







User Guide – Equipment & Application

To achieve the best results with Lavee Solar, please read this guide carefully. Understanding the recommended equipment and cleaning process is essential for optimal solar panel performance.

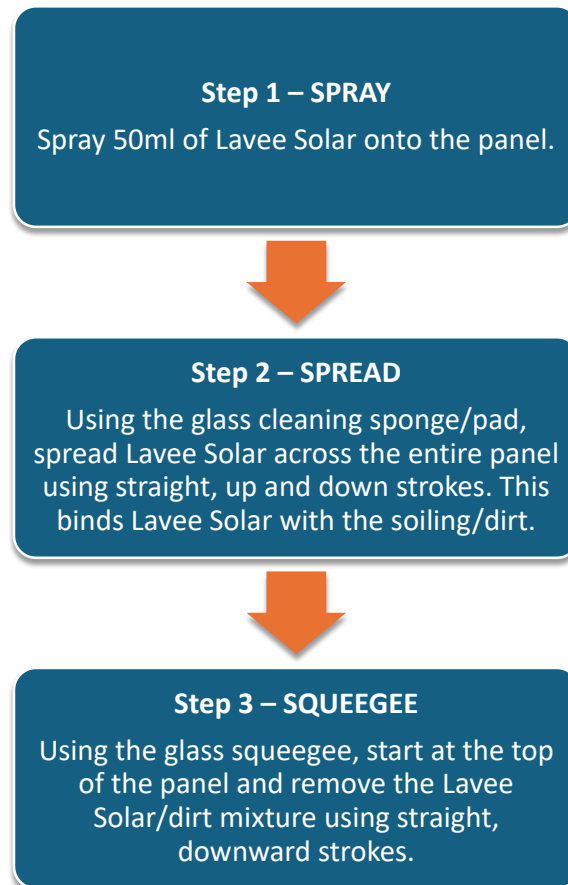
1. Equipment – Manual cleaning

Lavee Solar is designed for use with simple, accessible and easily available equipment. To achieve optimal results when using Lavee Solar, we recommend the following equipment is used. This advice has been refined through years of practical application and experience using Lavee Solar, cleaning different types of installations, varying levels of dirt, and climatic conditions.

	<p>Pressure sprayer</p> <p>The sprayer needs to have an adjustable nozzle and be able to spray the product up to 4.5m. This is necessary for the product to reach a second panel of a ground installation. We suggest a sprayer with a capacity of 1.2 litres, although sizes can vary. Sprayers can be easily found at reputable hardware, DIY or cleaning provision stores at affordable prices.</p>
	<p>Aluminium extension pole</p> <p>Any type of pole can be used although we highly recommend that a consistent brand is used so that connections with items below are the same. We also recommend 4.5m extendable poles to ensure reach. For a streamlined clean (using 2 people), we recommend one pole per person. <i>(Example product – ED450 Unger 4.5m 3 section telescopic pole)</i></p>
	<p>Glass cleaning sponge/pad support head</p> <p>The sponge/pad support head we recommend has a lock that locks the movement on one of the axes, providing enormous efficiency in the cleaning process, and preventing the glass cleaning sponge/pad from moving as cleaning takes place. <i>(Example product – PHH20 Unger Pad head + nLite thread cone c adapter)</i></p>
	<p>Glass cleaning sponge/pad</p> <p>The glass cleaning sponge/pad to be used is specifically designed for use on glass, and is typically white and soft. This product is safe to use as it does not cause any harm to the glass or frame. The sponges/pads are double-sided so can be turned over once soiled. <i>(Example product – OPS20 Unger white scrub pad)</i></p>
	<p>Glass squeegee</p> <p>The glass squeegee (i.e. for use on glass) has an aluminium base and silicone blade that is ideal for cleaning solar panels. Our recommendation is a squeegee with a width of 55cm (22 inches), allowing just two passes on each panel to remove the Lavee Solar residue. <i>(Example product – ES554 Unger Ergotec 55cm (22") Aluminium Squeegee)</i></p>
	<p>Glass microfibre cloths</p> <p>For the perfect aesthetic finish! Use to wipe away any residue left at the base of the panel or build-up on the squeegee. This cloth is recommended but not essential.</p>

2. Application – Manual cleaning summary

The application process is very simple, consisting of three steps that leaves the panel cleaned and protected in just 30-45 seconds:



For speed and efficiency, the cleaning process can be conducted by 2 people, with one person alternating between the sprayer and squeegee (steps 1 & 3), and the other person operating the glass cleaning sponge/pole (step 2).

