The **RAVO E2** sweeper:

- Is 100% Electric
- Provides 100% Performance
- Produces 0% CO² Emissions
- Is Low Noise



OK...but what makes it **REVOLUTIONARY ?**

Our engineers re-imagined and **redesigned its energy management systems** & optimized the sweeper's energy consumption, be it thermal, aeraulic, mechanical, electric or hydraulic. Their innovations, **5 of which have either been granted patents or are in the process of patent approval,** resulted in 9 main areas of substantial energy & resource management improvement.



Why is the E2 revolutionary?

RAVO E2's Energy & Resource Management (1/2):



- Auto brush & water pump stop system
- 2. Temporized fan boost function
- 3. Suction system redesign

Optimized function

- 4. Smart hydraulic power unit
- 5. Proportional control of pumps

Type of efficiency

When the sweeper is stopped, brushes & water spray are auto-stopped saving energy, water and brush wear.



Fan automatically returns to eco mode saving energy.

Description



Airflow optimization improves suction, reduces energy usage & noise.



Hydraulic fluid flow is auto-managed by the speed of the electric motor saving energy.



Up to 75% energy savings and water use reduction for the spraying functionality.



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Why is the E2 revolutionary?

RAVO E2's Energy & Resource Management (2/2):



- 6. Targeted cabin heating
- 7. Regenerative braking
- PATENTE *****
- 8. Battery cooling & conditioning system
- 9. Swappable battery

Type of efficiency

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Windshield, floor & seat heating improve operator comfort & save energy.

Description

Reversing the electric motors generates energy back into the electric system.

Use on-board water supply to cool battery. Saves energy and improves battery life.

Unique! We have designed a solution to easily swap in a few minutes an empty battery with a fully-charged one optimizing shifts & battery life.



Result of optimizing these 9 functions?



- 1. The **E2** has better vacuum performance, is quieter and more comfortable for operators compared to its thermal version cousin, but uses between **15% to 20% less energy**, reducing its environmental impact.
- 2. The **E2** provides more than a full working shift of autonomy, but thru energy optimization can afford to use a **smaller size battery**. Users can opt between 48 kWh & 64 kWh battery, choosing the right size & price point for their needs, also reducing TCO. The lower voltage 96V battery is **safer** for employees and the space and weight saved translates into higher payload capacity.









Targeted cabin heating: energy savings and operator comfort and ergonomy can go hand-in-hand.

The **E2** does away with the wasteful type of heating system which blows hundreds of cubic meters of hot air into the cabin (and often out the door) and focuses on **radiation heating versus convection heating**.

The E2's cabin heating system relies on:

- A heated windshield
- Floor heating
- Heated seats

Operators love it!





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Auto brush & water pump stop system: common sense and a desire to reduce waste leads to new patent.

- When the sweeper is immobile (f.i. at a traffic light), the brushes will stop rotating, the water pump will shut off and the vaccum's turbine speed will be minimized. All settings return to normal when the sweeper starts to move again.
- Brush rotation speed is linked to the forward speed of the sweeper, avoiding over-speed of the brushes. This reduces energy waste and guarantees a higher quality sweeping result.



Estimated savings
5% electric energy savings
Extra 5% lifetime on brushes
5% less water consumption

Smart hydraulic power unit.

This new system builds-up and stores hydraulic energy in accumulators for use on demand by the sweeper's cylinders (brush movement, suction mouth movement, steering, hopper cylinders, brake calipers).

Compared to a classic system, where a hydraulic pump runs continuously just to maintain pressure and flow even if no function is used, in the E2 hydraulic power is generated only when it needs to be.

Estimated 6% electric energy savings on the savings: total consumption of the machine







New battery cooling & conditioning system.

- This new design uses the sweeper's on-board fresh water supply to cool and condition the battery system.
- Since this water comes from underground storage, it is cool; thus this fresh water becomes a cooling system without using energy.
- Pumps and electric motors are submerged in hydraulic oil, saving space, facilitating cooling and reducing noise.
 - Estimated 4% savings compared to a traditional cooling system, during the summer period.
 - Battery life is optimized through cell temperature management.











Swappable battery system: many thought of it – we did it.



The E2 allows you to <u>easily</u> and <u>rapidly</u> exchange its battery for a freshly charged one.







- Greatly increases the sweeper's flexibility and ease of use, especially for the organization of work (shifts etc.)
- Extends battery life (no need for fast charging)
- Extends vehicle life (replace the battery, not the sweeper)
- Provides easy uncluttered access for maintenance
- Future proof: New technology? Replace the battery!
- Opens the door to a new commercial model: buy the sweeper but rent the battery (reducing initial investment)

In the same Product Line – The RAVO E2w



As a product line extension, the same base E2 machine is also available as a 100% electric WASHER. The RAVO E2w.





