

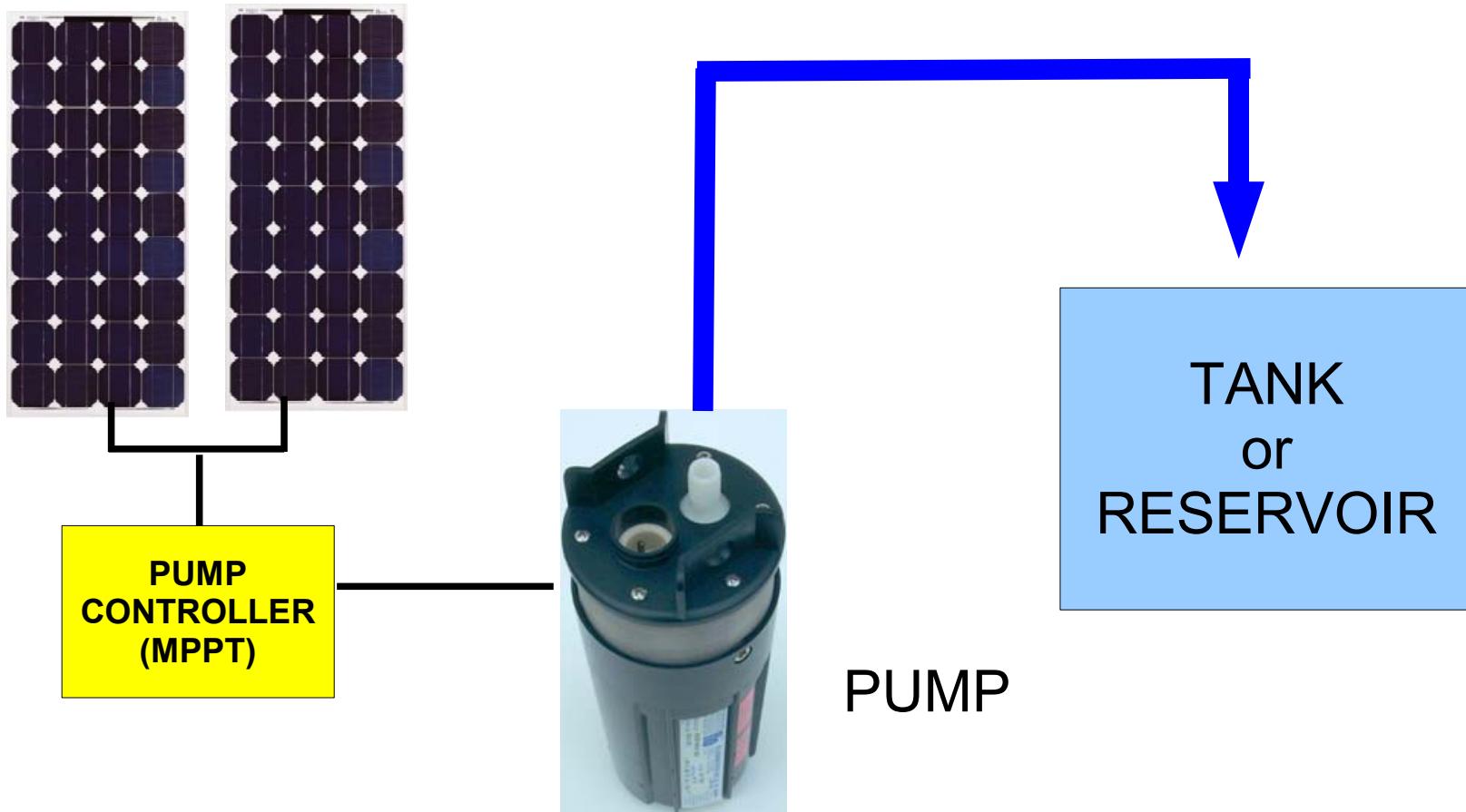
# SOLAR WATER PUMPING

# Solar water pumping

- Can be expensive
- Borehole can cost more than the PV system
- Generally more suitable for humans and animals rather than crop irrigation
- Usually no batteries
- At low heads it can be particularly effective



