

MONO PUMPS

A National Oilwell® Company

Sun-Sub®

Stainless Steel Solar Powered
Submersible Pump



*The New Generation
Solar Pumping Systems*

Mono®


THE NEW GENERATION

POWER FROM THE SUN

Solar Pumping - Today's answer to remote water delivery.

One of the most interesting developments in the last two decades has been in the use of solar power for pumping purposes in remote area locations.

Traditionally this area of remote water pumping has been the domain of systems using mains / generator electricity, windmills or diesel engines. Mains powered pumping often requires the high expenses of the extension of power lines. Diesel driven pumps have the benefit of providing a predictable output but require a high level of maintenance and running costs as well as adding to the global problems of greenhouse gas emissions.

Solar pumping therefore is a sensible and effective use of solar energy. Mono solar water pumping systems not only provide water in a cost effective, efficient manner, they are also "green" non polluting pumping systems which help to contribute to the healthy maintenance of our atmosphere and the all important ozone layer.

With the new generation Sun-Sub, Mono have combined over 15 years of solar water pumping development to offer

a reliable, efficient solar system, providing our customers the maximum water pumped for the dollar invested when compared to other solar water pumping technologies.

There are four main components in a solar water pumping system. These are the solar array, controller (inverter), electric motor and pump.

The table below highlights Mono's new generation Sun-Sub's efficiency when compared with a rotodynamic centrifugal pumping system.

Components of System	AC System	DC System (Brushless)
	Centrifugal	Prog. Cavity
ARRAY	14%	14%
MPPT/INVERTER	90%	98%
MOTOR	60%	85%
PUMP	55%	70%
Sun to Water Efficiency	4.2%	8.2%



GPS TRACKING ARRAY

The Mono GPS Tracker (patent applied for) will ensure that your solar modules are always facing the sun. The GPS Tracker overcomes the problems that are traditionally associated with refrigerant gas and light sensor trackers to ensure 100% tracking accuracy in all conditions.

A GPS (Global Positioning Satellite) sensor built into the controller provides precise latitude, longitude and time. This is all that the controller needs to calculate the exact position of the sun and correctly position the solar array.

Features

Benefits

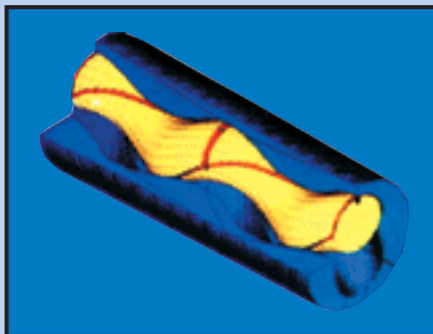
Not dependent on light	Will track in overcast conditions, always ready for breaks in the cloud
Not dependent on heat	Will track in cold conditions, ready before the sun comes up
Fully rigid design	Not affected by wind
Built in GPS sensor	Simple installation, no calibration required
Automatic Calibration	No accumulated time error
No external sensors	No replacement of damaged sensors
Single button start	Simple to install, fully automatic
Designed to meet Australian Standards	Safe, fully engineered frame design
Excellent tracking accuracy	Maximise the power generated by the array
No refrigerant gas	Friendly to the environment
75° East / West tilt angle	More time pointing directly at the sun

MONO SUN-SUB RANGE

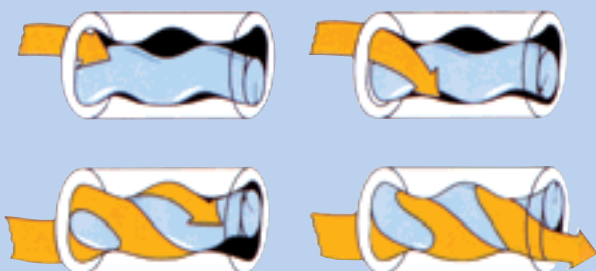
THE MONO PUMP

Since Mono's conception in 1935, our progressive cavity pumping principle has been proven through many years of experience. For solar pumping applications, the Mono progressive cavity pumps ability to pump water, even when running at low speeds (early morning and late afternoon) means quite simply, that it is possible to generate more water per day for a given array than systems using rotodynamic pumping methods which only generate heads at high running speeds.

