

# Joint Venture with Nature



A Complete Solution for Solar Water Pumping

More Than  
25,000 Solar  
Pumps in  
Operation

 **Jain**<sup>TM</sup>  
**Solar Pump**

 **Jain**<sup>TM</sup>  
**PV Panels**





Jain Solar PV Module Manufacturing Plant; Green Energy Park; Jain Valley, Jalgaon.



8.5 MWp Solar Power Generation Plant at Jain Valley, Jalgaon

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The claims including benefits of Jain Solar Pumping system, It depend on the climate and many other factors beyond the control of JISL. Hence they cannot be guaranteed.

India is a vast country. With increase in population, every year there is an increase in energy demand. People require energy for domestic lighting, agricultural pumping, washing, cooking, bathing, cleaning, refrigeration etc. Energy requirements are ever increasing with needs of the people and increase in population. Every day new electrical appliances are being introduced in the market. These appliances consume more energy and add to the demand side.

By the year 2016, India had electrical installed capacity of about 250 GW which contributed to about 4.8% of the global share. India is number one in electricity production in the world. The non-renewable power plants contribute about 87.55 % and renewable power plants contribute about 12.45%

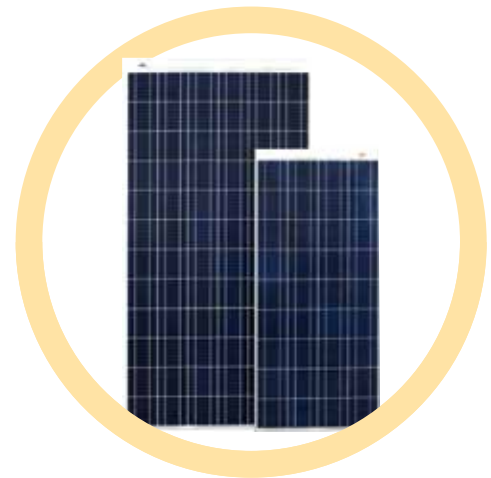
India has a very good solar radiation between 4 to 7 kWh / square meter per day and highest global solar radiation on horizontal surface. Thus, India has the most favourable conditions for solar energy production and consumption. Solar energy is known to be environment friendly technology and therefore should be promoted in order to reduce the burden on conventional energy sources and also save earth from GHG emissions resulting out of coal burning.



## Jain Renewable Energy Solutions

Jain Irrigation Systems Ltd. (JISL) started solar division in 1995 with solar water heater manufacturing.

- In year 2000 introduced solar appliances
- In year 2010 started photovoltaic module manufacturing
- **In year 2010 Jain Pioneered in Solar Pumping Systems**
- In year 2013 initiated manufacturing of DC solar pumps
- JISL is one of the few manufacturers of BLDC motor in the world. JISL has developed BLDC motor up to 7.5 kW (10 hp) & set up state-of-the-art manufacturing facility.
- JISL also manufactures BLDC and AC pump controllers up to 7.5 kW (10 hp).
- JISL business is backed up by its strong R&D testing centre.
- **JISL is the only company in the world to offer complete solar pumping solutions**



