaders and Multidirectional Forklifts can be obtained from **B-P Battioni e Pagani S.p.A.** Via Nazionale, 68 (Località Croce) 43058 Sorbolo - Parma (Italy) Phone: +390521604200 Fax: +390521604359

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