At the heart of all Mono Pumps solar water pumping systems is the unique pumping system itself. The design consists of just two complementary pump components, the Rotor and the Stator. The geometry of these two components is the key to the pump operating system.



When the hard chrome plated rotor lays inside the rubber stator, the two components touch along a ribbon of contact called the seal line, behind which is a sealed capsule of liquid which moves from suction to discharge in a positive manner as the rotor rotates inside the stator. In the design of the new generation Sun-Sub, the rotor form and low interference results in excellent hydraulic performance and reduced breakout torque.



1. Foot Valve

Designed specifically to prevent leakage and loss of pipeline water, with minimum restriction to the pump outlet. Includes an anti-rotation pin to eliminate spindle wear.

2. Rotor / Stator

The rotor is made from 316 stainless steel material and is hard chrome plated to optimise abrasion resistance.

The rubber stator is soft allowing the grit particles to be depressed into its surface and then spring out again as the rotor seal line moves across its surface.

3. Flexishaft

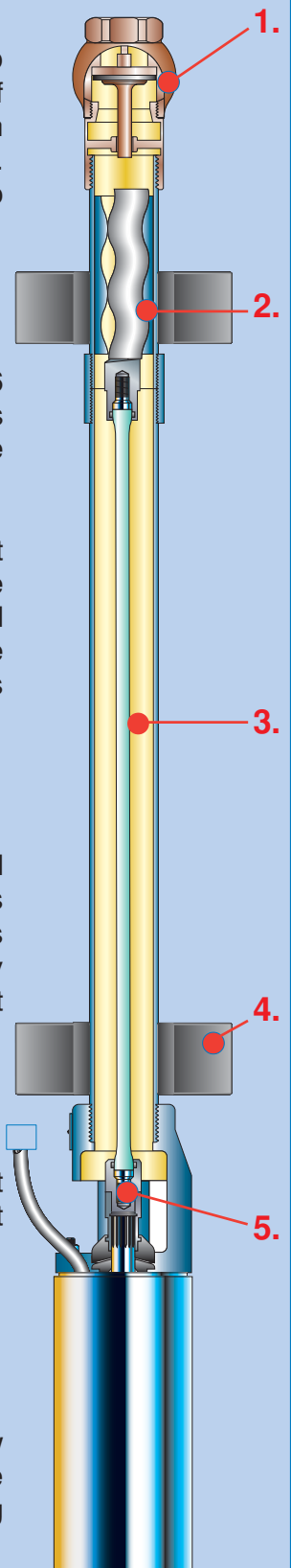
The flexishaft is manufactured from toughened materials using a specific Mono process and is covered by chemically inert, abrasion resistant coating.

4. Stabilisers

A unique Mono development to centralise the pump element while eliminating vibration.

5. Screwed Shaft Connection

Direct flexishaft screw connection allows simple removal from motor during maintenance.



THE NEW GENERATION

THE CONTROLLER

The new generation solar controller is the electronic “brain” of the Sun-Sub solar water pumping system. Using the latest in microprocessor technology, the controller consists of two electronic PCB’s -

- Maximum Power Point Tracker (MPPT) controls the voltage of the array and the DC voltage to the motor controller.
- The Solar Motor Controller (SMC) converts the variable DC voltage from the MPPT into a type of three phase voltage to suit the brushless DC motor.

The micro processor continuously changes the array voltage and monitors the input power level changes from the maximum power point of the array.



1. Status Indicator Lights (LED's)

Five multifunction system status lights designed to give the end user a simple identification on the systems operating status.

2. Plug & Socket Connections

For ease in installation and maintenance periods.

3. Float & Pressure Switch Facility

To allow connection of low voltage bore level probes or pressure switches ensuring automatic operation of the system when the tank is full or the bore level is low.

4. ON / OFF Switch

Allows instant startup or shutdown of system when required.

