



GEF Solar Chill

Training Module 5

MAINTENANCE





MAINTENANCE AND REPAIR

- Planning
- **Preventive** maintenance
(by on-site workers)
- **Corrective** maintenance & repair
(by trained technicians)





WHY MAINTENANCE AND REPAIR?

- Refrigerators and solar panels are complex technologies
- **Preventive** maintenance and repair to function properly
 - Secure vaccine safety
 - Secure health
 - Reduce cost



WHAT NEEDS TO BE DONE?

Preventive Maintenance

- Refrigerators are expected to last for 10 years
- Keep the machine and power system running
 - Basis: daily, weekly or monthly

On-Site Training

- Responsible person at the Health Facility should receive a basic training to be able to conduct the routine maintenance
 - Tasks should be provided in written form (checklist)
 - Reporting (weekly or monthly)
 - Best on the unit which will be installed



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ON-SITE TRAINING

- Are all required tools and supplies in place?
- Was a training conducted?



TECHNICIAN MAINTENANCE TOOLS

- Users typically need to be supplied with specific maintenance training and specific tools and supplies
- In some cases, special long-reach tools or personal access to the photovoltaic array is required to safely reach the photovoltaic array for routine cleaning
- In general, the supplies and tools for preventive maintenance include the following:
 - soft brush for cleaning condenser fins
 - plastic scraper (for safely removing ice build-up)
 - optional for certain appliances: condensate collection pan
 - optional for cleaning photovoltaic arrays with difficult access: long-handle glass cleaning tools and/or ladder.

... and more, see next slides

TECHNICIAN MAINTENANCE TOOLS

Cleaning kit

Soft cloth rags

Mild soap detergent

Water bucket

Wire brush

Abrasives (emery or sandpaper)



General

First-Aid kit

Paper and Pencil

Thermometer



Electricians tool kit

Wire stripper / crimper

Lineman pliers

Long nose plier

Diagonal pliers

Spare fuses

Selection of electric connectors / hardware

Multimeter (bring 2 in case of failure)



TECHNICIAN MAINTENANCE TOOLS

General tool kit

Hammer

Screwdriver

Wrenches

Pliers

Socket set

Tape measure

Selection of fasteners

Battery operated drill and bits

Battery operated portable lights (2)

Spare parts kit (per manufacturers recommendation)



Optional

Long handle glass cleaning tool

Soldering iron and solder (if power is available)

PREVENTIVE MAINTENANCE: daily basis

MAINTENANCE TASKS	CHECK
Check thermometer on refrigerator for acceptable temperature (+2°C to +8°C)	
Record refrigerator temperature	
Check other indicators for correct operation (e.g. 30-day temperature recorders for alarms, light emitting diode [LED] lights on refrigerator for correct daytime operation, battery voltmeters)	
Ensure efficient operation: <ul style="list-style-type: none"> • Open only when needed and close as soon as possible • Do not store personal food or drinks • Load vaccine and ice-packs according to manufacturers recommendation 	
Check refrigerator lid(s) fit tightly and are in position	
If freezer is not completely frozen in the morning wipe away interior moisture	
Check that ventilation of refrigerator is free of blockage	
Report to supervisor any problems that cannot be solved	

PREVENTIVE MAINTENANCE: weekly basis

MAINTENANCE TASKS	CHECK
Disconnect power	
Drain or wipe up refrigerator condensate	
Clean appliance inside, door seals, ventilation grills, condenser and outside	
Defrost as necessary (maybe more frequent than monthly)	
Check door seal tightness	
Clean solar array (only if dusty, dirty and/or mould is growing on it)	
Clean solar array for shading from plants. Trim plants that shade solar array	
Clean solar array for other shading (e.g. new construction), report to supervisor	
Clean wiring for signs of damage (animals, storm, accidents), report to supervisor	
Reconnect power	
Check for expected operation (e.g. indicator lights, fans operating, cooling as expected)	

PREVENTIVE MAINTENANCE: bi-annual basis

MAINTENANCE TASKS	CHECK
Oil hinges	
Request technician to tighten all electrical connections	
Request technician to tighten all mechanical connections	
For flooded-battery systems: request technician to service batteries (i.e. record specific gravity of each cell, clean terminals, inspect condition of plates, add distilled water as required, apply equalizing charge as needed and check battery enclosure ventilation)	

CORRECTIVE MAINTENANCE AND REPAIR

Usually conducted by technicians (Refrigerators and solar electric systems)

- Troubleshooting
- Minor repairs (if needed)
- 2 visits per year

Tasks include

- Retrain users
- Review system performance
- Inspect location and condition
- Check fasteners and tighten
- Check cabling and conduits
- Inspect solar array for shading and cleaning

MAINTENANCE OF GENERAL FUNCTIONALITY

- Through monitoring of the units the temperature is regularly surveyed
- Through daily and weekly maintenance and reporting the system should be routinely checked
- Any malfunction should be reported ASAP (clarify to whom)

SDD unit	PV electrical system
<ul style="list-style-type: none"> • Check closing function • Check interior • Check cable and wiring • Check unit and location in terms of damage • Any leakages visible • Temperature reading 	<ul style="list-style-type: none"> • Check panels visible for dirt, dust • Check shading • Check orientation relative to the sun • Check fasteners and tighten • Check PV and cable for potential damage • Check power output (Voltage and Ampere) • Check location for any signs of damage



Thank you for your attention!