## Jain Solar Pumping System

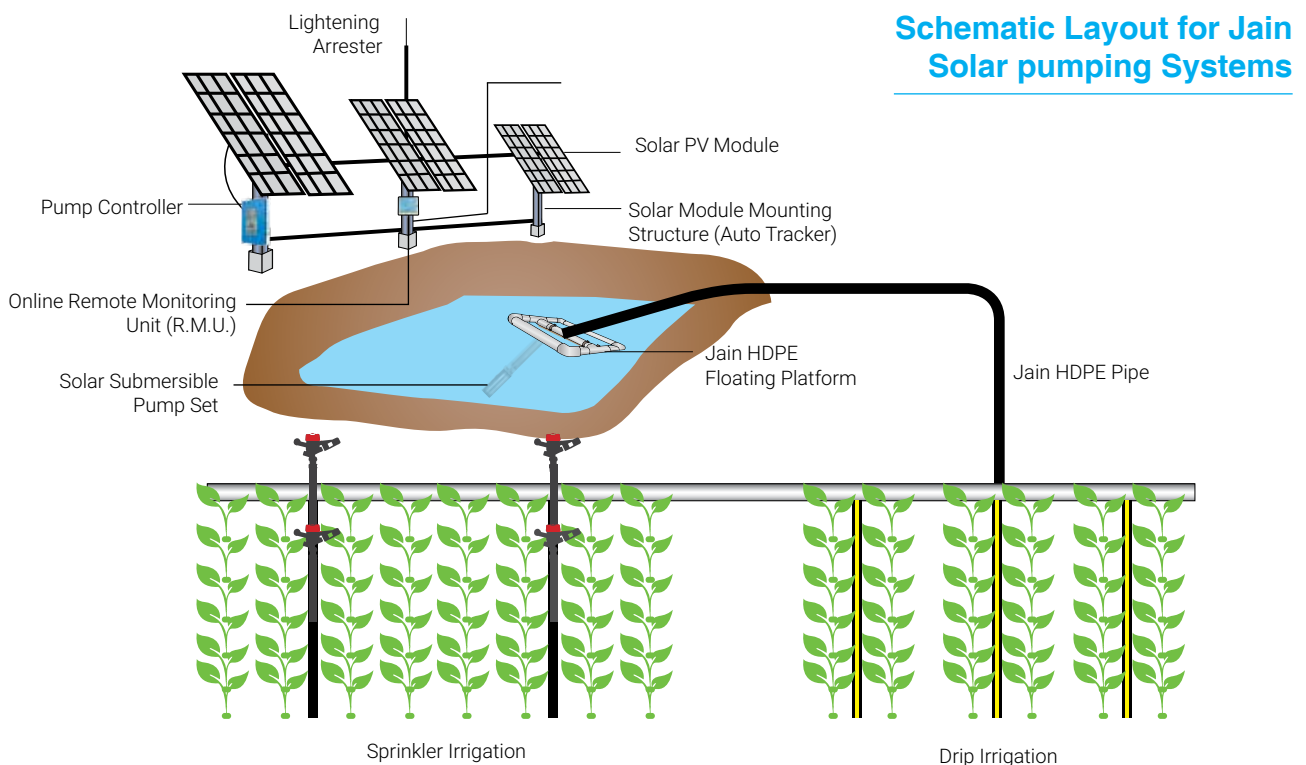
Solar pumps are specially designed pumps which run at low/variable frequency and powered by solar photovoltaic modules. There are two basic types of solar pumps DC and AC pumps. In DC pumps brushless DC motor is used whereas in AC pumps specially designed AC motor which is compatible to run on Solar power is used. These pumps may be either surface or submersible pumps. Generally, solar powered surface pumps up to 2.2 kW (3 hp) and submersible type up to 75 kW (100 hp) are available. Electronic controller is used between solar PV modules and pump which controls the electrical parameters of the pump. PV modules are configured in series and parallel connection to suit the electrical requirement of pump.

These PV modules are installed on a metal structure. The structure can be either fixed type or tracking type. Tracking structure follows the Sun path and gives 20-25 % more water output than the fixed structure.