# Solar water pumping system



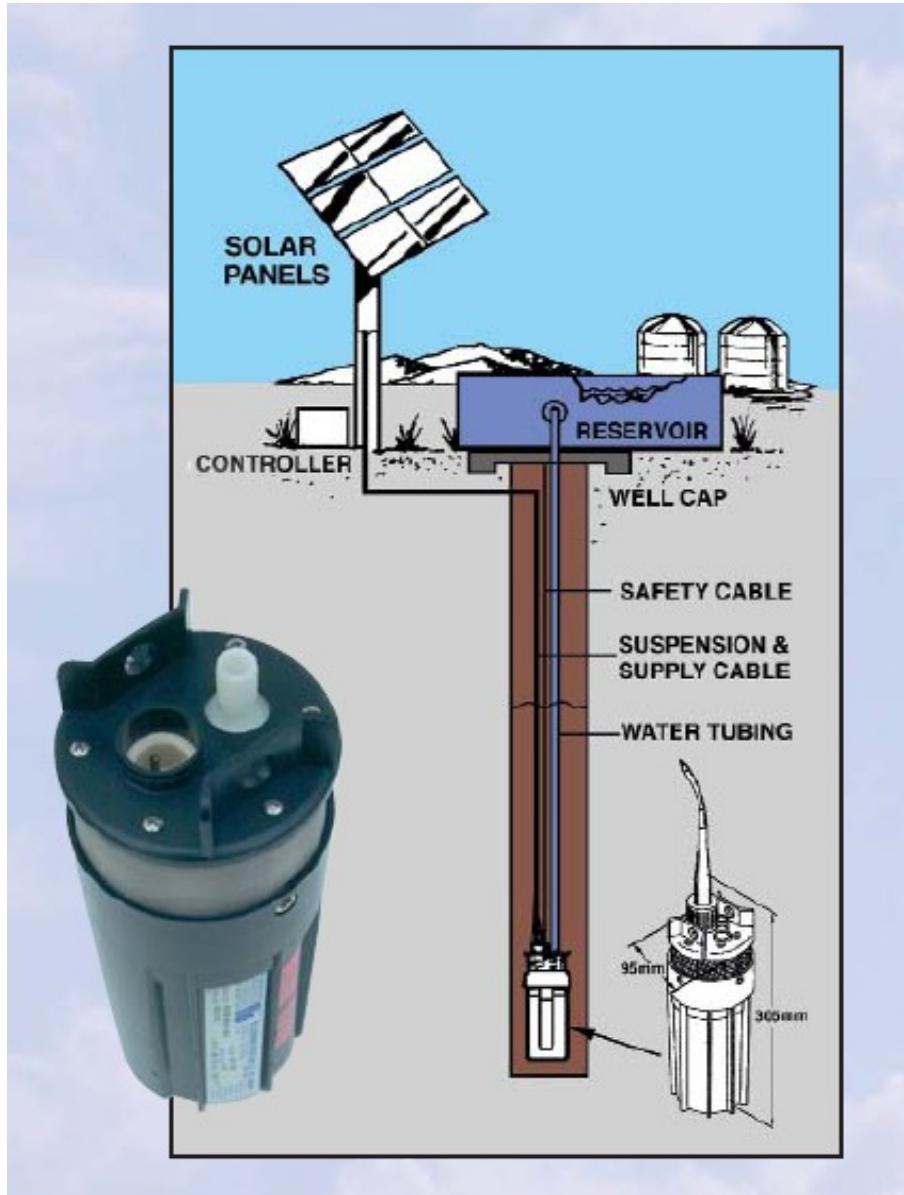
# Solar water pump

- Pump works when the sun shines
- Water is stored
- High starting current needed
- MPPTs often used



*Centre for Alternative Technology, Wales*

# Deep borehole pumps



[www.ampair.com](http://www.ampair.com)

