Cleaning solar panels: an evolution

The craze for solar panels begins in the 1980s. Following the oil shocks, electricity produced by 'alternative' sources appears to be an effective long-term solution. The first MW of production at the world level is reached in 1999. The United States, a pioneer in the field to the point of owning 21% of the total photovoltaic surface area in 1983, is quickly caught up by Germany, and today by China, which now produces 29.7% of the world's solar energy (figures from 2017). A directly correlated issue to the rising number of solar panels is their long-term maintenance in order to ensure ongoing efficiency. Therefore, the way to keep them clean.

At the time of the photovoltaic 'boom', knowledge about the maintenance of solar panels is very limited. Until 2010, the most widespread opinion is that solar panels do not need to be cleaned because 'wind and rain water clean them'. This argument by solar panel producers is commonly accepted, although experiences with other objects left outside over a period of time seem to prove it

wrong. For example, a car parked outside will show traces of dirt despite being subject to rain and wind.

After several years of using solar panels, owners of solar power plants begin to notice a drop in production and fouling of the installed panels. In some regions of the world, where dirt accumulates rapidly under the effect of wind while maintaining a high degree of sunshine, values of decrease in energy production of up to -30% are detected.

As there is no solution available on the market at this time, the job of cleaning the technical surface of the solar panels is given to professional cleaners. Due to the sensitivity and high investment costs of the solar panels, cleaners exclusively use manual brushes. Not knowing yet the impact of machine cleaning on solar panels, it is believed to be the safest way to clean without damaging the panel.

This efficient cleaning system for small, to very small installations, quickly shows its limits with the arrival of increasingly larger plants. The cost of labour and cleaning time reduce the profitability of the cleaning operation. However, this method is still preferred today for small and very small installations, or in some countries with low workhour rates.

Similarly, many professional solar panel cleaners think first of equipping themselves with manual brushes. This is of course for financial reasons and despite the physical constraint of such cleaning. The innovation following this development is the rotating brush, which reduce the drudgery of the work and speed up the process somewhat.

Working on the same principle as manual brushes, they clean more efficiently. However, these brushes still require a person working at a height on the installation, especially in the case of roof-installed panels. The risks associated with working at a height are therefore not ruled out.

At the same time, brushes dedicated to solar panels are developed for the type of 'solar field' installations: a brush is fixed at the end of the line and cleans the row assigned to it. This invention is adapted to solar fields installed in deserts, with constant and significant dust, profitable single line activity. However, being less use for other installation types, it remains tied to a very specific market. So due to the lack of a more efficient solution, installations whose assembly, or quantity do not allow the use of this type of brush still have to be cleaned by hand.