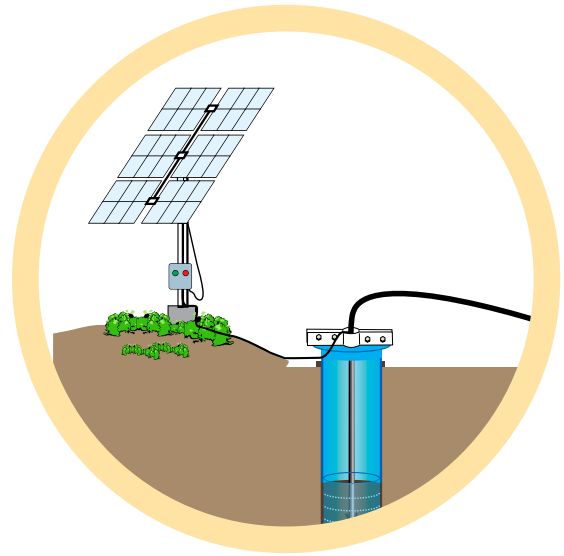
# Components

Major components	Type	Make	Specification
Solar module	High efficient multi crystalline Silicon	Jain	Up to 325 Wp As per IEC & MNRE
Module mounting structure	■ Fixed structure	Jain	<ul style="list-style-type: none"> <li>● Galvanized iron</li> <li>● Design wind speed- 150 -200 kmph</li> <li>● Ground mounted /roof mounted</li> <li>● HDPE floating structure</li> </ul>
	■ Canal top structure		
	■ Manual single axis tracker		
	■ Auto single axis/dual axis tracker		
	■ Floating structure		
Solar Pump type	■ Surface pump	Jain / Branded	Up to 2.2 kW (3 hp)
	■ Submersible pump	Branded	0.37 kW (0.5 hp) - 75 kW (100 hp)
Motor type	■ BLDC motor	Jain	Up to 3.7 kW (5 hp)
	■ AC motor	Jain/ Branded	Up to 75 kW (100 hp)
Pump controller	■ BLDC controller	Jain	Up to 3.7 kW (5 hp)
	■ AC controller	Jain / Branded	Up to 75 kW (100 hp)
Riser pipe	HDPE / PVC column	Jain	Up to 10 kg/cm <sup>2</sup>
Accessories	Standard	Branded	As per IS standards
Tarang Floating (platform) for Open well / sump		Jain	As per requirement
Choke or sine filter on output of pump controller		If pump cable increases beyond 100 mtr. in case of AC pump	



# Jain Solar Pumping - Features / Benefits

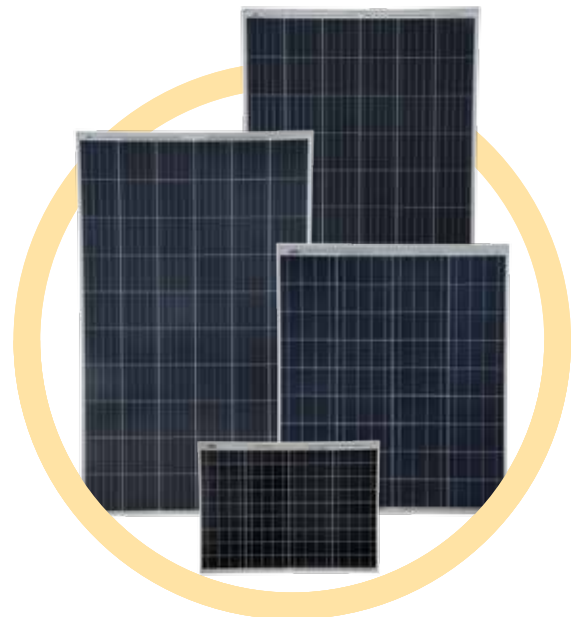
- Independent of power cuts
- Minimum 25 years operational life for solar modules
- Inbuilt motor protections to enhance pump set life and reduce maintenance cost
- Soft start capability leading to increased motor/ pump life and decreased service /maintenance cost
- In case of AC pumping system, Solar pumps can also be run on grid whenever required (optional)
- Most efficient components
- Premium Stainless Steel material
- Completely automatic
- Utilization of solar power to save natural resources
- Pollution free
- Extra revenue can be generated if excess water is available
- Dawn to dusk working of pump
- Highly reliable and robust
- No need of skilled manpower for operation
- Eco-friendly



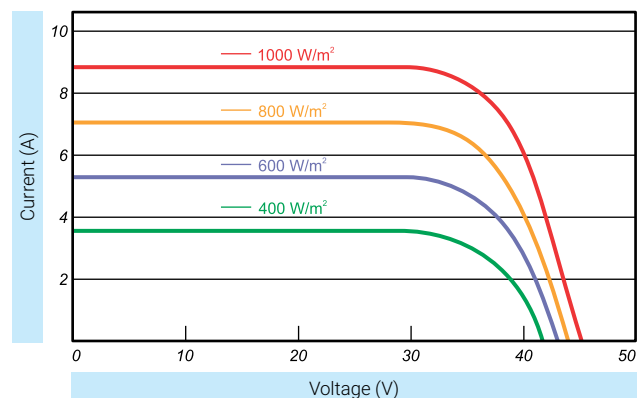
Jain Photovoltaic Modules are made from high efficiency Multi Crystalline solar cells. Suitable number of cells are interconnected in series and then encapsulated in low iron content, high transmissivity tempered glass using UV stable Ethylene Vinyl Acetate (EVA) sheets and premium quality back sheet. These encapsulating materials protect the cells from the harsh environmental conditions when laminated together thus ensuring long life. The laminates are then framed with anodized aluminium frame with holes for ease of installation. PV module are fitted with terminal box of different type and rating depending on the application.

