



100% Electric Boom Lifts by Riwal

IT STARTED WITH A CUSTOMER DEMAND

- *“We need a 26 meter working height aerial work platform for use on aircraft maintenance inside the hangars that will not expose our employees to emissions or loud noise” – KLM Engineering & Maintenance*
- *Riwal engineers converted a diesel machine into 100% electric*
- *The start of a series of unique sustainable innovations for working at height*





ELECTRIC MACHINE FEATURES

	660SJ electric	800AJ electric	860SJ electric	1200SJP electric	1350SJP electric
Working height (m)	21.90	26.20	28.20	38.73	43.30
Machine weight (kg)	12,300	15,500	17,200	18,500	20,300
Lift capacity (kg)	250 / 340	230	230	230 / 450	230 / 450
Horizontal outreach (m)	17.40	15.74	22.86	22.86	24.38
Battery charging time (hours)	11	7-8	7-8	10-11	10-11
Operating hours on full battery	3 hours*	5 hours*	5 hours*	5 hours*	5 hours*

* During a normal shift of 8 hours, the machine on average is operated for 2 to 3 hours.

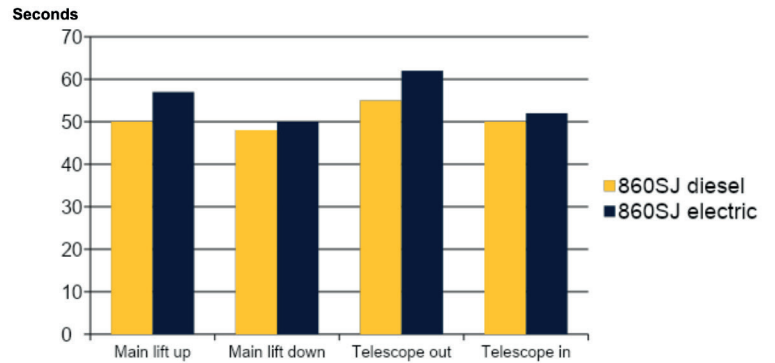
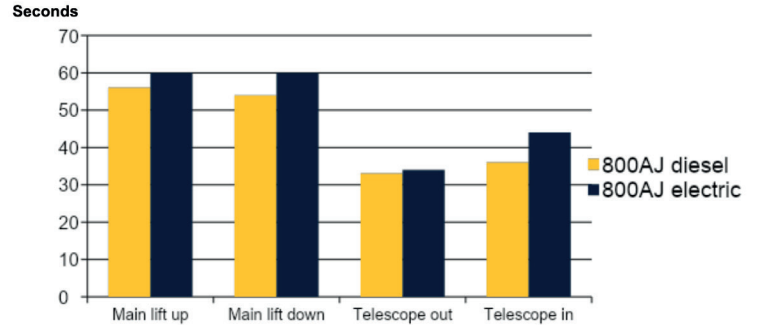
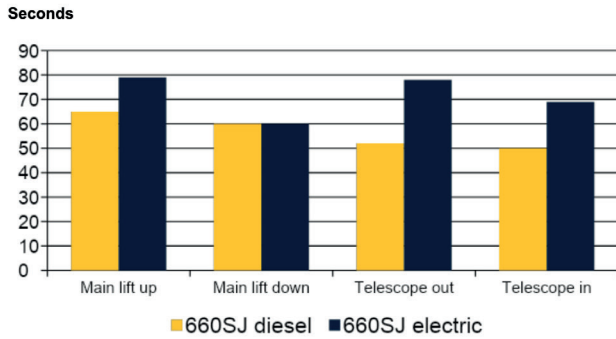


