

# Breaking the bond between cement and solar glass

CRA case study modules: comparison with and without CRA

Four years ago, Portuguese company ChemiTek innovated with the creation of removal agents for specific contaminants and coatings for soiling mitigating and efficiency enhancement for the solar industry. The Cement Removal Agent (CRA) effectively removes cured cement dust from solar glass without damaging the solar panel or the environment. Here is what happened when the solution was used on a solar plant in Dubai over a 35 day period.

The operational and efficiency gains associated with the use of the ChemiTek product were evaluated between the period of May 1 to June 5, 2022, on 288 panels.

The plant, with a harsh contaminant problem of cement dust cured on glass, was being cleaned every two weeks with water and rotative brush, without any success in removing the cement contamination.

For this study, the inverter 6 was cleaned using the CRA solution and the inverter 7 was used as a reference, since it was not contaminated with cement, and it was only cleaned with water. Before the use of the CRA, the inverter 6 was losing almost 7% of the energy output when compared with the inverter 7.

As the existing problem on the solar plant was severe, the concentrated product was mixed with water at a dilution ratio of 1:2. Each 5 liters of CRA product was diluted in 10 liters of water.

The application method used was a sprayer, then brushing and rinsing with water and using a Karcher machine after a few seconds. With this procedure the product did not dry quickly on the panels, and therefore the efficiency of the solution was maintained. So, ChemiTek's recommended ratio solved the problem.

During cleaning, the O&M team reported that the CRA was indeed able to break the cement bond with the glass and loosen the contaminant. An important note is that the product must not be left to dry on the module, otherwise the results can be compromised. The experience in using the CRA made the process more efficient over time.

The energy output of each string was controlled at the inverter level and compared with the average energy generated.

In this test, the temperature of the panels had no influence on the results since all panels were subject to the same solar irradiation and ambient temperature.

The test was considered a success and the O&M team decided to move forward with the use of CRA for the whole plant contaminated with cement dust. After the cleaning, the inverter 6 had recovered almost five per cent of energy output.

As a preventive maintenance measure, in order to avoid the need of the recurrent use of the CRA, the plants will be protected with the antistatic and anti-adherent coating provided by ChemiTek: Solar Wash Protect or Antistatic Solar Amor. This will reduce the adhesion of the cement to the modules, thus making their cleaning much easier.

As several studies show, solar panels lose efficiency over time, due to several factors. The most common one is organic dirt that reduces the ability to absorb sunlight, that can lead to a loss of energy production of up to 50%. That is why, in late 2017, César Martins, Master in Micro/Nanotechnology, realizing the obvious gap that existed in the solar market, in optimization and cleaning of solar panels, founded ChemiTek.

However, manufacturer's guidelines must always be followed when cleaning modules. Most module manufacturers only tolerate cleaning with soft water and soft bristles' brushes, with the use of detergents being very limited. The cleaning products must be at least pH neutral and free of aggressive chemicals.

With that in mind, ChemiTek, in partnership with O&M companies and solar plant managers, developed a range of biodegradable and certified products to solve specific problems in the solar industry, considering the different problems and conditions of each solar plant.

Conditions such as the amount and type of dirt, the location of the panels and the local climate, as well as the cleaning method, were studied to find the best solution for customers' solar assets.

**Energy comparison table**

BEFORE CLEANING			
Date	Daily Energy Produced Inverter 6	Daily Energy Produced Inverter 7	Comparison
27 May 2022	658,25	703,98	-6,50%
28 May 2022	657,9	703,98	-6,55%
29 May 2022	633,92	672,34	-5,71%
30 May 2022	707,06	761,15	-7,11%
31 May 2022	674,01	725,4	-7,08%
<b>AVERAGE</b>	<b>666,228</b>	<b>713,37</b>	<b>-6,59%</b>
AFTER CLEANING			
Date	Daily Energy Produced Inverter 6	Daily Energy Produced Inverter 7	Comparison
1 June 2022	682,18	691,43	-1,34%
2 June 2022	730,75	750,04	-2,57%
3 June 2022	761,04	781,82	-2,66%
4 June 2022	767,37	783,8	-2,10%
5 June 2022	747,86	760,46	-1,66%
<b>AVERAGE</b>	<b>737,84</b>	<b>753,51</b>	<b>-2,06%</b>

Thus, ChemiTek's products are divided into two categories that complement each other perfectly: contaminants removal agents and soiling mitigation coatings suitable for the different surroundings of the PV plants.