## Features

- PID free high efficiency multi crystalline silicon solar cells.
- AR coated high transmission textured toughened glass.
- Module as per IEC-61215; IEC-61730 safety class & IEC-61701 Salt Mist Test.
- Narrow power tolerance for minimizing losses due to module power mismatch in an array.
- High quality screwless anodized aluminium frame to provide structural strength to the laminate.
- TUV approved, IP65 rated 4 terminal junction box with 3 by-pass diodes.
- Bypass diodes to reduce the effect of partial shading of modules.
- Preassembled cable of one meter length each with MC4 type +Ve and –Ve connectors.
- Manufacturing facility certified for ISO 9001:2015, ISO 14001:2015, BS OHSAS 18001:2007 and EN ISO 50001:2011 standards.
- Latest PERC Technology for high efficiency models.



## I-V Curves for 300 Wp module



## Mechanical Characteristics (JJ-M672)

Front Cover	Low Iron tempered glass
Solar Cells (Quantity/type/arrangement/size)	72 pcs/Multi crystalline/6 x 12/156 mm x 156 mm
Junction Box	TUV approved, IP65 rated 4 terminal junction box with 3 by-pass diodes
Cable (length/size)	1000 mm/ 4.0mm <sup>2</sup>
Connectors	MC4 type +Ve and –Ve
Dimensions (LxWxH)	1960 mm x 996 mm x 40 mm (± 1 mm)
Weight	22 kg approximate

## Operating Conditions (JJ-M672)

Max. System Voltage	1000 VDC
Safety Class	II
Maximum Series fuse	15A
Operating Temperature	-40°C to +85°C

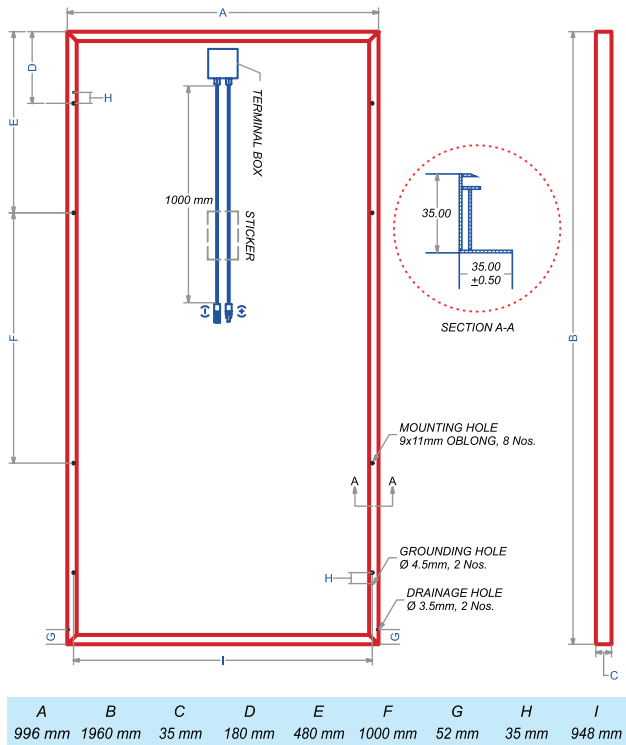
## Thermal Characteristics (JJ-M672)

Temperature coefficient of P <sub>max</sub>	-0.43%/°K
Temperature coefficient of I <sub>sc</sub>	0.046%/°K
Temperature coefficient of V <sub>oc</sub>	-0.33%/°K
Normal module cell temp (NMCT)	45 + 2 °C