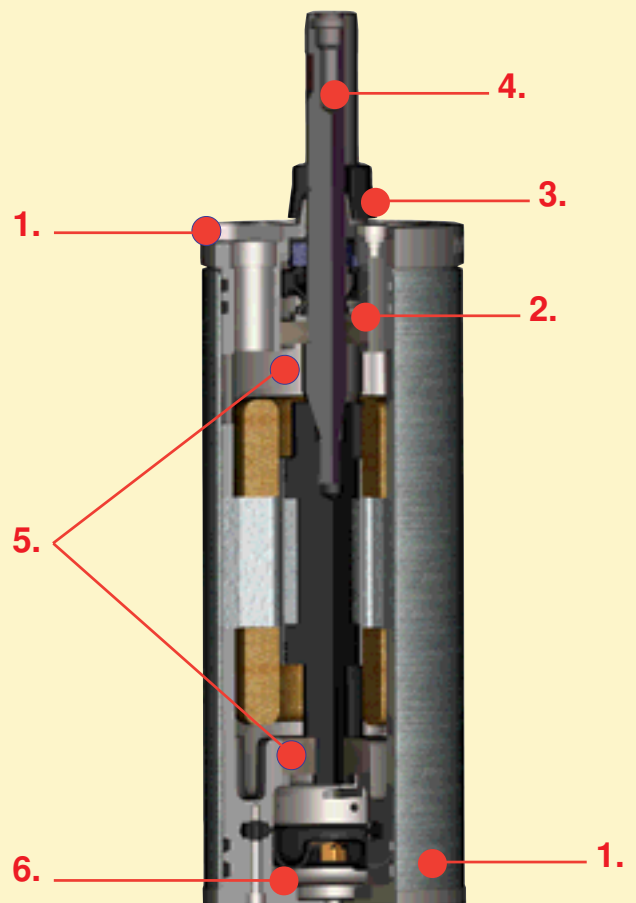
5. Com Port

Designed for simple connection to data interface with hand held diagnostic processing unit.

THE M

Purpose built and designed by Mono, the DC fully submersible brushless and sensorless motor ensures that the electronics are located at the surface within the Sun-Sub controller. This reduces maintenance periods when compared to conventional brushed submersible motors.

The motor is built in 3 standard sizes being 300, 600 and 1200 wp to suit the various input powers available from our 150 - 1200 watt array options.



THE CONTROLLER

Other Features Include -

- IP66 rating for use in harsh outdoor environment.
- All electronics are above ground for easy access.
- Thermal, input and output current overload protection giving further peace of mind to product reliability and wear life.

MONO SUN-SUB RANGE

MOTOR

1. 316 Outer Casings and Wetted Parts

Designed for greater corrosion resistance in brackish / salty type water applications.

2. Mechanically Sealed

The custom manufactured hard face seal incorporates a low friction design to maintain high efficiency. This ensures the best utilisation of input power coupled with the hard face abrasion resistance for longer seal life.

3. Sand Thrower

Designed as added protection against the ingress of silt and abrasive particles. The sand thrower gives further peace of mind to abrasion resistance.

4. Screwed Shaft Connection

Provides easier removal of pump from motor if necessary at maintenance period.

5. Bearings

Deep groove and angular contact thrust ball bearings. Designed to handle the increased loads in higher pressure applications.

6. Pressure Equalisation Diaphragm

Designed to minimise the effects from internal and external forces. The pressure diaphragm ensures that the motor continues to run smoothly in various operating conditions.

THE HAND HELD DISPLAY UNIT

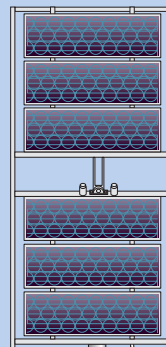
As an accessory to the new generation controller, the hand held display unit is the latest development in user friendly trouble shooting and diagnostic parameter setting technology.

The unit allows the operator to extract data from the SMC and if applicable, change software settings.