SOLAR WATER PUMPING

# Sizing a solar water pump

- How much water needed in  $\text{m}^3$  per day?
- How high does it have to be pumped - in m?
  - vertical head
  - from max. borehole depth
  - to storage tank
- **With this information a pump can be selected**
- What is the solar radiation in the design month?
- **With this information a PV array can be sized**

# Water requirements

- Each person - 280 litres per day
- Milk cow - 133 litres per day
- Cow/calf pair - 38-144 litres per day
- Horse, beef animal - 38-76 litres per day
  - Sheep - 8 litres per day
  - Pig - 15 litres per day
  - 100 chickens - 15 litres per day

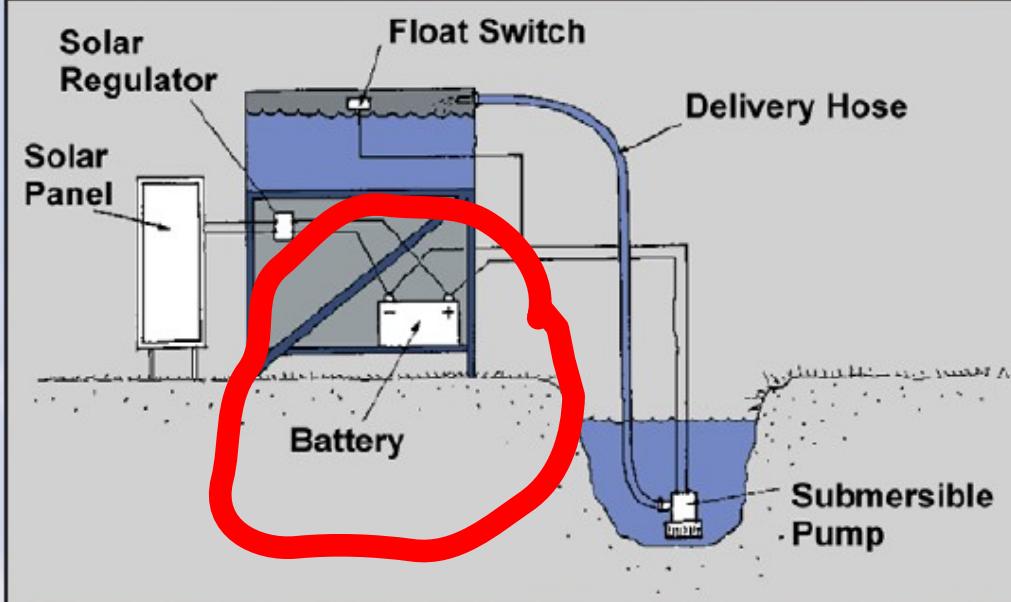
SYSTEMS  
DO NOT  
USUALLY  
HAVE  
BATTERIES



[www.ampair.com](http://www.ampair.com)

### *Submersible Surface Pumps.*

*These can be selected to suit the application. Factors that need to be considered include: Head of water (including storage tank height), flow rate required, method of priming, inclusion of automatic float switches, filtering system, match to power system and pump maintenance.*



# Low power boat / bilge / pond pumps

## Solar Pond Pumps

These provide a remote, self-powered water feature.