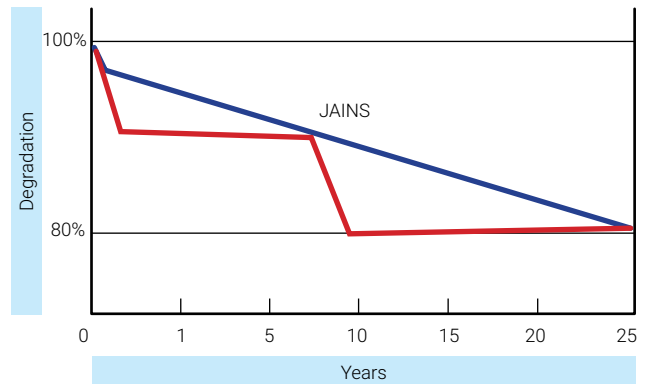
## Warranty

- Manufacturing defect & workmanship: 5 Years
- Power Production (Limited Warranty): 90% for 10 years & 80% for 25 years
- In compliance with our warranty terms and conditions. Contact Jain Irrigation System Ltd. for complete warranty details.
- For any kind of technical or design support, you may contact Jain Irrigation System Ltd.
- Please refer standard warranty details

## Module dimensions (JJ-M672)



## Degradation Curve



## Typical Electrical Characteristics

Module Type	JJ-1274	JJ-M636	JJ-M648	JJ-M660	JJ-M672
Maximum Power [P <sub>m</sub> (Wp)]	80	160	210	260	310
Power Tolerance [Wp]	+4.99	+4.99	+4.99	+4.99	+4.99
Maximum Power Voltage [V <sub>mp</sub> (V)]	18.83	18.10	23.80	30.80	36.56
Maximum Power Current [I <sub>mp</sub> (A)]	4.25	8.40	8.80	8.52	8.48
Open Circuit Voltage [V <sub>oc</sub> (V)]	22.00	22.70	29.75	37.70	45.32
Short Circuit Current [I <sub>sc</sub> (A)]	4.64	8.80	8.98	9.02	9.02
Max. System Voltage (Vdc)	50	1000	1000	1000	1000
Module Size (mm) (± 2mm)	850x655	1478x655	1327x996	1640x996	1960x996

\* All electrical measurements are at STC (25° C, 1.5 AM, 1000 W/m<sup>2</sup>)

\* Positive power tolerance system applied while categorizing the module in various power ranges.

- Jain manufactures Solar Modules from 10 Wp to 325 Wp.
- High efficiency solar modules of capacity > 325 Wp with PERC technology are also available

# Solar Module Mounting Structure Solutions

JISL being a leader in solar pump manufacturing in India, developed the module mounted structure as per project requirements. We have a strong development team backed by inhouse R&D for tracker development and manufacturing.

## Features

- 1) Tailor made solutions to suit project requirement
- 2) Optimised for maximum yield within minimum area
- 3) Hot dip Galvanised / Aluminium structure as per requirement
- 4) Single tracker up to 36 sq. m PV module area
- 5) Stand alone or centralised astronomical tracker controller
- 6) Structure designed up to 200 kmph wind speed



Fix Type Structure



Single Axis Structure



Dual Axis Structure



Canal Top Structure



# Solar Module Mounting Structure Solutions



Mobile Structure



Roof Top Structure



Floating Structure

# Jain Tarang - Floating Structure

India has reached to more than 5 GW solar installations and has massive target of 100 GW by 2022. To complete this target huge land is required and it can not be created artificially. As a alternate to this JISL has developed floating platform. Jain Tarang Floating platform can be used for installation of Solar Modules and submersible pump in open reservoir.

In India, water bodies (apart from rivers, canals) occupy about 7 M. Ha area which can be utilised for solar power generation using Jains Tarang Floating Structure.

## Features

- 1) Highly modular
- 2) Custom design
- 3) No Rusting
- 4) No Maintenance
- 5) Rigid , unsinkable, durable
- 6) Supporting stand in dry condition
- 7) Easy to transport, assemble & dissemble

## Benefits

- 1) Enhanced performance due to lower operating temperature
- 2) Reduces evaporation loss of water
- 3) Enhanced pump life
- 4) Reduces algae growth
- 5) Saves land
- 6) Long life > 100 years
- 7) Safe for aquatic life
- 8) Easy to shift in water body as per requirement
- 9) Adjust the head automatically



