HECTOR-HEliosstats Cleaning Team Oriented Robot

HELIOSTAT’s CLEANING

Central-receiver-tower power plants have a large number of heliostats whose reflective surfaces, which are composed of mirrors, focus solar rays on a receiver located at the top of a tower.

Reduced average reflectivity levels of reflective heliostat surfaces in thermosolar power plants, affected by accumulated dust & dirt, have a direct and substantial influence upon the plant’s productivity as these are directly proportional to the overall productivity capacity translating to important losses in plant revenues and profits.

To take full advantage of solar energy, it is extremely important to maintain maximum reflectivity of these mirrors. Therefore a regular cleaning is essential for maintaining desired productivity levels.

The cleaning system by wet brushing ensures, in comparison with water jet cleaning, a high cleaning efficiency in one pass while minimizing the water and fuel consumption, being the most effective cleaning method to maintain the average reflectivity factor of the field in an optimum level.

The distribution of the heliostats along miles of road, and the accuracy requirements of the cleaning performance make the application of an unmanaged and autonomous cleaning system perfectly suitable to carry out a repetitive activity as the solar field’s cleaning, optimizing the plant’s maintenance, both in cost and performance.

To address this need, SENER has patented, designed, and developed HECTOR (Heliostat Cleaning Team Oriented Robot). HECTOR is an innovative, autonomous cleaning system for heliostats based on a fleet of small, individual cleaning robots.

HECTOR is also suitable to clean CPV and large, flat PV rooftop installations, also affected by the accumulation of dust that can reduce significantly production levels.

HECTOR ROBOT

HECTOR is a small size robot which performs a uniform and extremely thorough cleaning of the mirror surface of the heliostats. Its small size and weight favor the operation and handling process, such that a small fleet of such robots can effectively perform the cleaning of a considerable size central tower solar plant in a distributed way, thus minimizing cleaning time and human intervention.

HECTOR robot carries a suite of various sensors and GNC software which permit it to navigate autonomously upon the heliostat’s surface without any human supervision, including surpassing steps and separations among the different facets or panels. No external power or water supply is necessary for its operation. HECTOR carries its own batteries and water tank, and its consumption is so low that a considerable cleaning capacity and autonomy is achieved.
HECTOR-HEliostats Cleaning Team Oriented Robot

HECTOR performs a thorough, uniform, brush cleaning action. It physically wipes and leaves mirror surface practically dry, in contrast to traditional approaches, reducing the posterior accumulation of dust and, thus, maintaining its already high reflectivity longer. Thanks to its innovative design, HECTOR achieves an excellent degree of cleanliness with extremely low water consumption.

HECTOR’s SYSTEM

HECTOR robots only require an operator’s intervention for refilling its water tank, changing the battery and distributing it within the plant. For the latter, in Central Tower Receiver plants a transport vehicle driven by the operator coordinates an entire fleet of such robots whose parallel operation make this system so rapid and cost-effective in cleaning large plants, thereby dramatically increasing an operator’s cleaning capacity.

The operator performs the distribution, support and maintenance tasks for the fleet of robots. This concept allows the robots to clean simultaneously a group of heliostats, assisted by just one operator, which optimizes the process and minimizes operating costs. Furthermore, due to the operator only performs non-critical support task, the risk of mirror breakage is minimized.

HECTOR is designed for day and nighttime operation. Night operation implies several advantages for both the plant and the heliostat itself. It allows performing the cleaning procedure without affecting plant production while taking advantage of the heliostats’ horizontal night stow position.

MAIN FEATURES

- Autonomous cleaning system
- Operator performs non-critical support tasks
- Maximized the cleaning capacity per operator
- Minimized the mirror damages making the cleaning independent of human skills
- Maintains higher average reflectivity levels due its thorough, uniform, brush cleaning action
- Ultra low water and power consumption
- Tolerant to rain and wind
- Benign to the service road infrastructure
- Easily scalable to larger plants
- Robustness to single failure
- Day and nighttime operation.

Contact: solarproducts@sener.es