

Customer: RCS Solar

Subject: Instructions on adapting RST cleaning system to LONGi modules

To Whom It May Concern:

LONGi modules have good load capacity and compatibility. After internal evaluation, the modules are suitable for the RST cleaning system. According to the product datasheet (Appendix 1) provided, the system meets the instructions in the LONGi OPERATION AND MAINTENANCE MANUAL (Appendix 2). It does not damage the structure of the product, so it can be installed and used normally, and does not affect product performance and quality assurance.

If you have any questions, please feel free to contact me.

Sincerely

LONGi Solar Technology Co., Ltd.

Justin Zhang

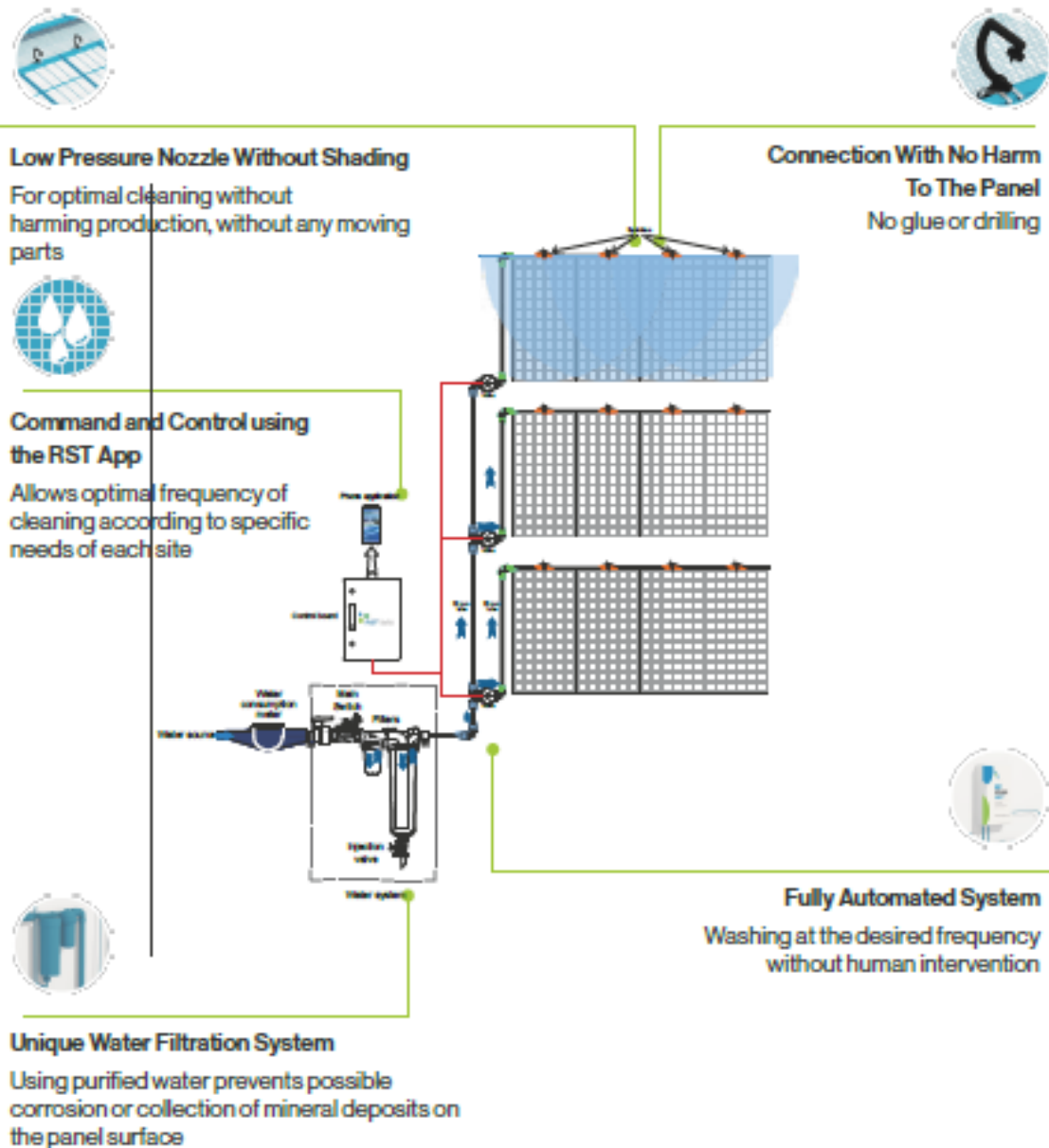
张智铭

Justin Zhang

隆基乐叶光伏科技有限公司
LONGI SOLAR TECHNOLOGY CO., LTD

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Appendix 2

2.2 Cleaning of PV Modules

During the operation of the module, the obstruction of dust, bird droppings, ice and snow will reduce the output power, and partial obstruction may even cause hot spots. Therefore, modules need to be cleaned regularly.