For videos on (a) the application process and (b) how to use the recommended equipment, please visit our website using the following link: <https://lavee-solar.com/product-information>

Important notes:

1. It is recommended that cleaning is done when temperatures (and panels) are cooler – such as early morning, late afternoon, or on overcast days (i.e. during periods of low solar irradiance). If this cannot be avoided, more Lavee Solar may need to be applied (due to some product loss from evaporation).
2. **In the case of heavily soiled panels (e.g. hard-grained encrusted dirt, tree sap, cement, etc.), the 3 step process may need to be repeated and/or more Lavee Solar may need to be applied. Once a heavily soiled panel has been cleaned and protected using Lavee Solar, future cleaning will be faster and simpler.**

There are more details on (1) when to clean time and (2) heavy soiling in section 3.

3. Application – Manual cleaning detail

Before you start...

Go prepared. Before undertaking the clean, we would recommend a brief inspection of the installation. This gives scope for how much Lavee Solar is needed and can also highlight any exceptional problems (e.g. previously neglected panels that have hard-grained encrusted dirt, tree sap, cement).

Ready to use – Lavee Solar is supplied in its final form of use. Do **not** dilute the product, as this may compromise its essential properties and effectiveness.

3 step process

Step 1 – Spray

Spray Lavee Solar directly onto the panel. With the recommended sprayer, adjust the nozzle so that the jet of Lavee Solar reaches a sufficient distance to cover the entire panel. Subject the pressure and nozzle settings, pulling the sprayer's trigger for 10 seconds will release approximately 50ml of Lavee Solar (the recommended amount per panel). Applying less than 50ml per panel may cause the water content to evaporate and make the following processes less effective. In this case, simply repeat the application of Lavee Solar, now using 50ml per panel.

It is not advised to spray the product as mist, because in the next step (Step 2 – Spread) Lavee Solar and the soiling/dirt will be homogenized over the entire panel.

Using a larger sprayer (e.g. backpack) is perfectly acceptable but as the larger tank has a greater weight, this can cause operator fatigue and slow down the cleaning process.

When spraying, be careful not to splash the product on panels that have already been cleaned. If this happens, remove the excess liquid using a squeegee (step 3) or microfibre cloth or, if necessary, repeat steps 1-3 on the already cleaned panel.

Step 2 – Spread

Using the glass cleaning sponge/pad, spread Lavee Solar over the entire panel (and thereby mixing it with the soiling/dirt) using straight, up and down movements. There is no need to scrub in one place or apply pressure.

Use an appropriate extension pole so that the glass cleaning sponge/pad reaches the entire panel without having to lean over it. The same glass cleaning sponge/pad can be used on many panels, depending on the severity of soiling. The reverse side can be used when the previous one is dirty. Once both sides are dirty, it can be washed in water for re-use.

Step 3 – Squeegee

The squeegee needs to be designed specifically for use on glass, with a silicone blade. Other types of squeegees do not provide the optimum firmness for cleaning and may even pose a risk to the panel glass.

To remove the Lavee Solar/dirt mixture, make straight single passes from the top of the panel to the bottom of the panel, as stopping halfway leaves marks on the panel. We recommend a small shake after each pass to get rid of any residual drips. We also recommend cleaning the squeegee with the microfibre cloth from time to time/as required.

Over time, the silicone blades can dry-out with use and replacements can be purchased.