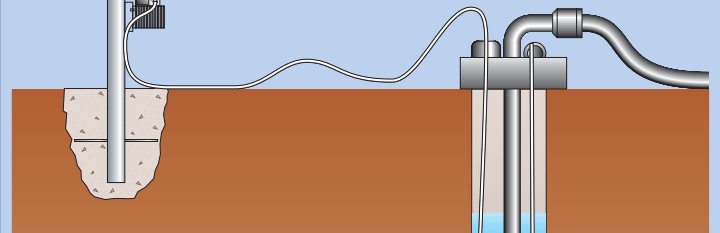
THE SYSTEM

The Mono new generation Sun-Sub is offered as a complete solar pumping package. This includes factory wired and tested array's, motors and controllers. Fitted with simple plug and socket connections, our systems are designed to ensure ease of installation on site.



Solar Array -

- 150 - 1200 watt systems.
- Highly efficient monocrystalline silicon cells.
- Highly resistant to water, abrasion, hail impact and other environmental factors.



Array Frame and Post -

- Stationary and Tracking Systems available.
- Array frames are galvanised for long life protection.
- Post galvanised for long life protection.

THE NEW GENERATION

COMPUTER AIDED SOLAR SELECTION (CASS)

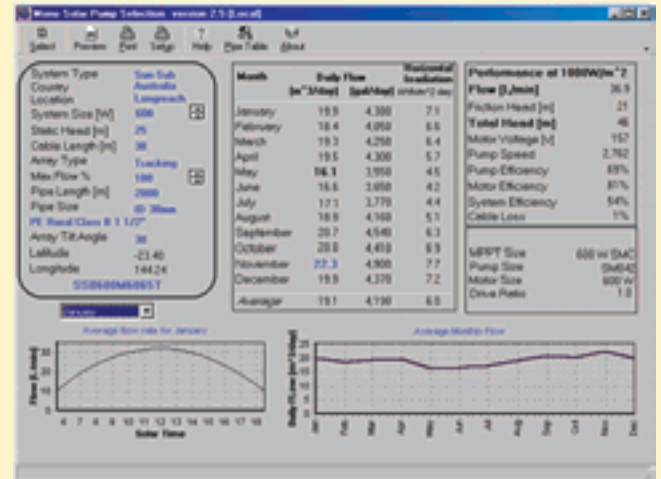
Mono Pumps can accurately predict the daily average flow you can expect from your solar pumping system for every month of the year for hundreds of locations.

Through the development of CASS (Computer Aided Solar Selection) the flow-rate of every system in the Mono Pumps solar range can be predicted for hundreds of locations around the world.

All that you need to do is enter your location, select the type of pumping system that you want to use, the size of solar array that you intend to use and the size and length of discharge pipework that you will be using. CASS will predict the flow-rate of your system, with your pipework, in your location.

CASS uses historical meteorological data and the results of extensive system testing to accurately model the installation and predict the system output.

It is easy to model a variety of systems to determine exactly which Mono Pumps solar pump will meet your flow requirements.



Typical Performance - Tracking Array System 6.5kWh/m²/day

System Size (Watts)	225	300	375	450	525	600	750	900	1050	1200
CAPACITY 1000's Litres per day (m³ per day)*										
Head (m)										
5	26.7	29.4	54.4	63.4	80.0	90.6	102.6	108.2	110.9	112.9
10	23.0	27.3	39.8	49.1	55.8	65.5	88.0	97.8	103.3	107.1
15	18.4	24.8	30.8	37.9	45.6	53.2	67.6	83.9	93.4	99.3
20	15.0	21.3	24.8	30.9	36.8	43.1	58.3	65.6	80.0	89.5
25	12.3	17.8	20.2	25.5	30.3	35.6	49.0	59.7	65.4	69.0
30	10.1	14.9	17.1	21.5	25.8	30.5	41.5	51.6	60.3	65.1
35	8.3	11.7	14.5	18.5	21.5	25.7	35.3	44.3	53.4	60.5
40	7.5	10.6	12.2	15.8	18.2	21.3	30.9	37.5	46.3	54.6
45	6.7	9.6	10.1	13.4	16.5	19.3	26.5	33.8	40.2	47.7
50	6.0	8.7	9.9	12.2	14.9	17.6	22.5	29.3	34.8	41.7
55	5.4	7.9	9.1	11.4	13.6	16.0	22.1	25.7	29.9	36.2
60	4.8	7.2	8.3	10.4	12.3	14.6	20.3	24.5	26.7	28.0
65	4.3	6.5	7.5	9.6	11.1	13.3	18.7	23.2	25.7	27.3
70	3.7	5.8	6.8	8.7	10.7	12.1	17.2	21.7	24.7	26.5
75	3.2	5.2	6.1	8.0	9.8	11.5	15.7	20.0	23.6	25.6
80	2.7	4.6	5.5	7.3	9.0	10.8	14.4	18.4	22.3	24.6
85			5.0	6.7	8.4	10.1	13.6	17.5	21.4	23.9
90			4.5	6.1	7.7	9.3	12.4	16.1	19.8	22.9
95			3.9	5.4	7.0	8.5	11.3	14.8	18.4	21.7
100			3.4	4.8	6.3	7.8	10.9	12.1	17.0	20.4
105			2.8	4.2	5.7	7.1	10.3	11.7	15.6	18.9
110			2.4	3.6	5.0	6.4	9.7	11.2	14.3	17.5
115			1.9	3.1	4.4	5.7	9.0	10.7	13.1	16.1
120			1.5	2.6	3.8	5.1	8.2	10.1	11.8	14.8