2.2.1 Requirements for Cleaning Water and Detergent

1. Municipal domestic water can be used for the cleaning of PV modules. If other water sources are used, the following requirements shall be met:

- pH: 6-8
- Chloride or salinity: 0-1000 mg/L
- Turbidity: 0-30 NTU
- Specific conductance: $\leq 3000 \mu\text{s}/\text{cm}$
- Total dissolved solids: $\leq 1000 \text{ mg}/\text{L}$
- Water Hardness: 0-450 mg/L

It is not recommended to use water with high mineral content, because the minerals in the water will deposit on the glass surface after long-term use, which will gradually accumulate and cause a change of the appearance of glasses and a decrease of glass transmittance which may further reduce the power generation of the module.

- The temperature difference between water and module cannot exceed 10°C . Do not clean the module when the ambient temperature is lower than 5°C to avoid freezing and cracking of the glass.
- When using pressure water flow for cleaning, the water pressure on the surface of the module shall not exceed 0.69Mpa.
- Detergents, such as commercial glass cleaning agents, alcohol, and methanol, can only be used when the module cannot be cleaned with water. Do not use abrasive powder, abrasive cleaning agent, washing cleaning agent, polishing machine, sodium hydroxide, benzene, nitro thinner, acid or alkali and other chemical substances.
- Do not use steam or corrosive chemical reagents to accelerate cleaning.

2.2.3 Notes for Cleaning Process

- The back of the bifacial module needs to be cleaned, and the back of the mono-facial module is not recommended to be cleaned.
- During the cleaning of PV modules, do not splash water on the cables. Ensure that the connectors are clean and dry to prevent electric shock and fire hazards.
- To prevent the risk of electric shock, do not clean PV modules with broken glass or exposed cables.
- Do not step on modules when cleaning.



- If the PV module is cleaned under strong wind, heavy rain or heavy snow weather conditions, avoid cleaning tools or operation damage to the module.
- When removing the snow on the surface of the PV module, use a mop to gently remove all the snow. Avoid the phenomenon of "partly with snow and partly without snow" on PV modules. Do not forcibly clean up frost and snow to prevent damage to the surface glass of the module.
- After cleaning, the glass surface of the PV module shall be free of dust and dirt.

2.2.4 Recommended Cleaning Methods

1. Cleaning Time

The cleaning of modules should be carried out in the early morning, dust, night or on rainy day (recommended irradiation $\leq 200\text{W}/\text{m}^2$). The cleaning in the morning or dust should be carried out at a time when the sun is dim (it is recommended to clean modules when the inverter is not started). Prevent man-made shadows from causing hot spots on the PV array;

On cloudy or rainy days, sunlight will penetrate the thin cloud layer, and modules will generate voltage. It is necessary to pay attention to the safety of personnel to prevent danger.

2. Cleaning Cycle and Area

As large-scale PV power stations occupy a large area, the number of modules is huge, and every day the suitable time for cleaning operations is short, the cleaning work of PV power stations should be planned and carried out according to the specific area, to use the least manpower to complete cleaning work of PV power station. The area division of the cleaning work should be carried out in accordance with the electrical structure of the PV power station, and at the same time, it should be ensured that each cleaning work can cover all modules connected to several combiner boxes and inverters.

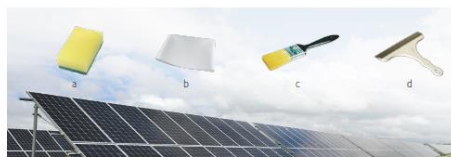
2.2.2 Requirements for Cleaning Tools or Equipment

1. During the cleaning process, it is recommended to wear cleaning gloves to avoid fingerprints or other dirt remaining on the glass. Do not touch the surface of the glass with bare hands without gloves.

2. Do not use tools and materials that will scratch the surface of modules, such as blades, scouring wire and other metal tools or other abrasive materials.



3. Various soft foam materials, non-woven fabrics, brooms, soft sponges, soft brushes and brushes whose diameter of nylon thread is 0.06-0.1mm can be used. If the sponge shown in the following figure (a) is used to clean modules, avoid using the hard surface of the sponge for cleaning.



4. LONGi modules can be cleaned with automatic cleaning equipment. During the cleaning process, the requirements for the use of automatic cleaning equipment must be followed, and modules must be protected from damage. If you are not sure whether the automatic cleaning equipment will cause damage to modules, you can consult the customer service personnel of LONGi.

For the cleaning cycle, the customer should evaluate the module cleaning frequency according to the actual situation of the project:

- In rainy areas, it is recommended to clean at least once in 40-50 days; in dry areas with little rain, it is recommended to clean at least once in 20-30 days;
- It is recommended to clean the back of the bifacial module at least once per half a year.
- When the module/cell is partially obscured by dirt, the module must be cleaned.

3. Cleaning Process

Routine cleaning work is recommended to be completed through three processes: first sweep, second scraping, and third washing.

Step 1: Sweep

A dry duster (without hard objects) or a soft and clean cloth should be used to remove the deposited dust and fallen leaves on the surface of the module. If there are no other deposits on the surface of the module and the module has been cleaned up according to this step, the following steps are not necessary.