The company's contaminant removal agents are an innovative range, including the CRA, concentrated for removing cement dust, stone dust, gypsum and other alkaline contaminants that are cured on the glass surface of solar modules. 'This was not a problem that the company had in mind when creating the products, but cement plants usually have solar farms nearby due to their high energy consumption, and cement ends up settling on the panels,' said Martins.

The range also includes remediation agents, such as the Lichen Removal Agent, to remove lichens, mosses and fungi, contaminants that are very common in humid climates. It is a biodegradable product designed to be as delicate as possible with the components of the solar module. The product will help break the bond between the lichen and the solar glass, making them easier to remove.

Organic dirt, such as bird droppings, dust and powder, pollen and bees' wax, among others, can be cleaned with ChemiTek's pioneering product, Solar Wash Protect, a 2-in-1 product that not only cleans different types of organic dirt from the panels, but it also confers them antistatic and antiadherent protection in the end of the cleaning.

If the water used to clean the modules is hard and leaves spots and stains after drying, ChemiTek's Water Softening Agent (WSA), a concentrated biodegradable treatment for hard and very hard water, is simply mixed in the cleaning water and prevents the appearance of spots and stains.



LRA

These are all contaminant removal agents and should be used as such, except for the Solar Wash Protect that is a 2-in-1 product for cleaning and antistatic protection. To avoid the recurring use of these products, act preventively and protect modules with one of ChemiTek's coatings: Antistatic Solar Amor or Solar Wash Protect for an antistatic protection of the modules, D-Solar Defendor and Industrial Glass Protect for an hydrophobic protection of the modules. The coating will seal the glass and any future growth of lichen, cement dust, bird droppings, or other contaminants will not be

bonded to it so strongly, thus making it easier to remove.

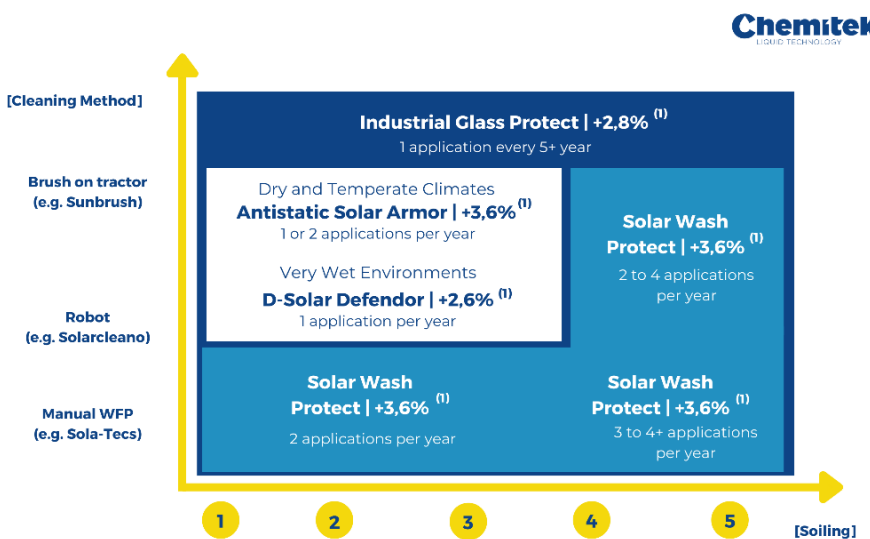
Besides being biodegradable and environmentally friendly, most ChemiTek solar products are also tested by independent laboratories, such as the international laboratory TÜV Sud, showing their competitive advantages and that they are safe for solar modules.

The anti-static products have conformity letters from 12 of the 15 largest photovoltaic modules manufacturers in the world (TRINA, GCL, LONGI, JINKO, etc.) stating that the use of the products will not void their warranty.

This entire process implies persistence and many tests of ChemiTek's products to achieve their official validation from the solar industry giants, but it really differentiates the company and assures the client that their modules are safe!

ChemiTek's products are concentrated and designed to optimize energy production, saving money for both solar asset owners and cleaning and maintenance crews. It is also ChemiTek's goal to create solutions which are not harmful to either the environment or the solar panels, while also saving water in the cleaning process.

The table opposite shows independent results obtained during tests that took place over six months at the Green Energy Park Institute in Rabat, Morocco, to conclude what the additional energy production is compared to modules cleaned with water only.



(1) Additional energy output when compared with modules cleaned with only water - independent results obtained during testing on the Institute "Green Energy Park"