



ECOPPIA'S E4 ROBOTIC CLEANING SOLUTION

The water-free E4 cleaning solution optimizes photovoltaic panel performance in solar parks, while cutting operational costs. Using a water-free microfiber and airflow cleaning system, the E4 solution removes 99% of dust daily, keeping panels at top production even in the harshest desert conditions.

Effective, Fully Automatic Cleaning

The E4 cleaning solution handles an entire solar park using a fleet of cleaning robots, each assigned to a row of PV panels. Combining powerful, soft microfiber elements with controlled air flow, robots utilize gravitation to move dust particles downwards, and off the panels.

The water-free robots move along a rigid aluminum frame using wheels coated with polyurethane to ensure smooth movement with no load on the solar panels' surface. Each cleaning robot is powered by five electric motors – two motors driving the horizontal movement along the solar panel row, two motors powering the vertical up-and-down movement, and one motor operating the rotation of the microfiber elements.

To maintain a smooth sustainable upward and downward movement, the E4 robot uses a sophisticated winch system with two flexible coated silicon rubber wires that operate angularly from opposite sides of the winch cylinder to the center point of the microfiber cylinder frame.

Cleaning is performed at a pace of 54 square foot per 30 seconds, and typically takes place during the early hours of dark to avoid shading during electricity generation hours.



WHY E4?

EFFECTIVE

Removing 99% of dust daily, the E4 cleaning solution keeps solar panels at top production levels - even in the harshest desert conditions.

EFFICIENT

Eliminating manual labor and water waste, a fleet of E4 cleaning robots is remotely managed from a dashboard or mobile app.

ENERGY INDEPENDENT

Powered by a dedicated solar panel, each E4 robot charges its batteries and conserves energy.

ECOLOGICAL

The water-free E4 robots use a self-cleaning mechanism during and after cleaning routines. Eco-hybrid - significantly extends battery life time.



Energy Independent and Ecological

Minimizing energy consumption, the E4 cleaning system uses its own dedicated solar panel. When not cleaning, robots are securely locked to a docking station outside of the solar PV row to ensure they are not affected by strong winds. While docking, robot batteries are charged through their solar panel, with full batteries typically supporting 3 sequential cleaning cycles.

Energy consumption is further optimized with Ecoppia's Eco-hybrid solution in which the robots recover energy while descending solar panels, enabling longer intervals between battery charges.

Upon completion of a cleaning descent, the E4 robot performs a rapid auto-clean of the micro fiber elements before ascending the panel again. An additional self-cleaning routine is carried out at the end of the cleaning cycle, before the robot returns to its docking station.

Certified and Built to Last

All E4 solution components are built to last and are passed through rigorous stress tests in high temperatures (over 150 °F) and desert conditions to ensure stability over time.

Impact on solar panels over time was independently tested by world-renowned PI Berlin Institute, which declared no power degradation nor change in electroluminescence of solar panels after 20 years of daily cleaning by Ecoppia E4 robots.

Efficient Management

The entire solar park cleaning operation is managed through the E4 master application – allowing operators to schedule cleaning, disable or enable individual robots, or instantly send all robots back to base. In addition, all relevant data is being projected in real time and offered through a web-based dashboard allowing authorized users to manage, monitor and analyze the cleaning process and battery status.

Remote management and control are also enabled via a mobile device using SMS-based commands.

The remote management of robots is enabled using Programmable Logic Controllers (PLC), which store cleaning scenarios and communicates with the master application. Four electronic sensors embedded into each E4 cleaning robot ensure optimal cleaning performance with accurate measurement and monitoring of vertical and horizontal movement.



Empowering Solar

For more information please visit www.ecoppia.com or send an email to info@ecoppia.com