MONO SUN-SUB RANGE



A Typical Mono 1200 watt Tracking System



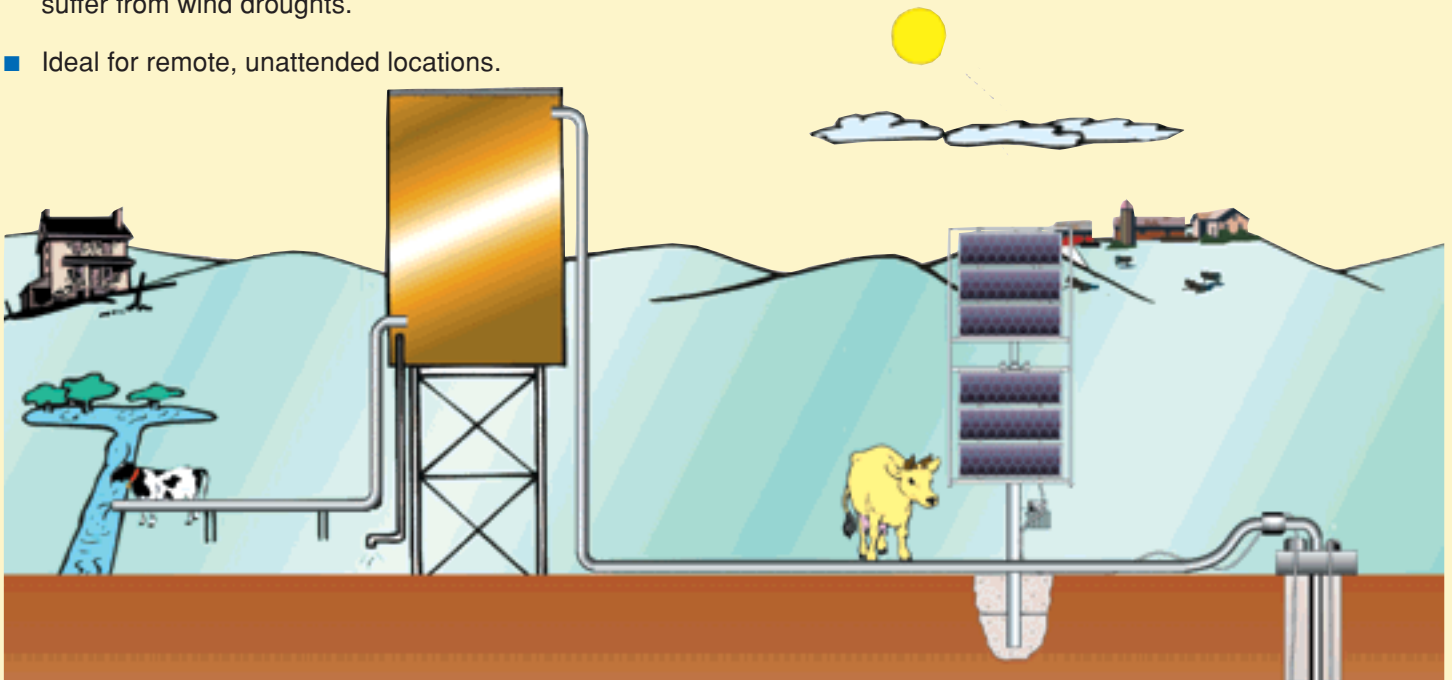
Stock Watering



Remote Residence

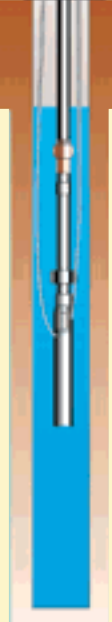
SOLAR WATER PUMPING BENEFITS

- Require no fuel to run them (no ongoing costs).
- Provides the maximum water when needed most. There is a natural relationship between the availability of solar energy and the need for water.
- More consistent water than a windmill - doesn't suffer from wind droughts.
- Ideal for remote, unattended locations.
- Systems are very reliable and require little or no maintenance. The power generation is a static process and the only moving parts are in the pump and motor.
- Systems can if necessary be transportable between sites.



Daily Stock Water Recommendations

ANIMAL	l/day	ANIMAL	l/day
Cows	75	Lambs, Dry Pasture	3
Cows, Dry	50	Sheep, Green Pasture	4
Calves	50	Lambs, Green Pasture	2
Beef Cattle	50	Pigs, mature	13
Horses, Active	60	Sows, Lactating	25
Horses, Grazing	40	Poultry, 100s	13
Sheep, Dry Pasture	10		



Mono Pumps Around the World

Australasia



Mono Pumps (Australia) Pty Ltd

338-348 Lower Dandenong Road
Mordialloc Victoria 3195
Australia
Telephone: +61 (0) 3 9580 5211
Facsimile: +61 (0) 3 9580 6659

Mono Pumps (New Zealand) Ltd

PO Box 71-021
35 - 41 Fremlin Place
Avondale Auckland 7
New Zealand
Telephone: +64 (0) 9 829 0333
Facsimile: +64 (0) 9 828 6480
Email: info@mono-pumps.co.nz