Jain Tarang (Floating) Platform in Open Well



Jain Tarang (Floating) Platform in Farm Pond



Jain Tarang (Floating) Platform in reservoir

## Features

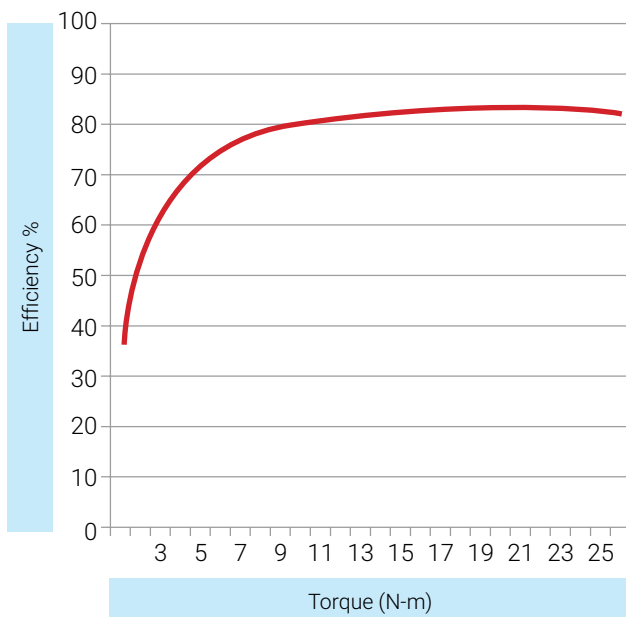
- Advanced permanent magnet brushless technology, high efficiency
- Low-maintenance
- High efficiency electrical design (low operation cost, cooler winding temperature)
- Complete Stainless steel
- Hermetically sealed stator, anti track, self healing stator resin prevents motor burn out
- No electronics inside motor
- Removable lead connector
- Double oil seals (shaft seals) for better protection against sand
- Prefilled with special non-contaminating and antirust solution
- Degree of protection: IP68
- Pressure balanced design
- Hydrodynamic journal bearings
- Hydrodynamic robust thrust bearing
- Materials of construction : Perineum stainless steel, Low loss silicon stampings, High magnetic density permanent magnets, corona resistant winding wires, rubber & cable drinking water approved
- Mounting : Vertical / max 30° inclination to water surface
- Compatible for Submersible pump sets as per IS8034:2002
- Motor head as per IS9283:2013
- 100% tested on state-of-the art computerized inhouse facility
- Performance test approval : MNRE, UL & TUV



## Available Range

0.74 kW to 7.5 kW (1 hp to 10 hp)

## Load Vs Efficiency Curve - Test Results for 3.7 kW (5 hp) BLDC Motor



Jain Solar Pumping System

## Features

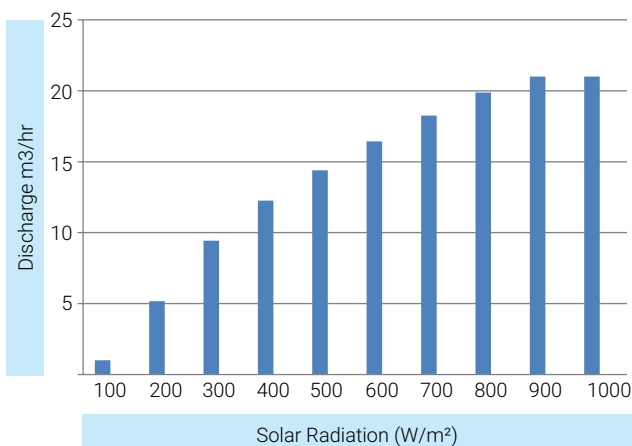
- Stainless steel construction designed and built for years of trouble free operation.
- Long service life as all components are made of stainless steel.
- High efficiency.
- Smooth safety hook.
- Mounting specifications are according to NEMA standards.
- High quality shaft bearings providing low friction and high wear resistance.
- Heavy duty stainless steel impellers & diffusers ensuring optimal performance.
- Stainless steel strainer to restrict the entry of sand and other extraneous material.
- A high strength stainless steel coupling facilitates a proper pump/ motor alignment.
- Inbuilt NRV (Non Return Valve)