The pump is directly connected to the Solar Panel

- **NO BATTERY REQUIRED**
- **NO MAINS REQUIRED**

## Aquasolar 700

Recommended Solar Panel  
10W to 20W

Max. Flow 12 litres per min.  
Max. Head 2m

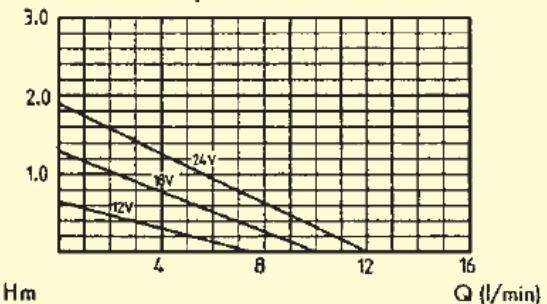
## Aquasolar 1500

Recommended Solar Panel  
20W to 25W

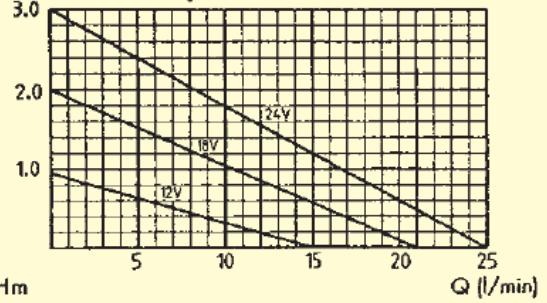
Max. Flow 25 litres per min.  
Max. Head 3m



Aquasolar 700



Aquasolar 1500



[www.ampair.com](http://www.ampair.com)

# Wind option (mechanical)

- 100,000s installed in the mid-West of USA in 19<sup>th</sup> century
- Also used in Australia and South Africa extensively
- Water is pumped and stored when wind blows
- Need to be above borehole



## Wind option (electrical)

- Wind pumps often come in kit form, such as the RUTLAND FM910 wind pump kit.
- The turbine has a rotor diameter of 0.9m.
- It can pump water from wells or boreholes from a depth of 70m



# Homesystem - SET



Garden irrigation Turkey

## Components:

- 2x Solar modul TWIN 75
- 1x Solar deep well pump STP 70
- 1x Wiring set for solar modules
- 1x Wiring set for pump

The system can be extended by 2 solar modules TWIN 75 and/or one wind generator WG 913 that could also operate at night!

Requirement: high-yield well and steady wind.

Available amount of water per day with the standard system:

Water depth	Yield in tons per day	With additional wind generator WG 913
10m	4	9
20m	3,5	8
30m	3	7
50m	2,5	6

## Qualified for:

- Household supply
- Irrigation of kitchen gardens
- Up to 1,5 hectares by vegetables
- Up to 4 hectares by trees

Recommended for a well depth from 10 to 40m (Max. 70m)



Public spring



[www.sunset-solar.com](http://www.sunset-solar.com)

## Field system MINI – SET

For irrigation of vegetable fields and tree plantations. Suitable for **up to 20 hectares of vegetables** and **up to 55 hectares of trees**, depending on water depth.

**Recommended for a well depth of up to 30m**

Components:

- 15x Solar modul KA 64
- 1x Solar deep well pump STP 400
- 1x Wiring set for solar modules
- 1x Wiring set for pump

The system can be extended by 6 solar modules KA 64 and/or one wind generator WG 1803.

Requirement: high-yield well and steady wind.

Available amount of water per day with the standard system:

Water depth	Yield in tons per day	With additional wind generator WG 1803
10m	75	150
20m	45	90
30m	35	70
50m	20	40



*Field irrigation Turkey*



## Field system MIDI – SET



Deep well pump for a cattle  
watering tank in Namibia



For irrigation of vegetable fields and tree plantations.  
Suitable for up to **7 hectares of vegetables** and up to **25 hectares of trees**, depending on water depth.

**Recommended for a well depth of up to 70m  
(max. 100m)**

Components:

16x	Solar modul TWIN 75
1x	Solar deep well pump STP 1200
1x	Pump inverter 1200
1x	Solar distributor
1x	Wiring set for solar modules
1x	Wiring set for pump

The system can be extended by 8 solar modules TWIN 75!

Available amount of water per day with the standard  
system:

Water depth	Yield in tons per day
20m	
30m	
50m	
70m	



## Field system MAXI – SET

For irrigation of vegetable fields and tree plantations. Suitable for **up to 9 hectares of vegetables** and **up to 25 hectares of trees**, depending on water depth.