	Telephone	Facsimile
Melbourne	03 9580 5211	03 9580 9036
Sydney	02 9521 5611	02 9542 3649
Brisbane	07 3350 4582	07 3350 3750
Adelaide	08 8447 8333	08 8447 8373
Perth	08 9479 0444	08 9479 0400
Darwin	08 8984 3099	08 8947 0540
Hobart	03 6249 8704	03 6249 8756
Kalgoorlie	08 9022 4880	08 9022 3660
Dunedin NZ	+64 3476 7264	+64 3476 2154



Europe



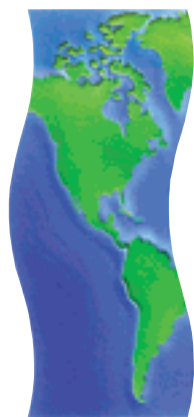
Mono Pumps Limited

Martin Street
Audenshaw
Manchester M34 5JA
England
Telephone: +44 (0) 161 339 9000
Facsimile: +44 (0) 161 344 0727
Email: info@mono-pumps.com
Website: www.mono-pumps.com

For total peace of mind ask about our scheduled maintenance contracts to suit your individual needs. We offer a complete package for all our product ranges including installation and commissioning if required.

Authorised Distributor:

Americas



Monoflo Incorporated

16503 Park Row
Houston
Texas 77084
U.S.A.
Telephone: +1 281 599 4700
Facsimile: +1 281 599 4733
Email: inquire@monoflo.com
Website: www.monoflo.com

Please contact the nearest Mono Office for details of your local authorised distributor.

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Mono Pumps (Australia) Pty Ltd

ABN 77004449478

Telephone: +61 (0) 3 9580 5211

Facsimile: +61 (0) 3 9580 6659

E-mail: rural@mono-pumps.com

Website: www.mono-pumps.com



Mono®

A National Oilwell® Company

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