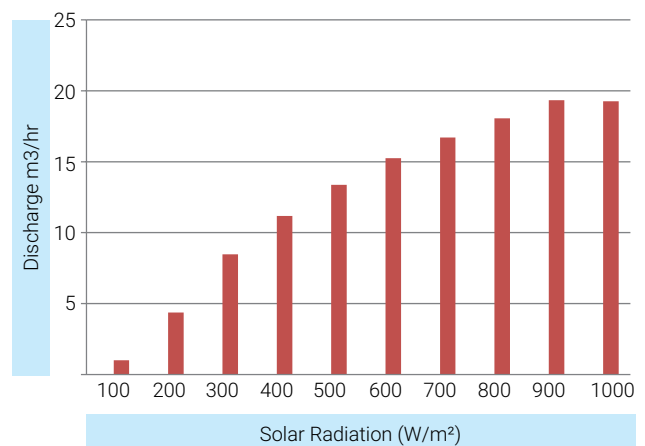
## Available Range

0.74 kW to 7.5 kW (1 hp to 10 hp)

**Radiation Vs Discharge Curve for BLDC Pump**



**Radiation Vs Discharge Curve for AC Pump**



Solar Pump installed at Jain Tissue Culture Park, Jalgaon

## Features

- Fully Automatic ON/OFF
  - Operates on solar radiation, automatically gets ON when sun rises and OFF at sun set
- High efficiency power electronics
  - Maximum water discharge
  - Minimum power loss
- Maintenance free
  - Sensor less protection against dry running
  - Electronics designed with long life components
  - Naturally cooled power electronics
  - Appropriate inbuilt protections against faults
- Wide operating voltage range
  - Provide more operating hours in a day, even operates in cloudy conditions
- Adaptable in varying climatic conditions
  - IP65 Enclosure
  - Suitable for outdoor installation
- User friendly interface
  - Screw less connection
  - Inbuilt emergency power disconnect switch
  - Digital display for operating parameters
  - Remote ON/OFF through mobile phone
  - Bluetooth interface
  - SD Card Connectivity
  - Online and offline data downloading
- Inbuilt Remote monitoring system
  - Parameters such as module voltage, current, power, energy generated, Pump RPM, UP time and OFF time can be remotely monitored through web portal [www.jains.com](http://www.jains.com)
  - Local or offline data available and can be downloaded through mobile App
  - Dedicated web portal for live data monitoring, with graphical and tabular parametric data
  - Historical data is available on web portal
  - Report generation facility
  - Fault logging
- CE compliance - Conforms to CE requirements
  - Ensures user safety. Since system is powered by high voltage and operating in the outdoor fields

## Available Range

0.74 kW to 7.5 kW (1 hp to 10 hp)



## Specifications: 3.7 kW (5 hp)

Sr.	Parameter	Specifications
1	System wattage	1800 to 4000 W
2	Startup Voltage*	150 V
3	Input Voltage Range	160-350 Vdc
4	Output Voltage Range	60-190 V ECPWM
5	Minimum RPM of Motor	900
6	Maximum RPM of Motor	3300
7	Electronics Efficiency	>= 95%
8	Operating Temperature Range	-20° to 60° C
9	Storage Temperature Range	-20° to 85° C
10	Dimensions (l x w x h)	482 x 337 x 260 mm
11	Weight	13 kg approx.

\* At start up voltage controller unit will wake up and motor will start running if sufficient power is available

## Protections

- **Panel reverse polarity protection:** The controller is protected against PV panel reverse polarity condition.
- **Overload protection:** During overload condition, the controller will turn off automatically.
- **Dryrun protection:** In case of very low water level, the controller will turn off. It will start automatically after 20 minutes if water level increases.
- **Tank full protection (optional):** To prevent overflow of water, the controller will turn off automatically when the tank is full.
- **Short Circuit Protection:** In case of a short circuit in motor winding or in the connecting wires, the controller will automatically turn off.
- **Motor jam or Open:** If the motor is jammed or if the winding or connecting wires are open circuited, the controller turns off temporarily for 2 minutes. After 2 minutes, the controller will try to start after re-checking the system condition.

# Data Logger with Remote Monitoring

JISL offers unique solutions for remote monitoring, data logging and data representation of solar pump. Most of the solar pumps are located at remote places. JISL has its dedicated cloud server for remote monitoring. RMU receives data from pump controller and send it to cloud via GSM modem.