Step 2: Scrape

If modules are closely attached to hard foreign objects such as soil, bird droppings, plant branches and leaves, etc., they need to be cleaned with a non-woven cloth or brush and do not use hard objects to scrape this area. Do not easily scrape the area without attaching hard foreign objects, just removed foreign objects.

Step 3: Cleaning

If there are stains on the surface of modules, such as bird droppings, plant juices, etc., or the air humidity is too high so that the dust is difficult to remove, modules need cleaning. After spraying the cleaning water on the contaminated area, use a brush to clean at the same time. If there are oily substances, alcohol can be applied to the contaminated area, and a brush is needed after the solution penetrates the contaminants. If there is still dirt that cannot be removed, you can use a commercial glass detergent and use a non-woven cloth to clean it.

Frameless bifacial modules generally use the same cleaning methods as common modules. However, because there is no frame around them, it is necessary to fully consider the deformation caused by external stress during the cleaning process, and try to avoid large-scale actions to prevent module damage or the occurrence of a security incident.

Because the back of the bifacial PV module can also generate power, the back of the module also needs to be cleaned, and the cleaning method is the same as that of the front. From the perspective of safety, it is recommended to complete the power-off operation before cleaning the back of the bifacial module; when cleaning the back of the bifacial module, do not directly wash the junction box with water, and ensure that the connector is clean and dry.

2.2.5 Special Environmental Cleaning Requirements

1. Accumulated Snow

LONGi Modules can withstand high snow loads (refer to the installation manual). If you need to remove snow to increase output power, please use tools that will not damage the surface of the module, such as a brush, mop, or blower, and gently remove all snow to avoid the appearance of "partly snow and part no snow" on the PV module. "The patchy phenomenon." Do not use hot water to pour PV modules, as uneven heat and cold will seriously damage PV modules. Please do not try to remove the frozen snow or ice on the module to prevent damage to the surface glass of the module.

2. Arid and Rainless Areas

In arid and rainless areas, sand and dust are likely to accumulate on the entire surface of the module, as shown in the figure below. The frequency of cleaning needs to be judged according to the dust accumulation. If the module/cell is partially obscured by dirt, the module must be cleaned. For small power stations, manual cleaning can be used to clean according to the above cleaning steps. For large-scale power stations, high-pressure cleaning vehicles can be used to tangentially or positively impact PV modules to achieve the effect of dust removal, or automatic cleaning equipment approved by LONGI can be used for cleaning.



3. Humid and Rainy Areas

In humid and rainy areas, the upper surface of the module can be kept clean to a certain extent by washing with rainwater, but a small amount of water and dirt are likely to remain on the lower edge of the module. This phenomenon is particularly obvious in the installation of the roof/factory distributed scene with a small inclination angle, as shown in the figure below. In this case, long-term accumulation of water on the bottom edge of the module will corrode the glass surface, and the uneven shielding of the bottom edge of the module will cause abnormal heating in the area. Please increase the cleaning frequency appropriately according to the actual situation. If the module/cell is partially obscured by dirt, the module must be cleaned.



2.2.6 Inspection after Cleaning

1. Visually, the overall appearance of modules is clean, bright, and free of stains.
2. There is no obvious scratch on the surface of the module.
3. There is no manned cracking on the surface of the module.
4. There is no tilt or bending of the module bracket after cleaning.
5. There is no damage to modules, such as broken glass, broken back sheet, twisted or deformed frame, damaged cables, disconnected or broken connectors, and damaged junction boxes.

2.3 Cleaning of Obstruction of PV Modules

2.3.1 Requirements of Obstruction Cleaning LONGI-商密-张智铭(zha

1. During the operation of modules, there should be no environmental factors that cast shadows on the module and block modules, otherwise, it will cause hot spots on the module, which will cause the output power to be significantly reduced. Generally, there is much vegetation in the mountain power stations, and vegetation blocking modules are prone to appear. If such a situation is found during the O&M process, please clean it up in time.



2. In the process of cleaning the obstruction, it is necessary to comply with the corresponding local regulations, including the electrical law, construction law and electrical connection requirements, to ensure the safety of the person and the PV module system, and to protect the environment.
3. If vegetation inhibitors are used for spraying, the drugs should not contain corrosive or oxidizing components to modules and the system, and the drugs should avoid contact with the module.
4. If the cleaning is carried out under strong wind, heavy rain or heavy snow, it is necessary to avoid cleaning tools or operating damaged modules.
5. The cleared obstructions should be taken away from the PV array area for disposal.
6. In the process of clearing obstructions or vegetation, avoid affecting the stability of pile foundations and columns.

2.3.2 Inspection after Obstructions Cleaning

1. Visually, the light-receiving surface of the module is not blocked, and the bifacial module should be paid attention to ensuring that the back is not blocked.
2. The vegetation needs to be 5cm below the lowest edge of the module.
3. The obstructions on-site are cleaned up, and PV modules are not damaged.