Additional cleaning notes

- a. **IMPORTANT - It is not recommended to clean solar panels while they are live (i.e. panels connected and generating electricity)** – Solar panel experts advise shutting down the solar system before cleaning. Always check your manufacturer's manual for specific cleaning and safety instructions as some warranties may be invalidated if cleaning is done incorrectly or while the system is live. As cleaning with Lavee Solar is quick and simple, downtime is minimised here.
- b. **When to clean** – It is recommended that the cleaning work is completed during periods of low solar irradiance such as early morning, late afternoon, or on overcast days – when temperatures (and the panels) are cooler. This avoids losing some product to evaporation (if panels are hot) and ensures the best performance of Lavee Solar in terms of consumption. In warmer conditions, Lavee Solar is best applied as a liquid jet rather as fine mist.
 - If it is necessary to clean the panel during peak irradiance moments, it may be necessary to use more product on the panel to account for some evaporation – in this case, the three steps should also be performed quickly, one after the other.
 - In extreme irradiance, it may be necessary to clean by dividing the panel into two or four regions.
- c. **Working in pairs** – For speed and efficiency on larger installations, it is recommended that the work is done in pairs. This speeds up the process and reduces the risk of water evaporation from Lavee Solar during the cleaning process. One person uses the sprayer and squeegee (steps 1 & 3), and the other person uses glass cleaning sponge/pad (step 2) – working in sequence.
 - Do not apply to several panels and then proceed to step 2 - cleaning should be done panel by panel, always going through the three steps.
- d. **Bird droppings** – In the case of bird droppings, apply a little more product in step 1 and then use the glass cleaning sponge/pad with a little more vigour - it comes off easily. There is no need to wait for the product to act. In the link below, there is a video from our YouTube channel specifically showing the cleaning of this type of dirt. <https://youtu.be/teWREUyl-Yg?si=A9SHIAMTaaBFJ6JN>
- e. **Encrusted dirt** – Lavee Solar can be used on all types of soiling. However, some soiling (such as hard-grained encrusted dirt, tree sap, cement residues, etc.) can be more difficult to remove. In extreme scenarios, we recommend applying more Lavee Solar than usual and leave to bind for a longer time. If necessary, repeat the 3-step process to remove the thick encrusted dirt in layers. Once a heavily soiled panel has been cleaned and protected using Lavee Solar, future cleaning will be faster and simpler.

- f. **Cosmetic stains** – It is normal to have a few stains on the panel; they do not hinder generation and will come off with the first rain. If desired, use a microfibre cloth to finish and remove stains.
- g. **Cleaning the frame** – Lavee Solar can be used to clean the whole module, including the frame. In this case, spray Lavee Solar directly onto the frame and remove using the microfibre cloth.
- h. **Training and demonstrations** – For training and demonstrations, choose an easily accessible panel where several people can participate and see the results. It is very important that the entire team undergoes training and tests what they have learned.
 - Be strict with personal protective equipment for each occasion. In ground plants, wear appropriate protective clothing, helmets for example as advised by site managers. On rooftops, do not forget to use a fall protection harness.
 - Evaluate in advance the need for special authorisation or training required by customers.

4. Semi and fully automated cleaning

Lavee Solar has been successfully developed and tested for use with semi-automated cleaning techniques (e.g. rotary brushes) and fully automated systems (e.g. tractor-based sprayers, surface cleaning robots). However, as there are a multitude of automated cleaning systems and manufacturers globally, Lavee Solar has not been tested with each of them.

For specific cleaning machinery/system compatibility and instructions, please contact the team at Lavee Solar Limited.

5. Training and practical guidance

We are very keen for Lavee Solar to be used correctly to ensure optimal performance. We have various channels to deliver the technical training as it is important that the people conducting the cleaning know the benefits and opportunities of using this waterless cleaning process.

On our website, <http://lavee-solar.com> there is a series of explanatory videos and experiences with the application of Lavee Solar. Please use these videos to increase your experience and achieve optimum results.

6. After-sales and feedback

We appreciate and listen to any feedback from our customers. Our suggested process is different from what has been applied in the history of photovoltaic systems worldwide, and requires training and understanding. The process designed today is the result of practical experiences of our team over several years and tests implemented with our main customers. If there are any suggestions, we will be very grateful to receive and hear them.