**Recommended for a well depth of up to 100m (max. 200m)**

Components:

24x	Solar modul KA 64
1x	Solar deep well pump STP 1500
1x	Pump inverter 1500
1x	Solar distributor
1x	Wiring set for solar modules
1x	Wiring set for pump

The system can be extended by 8 solar modules KA 64!

Available amount of water per day with the standard system:

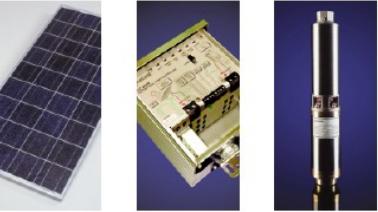
Water depth	Yield in tons per day
30m	55
50m	35
70m	25
100m	20



Water supply for a village in Namibia

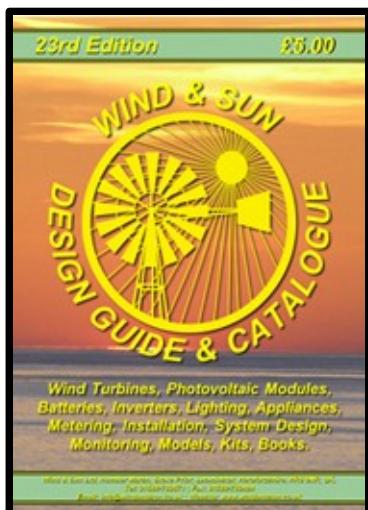


**SOLAR WATER PUMPING**



**APPLICATIONS GUIDE**

  
KYOCERA SOLAR, INC.



**Solar Pump Systems  
by SUNSET**

For a better quality of life and a healthier environment



Solar Pump Systems by 

**gate** *Technical Information E4e* 

**Photovoltaic Water Pumps**

Andreas Hahn  
GTZ - OE 4429  
(May 2000)

**Technical Field**

- Energy / Environment (E)
- Water / Irrigation (W)
- Agriculture (A)
- Environment Protection (P)
- Manufacturing (M)

This Technical Information is available in:

- English (e)
- French (f)
- German (g)
- Spanish (s)
- Chinese (c)

**RURAL WATER SUPPLY**

In many developing countries, the inadequate supply of drinking and irrigation water is a severe problem. In rural areas with no access to grid power, national water authorities and private farmers have to rely on hand pumps and other manual pumps. Many of which are out of service due to technical defects or a lack of fuel.

As a rule, hand-operated pumps are the only option for low infiltration rates and low pumping heads. If hand pumps cannot satisfy the demand, diesel-driven pumps are commonly used for drinking and irrigation water supply. These pumps are often incompatible with photovoltaic water pumps (PVP), which present themselves as a reliable and environmentally-sound alternative means of water delivery.

**GOOD REASONS FOR PVP-APPLICATION**

PVP systems offer numerous advantages over water supply systems utilising conventional power:

- PVP systems may be the only practical water supply solution in many regions where logistic make it too expensive or even impossible to supply diesel generators with the required fuel.
- PVP systems are ideal for meeting water requirements for villages between 500 and 2000 inhabitants and

small-scale irrigation purposes (up to 3 hectares).

- PVP systems run automatically, require little maintenance and few repairs.
- In areas where PVPs have entered the market, the use of diesel-driven pumps, their comparatively high initial cost is offset by the achieved savings on fuel and reduced maintenance expenditure.
- The use of solar energy eliminates emissions and fuel spills.

Taken together, these reasons can persuade water authorities as well as private investors to decide in favour of a PVP system as against conventional pumping techniques.

**HOW A PVP-SYSTEM WORKS**

The operating principle behind any photovoltaic pumping system is quite simple (see fig. 1). A solar generator provides electricity for driving a submersible pump, which then pumps water into an elevated water tank that bridges night-time periods and cloudy days.

Force of gravity causes the water to flow from the tank to public water taps and watering points for livestock or to the irrigation system.

The major advantage of solar pumps is that they need no fuel and no maintenance. The maintenance of a PVP system is restricted to regular cleaning of the solar modules. Depending on the

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