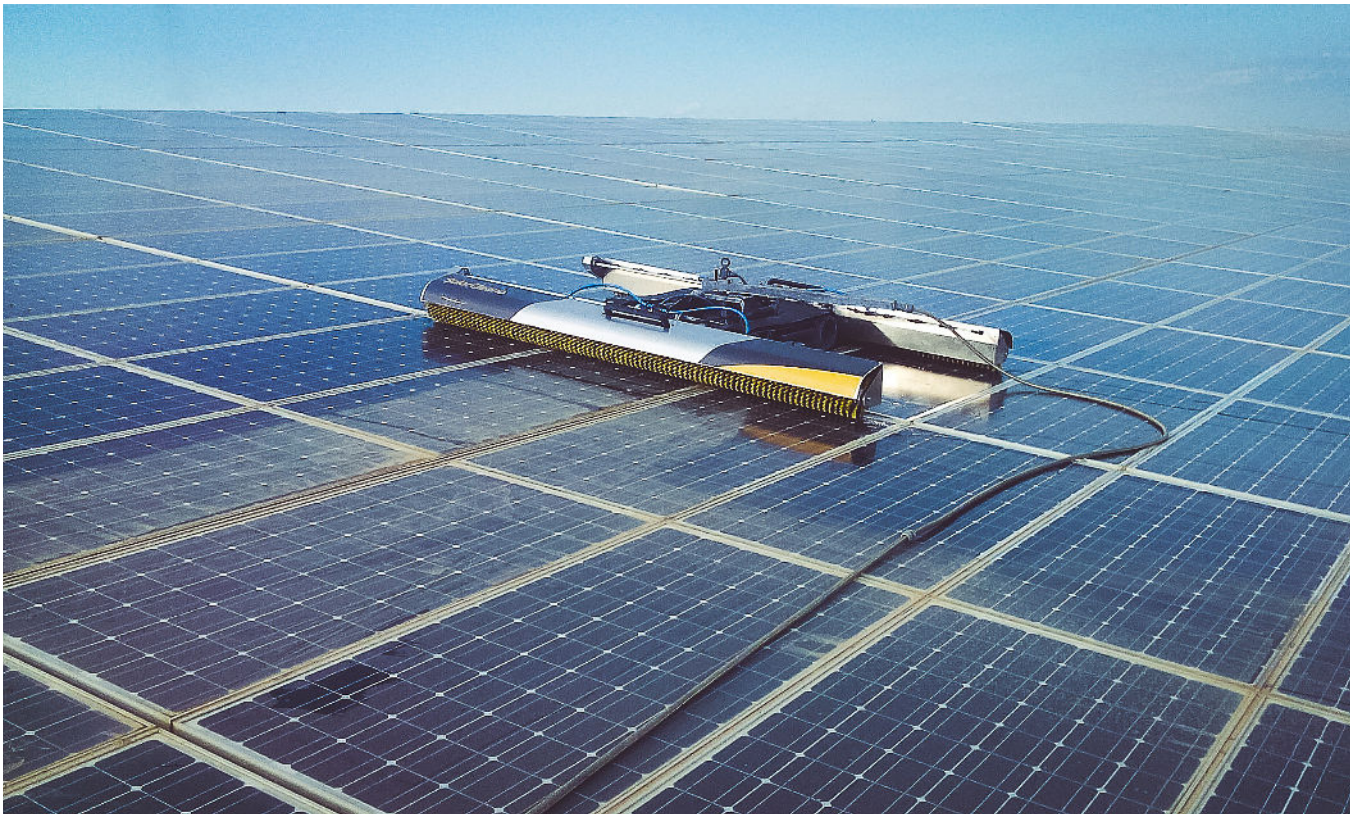
The first cleaning robots make their appearance in 2015, with the rise in the market of professionals dedicated to cleaning solar panels. As large installations are now the norm, for example shadings over car parks, on building roofs, etc., more modern cleaning techniques are becoming imperative. Most of the robots operate with a power supply connection and their ability to clean on inclines is limited.

Moreover, these robots require cherry pickers to be lifted onto the solar panels, increasing the cost of use and shortening the effective cleaning time. Only a few years later does the technology develop further and robots become suitable for the vast majority of installations.

In 2017, SolarCleano shakes up the market by launching its first robot: SolarCleano F1 (Fast One), the only robot designed for maximum convenience and the safety of the operators. Making the use of cradles obsolete, encouraging safe work from the ground, the robot shows a perfect understanding of the daily life and needs of professional cleaners. Its speed of execution makes it possible to follow the movement of an increasing number of solar panel installations of all sizes and types: floating, on the ground, on the roof, on solar trackers etc. Available in several versions, mini for small installations, with 2.2m brushes for increased capacity, SolarCleano reaches out to every need in the solar panel cleaning market.

At present, there are several solutions for cleaning solar panels. Although their efficiency has been surpassed by robots, manual brushes continue to meet with some success with cleaners, as they allow easy and precise cleaning of even the smallest installations. Several solutions are competing for the market of large solar installations in the form of fields, which are developing particularly fast in Arab and Maghreb countries.

This is of course the 'one brush one panel'



solution described above, but other solutions are already in place, such as large tractor-mounted brushes. When the distance between rows of panels is sufficient, this solution offers the advantage of quick cleaning with a single brush and an operator who moves from one row to another by tractor. However, this solution depends on the availability of the solar panels in sufficiently spaced rows, on human presence and on the supply of fuel for the tractor.

Robots of different sizes and capacities clean medium to large installations, with specific features for each brand. Different systems are used, suction cups or skids, with varying results and capacities. Some models incorporate additional technologies to manage panel maintenance in addition to cleaning. Others, such as SolarCleano, include additional options to extend the cleaning capabilities: wheels to stabilize the robot on floating panels, lights and camera to allow cleaning despite low light conditions.

Lastly, some companies, among them SolarCleano, are starting up solutions to get to the next step of solar panel cleaning: automatic cleaning of solar panels, with as little human input as possible. Several types of automated versions are considered: a 'teach and repeat' system that would automatize the cleaning of specific solar installations, by memorizing the cleaning path used in the past, an automatic detection of the edges of a solar field for cleaning with random cleaning paths... Cleaners keep their eyes open every day as the market is evolving fast.

SolarCleano still has many projects in the pipeline. Every year, solar panel cleaning robots experience new innovations! We are looking forward to many more productive years, to bring clarity to many more panels around the world.

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