BATTERY AND ELECTRIC MOTOR FEATURES

	660SJ electric	800AJ / 860SJ electric	1200SJP / 1350SJP electric
Battery type	12/5 PzSH 775	Wet battery 5PzSH775	Wet battery 8PzSH1120 and 9PzSH1125
Type of battery cells	24 cells of 2 volt	40 cells of 2 volt	48 cells of 2 volt
Total weight of complete set	1166 kg	1944 kg	3298 kg
Voltage	48V	80V	96V
Amp	775Ah/5h	775Ah/5h	1120Ah/5h
Charging time from empty	11 hours	7-8 hours	10-11 hours
Electric motor run per charge cycle	3 hours	5 hours	5 hours
Charger type	Fronius 4060 230V	Fronius 8060 400V	Fronius 4090A 2x 400V
Power supply	230V	400V	400V
		All types	
Life time batteries	Approximately 8-10 years (assuming 200 charge cycles per year)		
Warranty batteries	5 years (Only valid if maintenance is done according to user manual. Warranty only covers the cost of batteries)		
Warranty electric motor	2 years		
Battery Discharge Indicator (BDI)	<ul style="list-style-type: none"> • BDI starts to flash when 30% of the battery power is left • Once only 20% of battery power is left, the electric motor stops 		



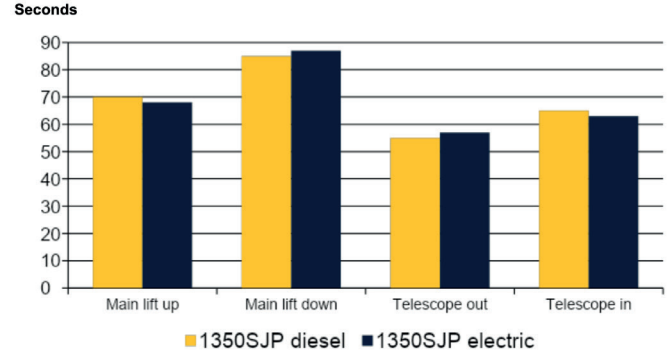
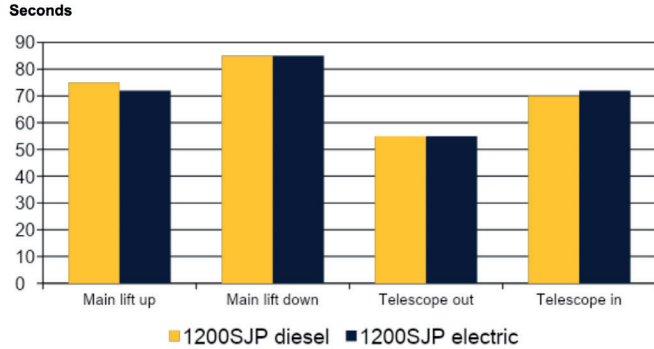
SPEED COMPARISON



Source: internal Riwal measurements



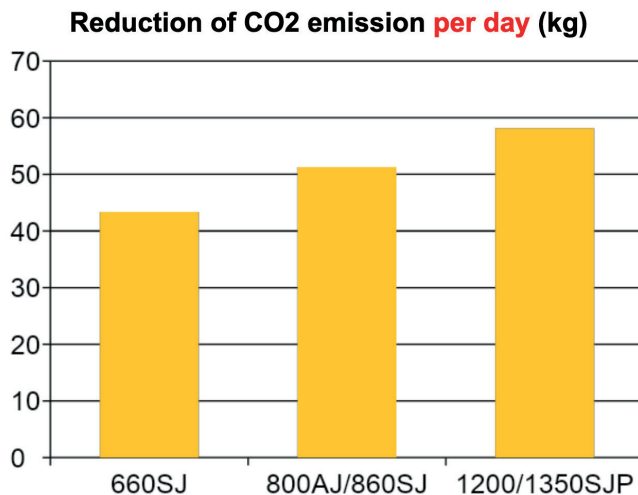
SPEED COMPARISON



Source: internal Riwal measurements

ZERO EMISSIONS

- Positive effect on the environment
- Healthier work environment for the operators
- Machine can be used inside a building



Source: internal Riwal measurements

Assumptions:

- CO2 emission per liter diesel = 2.67 kg
- Operating hours per day: 2 hrs idle, 2 hrs mid speed, 0.2 hrs high speed





REDUCED NOISE LEVELS

- Pleasant work environment for the operators and people working around the machine on the jobsite
- Comply to noise regulations and extend daily work hours on site

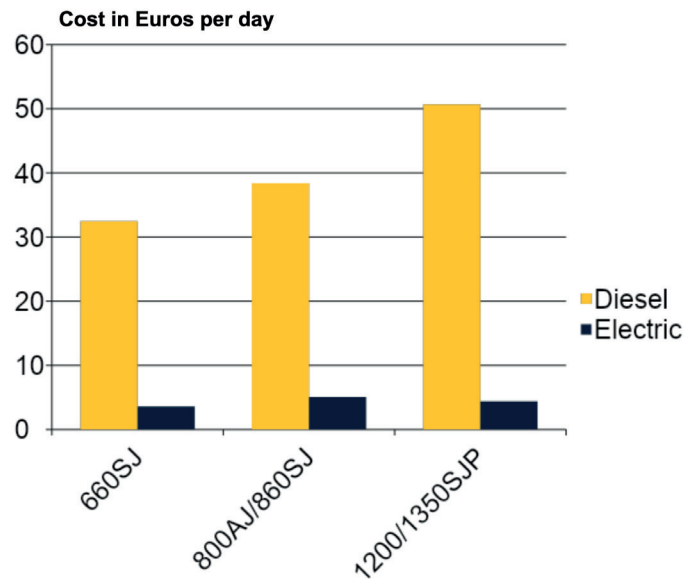
Noise levels – dB (A)	660SJ		800AJ / 860SJ		1200SJP / 1350SJP	
	Diesel	Electric	Diesel	Electric	Diesel	Electric
Boom movement function						
4 m from centre of machine	82	63	85	61	86	69
8 m from centre of machine	78	57	81	60	84	65
Drive function						
5 m from centre of machine	87	69	87	64	88	71

Source: internal Rival measurements



NO FUELLING REQUIRED

- Cost savings (electricity is cheaper than fuel).
- Time savings (charging battery is more simple than refuelling machine).
- Increased safety (no need to stand on a ladder to fuel the machine).
- No risk of using fuel that is not clean enough for new engines.
- No risk of environmental damage due to fuel spills.



Assumptions:

- 660/800/860 operating hours: 2 hrs idle, 2 hrs mid speed, 0.2 hrs high speed
- 1200/1350 operating hours: 2 hrs idle, 2.5 hrs mid speed, 0.2 hrs high speed
- Diesel fuel cost €2 Euro / liter
- Electricity cost €0.15 Euro / KWh



SAVINGS ON SERVICE COSTS

- Electric motor is maintenance free (2 year warranty).
- Easier and faster inspections, as there is no check on engine oil, cooling water, etc.
- Less wear on hydraulic components (electric motor only rotates if a motion is required).
- Compared to hybrid machine, only one system needs to be maintained.

	Yearly service costs Diesel	Yearly service costs Electric	Yearly Savings
660SJ	€ 1948	€ 378	€ 1570
800AJ / 860AJ	€ 3029	€ 340	€ 2689
1200SJP / 1350SJP	€ 3298	€ 353	€ 2945

Benefits of 100% Electric Machines

Less downtime

- Less chance of a breakdown because of fewer components (e.g. no oil, oil filter and fuel filters).
- Less chances of breakdown due to heating up of hydraulic system as the electric motor does not run idle.
- No dependence on fuel quality + no engine oil leaks or oil checks during the rental.

Better utilisation

- Electric machines can be used indoors and outdoors.
- Ability to work in areas with CO2 emission restrictions.
- Ability to work in situations with noise restrictions (e.g. close to hospitals, or urban areas before and after working hours).

Positive Effect on Environment

- Ability to establish innovative / green image to employees and customers.
- Contribute to a decreased carbon footprint.





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