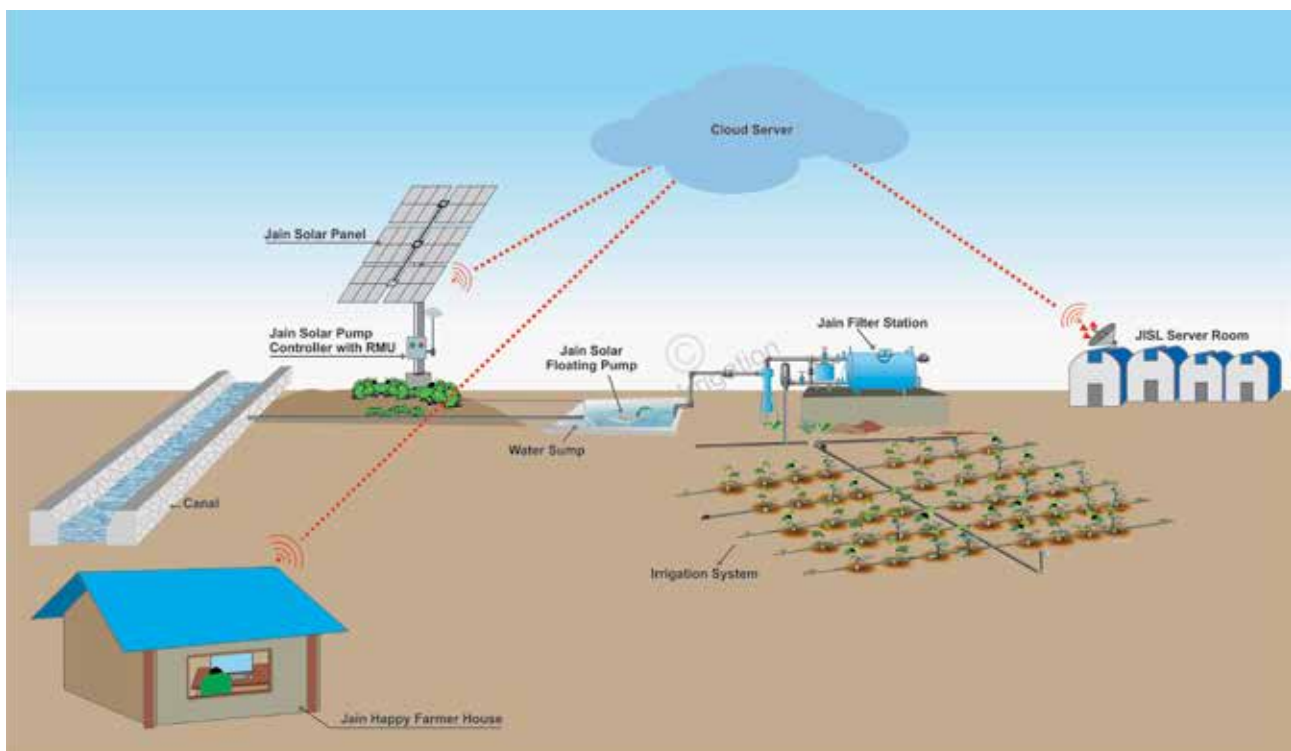
## Features

- Fully automatic operation
- Communicates with Jain Solar Pump system to collect all operational, fault and status information periodically
- Captured data is stored on a remote server for one year duration which can be accessed through World Wide Web
- Simple tabular view of data records on data viewing software while allowing historical view of records
- Built-in retry and buffering mechanism to transfer data to the server to mitigate low signal strength and temporary GPRS service outage problem
- Remote monitoring of solar pump system provides solar pump data and fault alerts on server. Person sitting anywhere in the world can see the performance of system



## Operational Parameters for Remote Monitoring

- 1) PV array Voltage
- 2) PV array current
- 3) Power
- 4) Energy generated
- 5) Pump RPM
- 6) Faults or Events (if any)
- 7) Pump on/off status
- 8) Pump ON Time and OFF Time
- 9) Discharge



Jain Remote Monitoring System Schematic Layout

## Jain Thread Loc Plus

- Skid Free Joint
- Anti Rotational mechanism
- Vibration absorbing mechanism
- No effect of pump's ON/OFF rotational jerk on column pipes life and functionality
- Inexpensive, quick and hassle free installation
- Safe for potable water application

### Available Range

- 1" to 4" in
- Copper
- Bronze
- Silver
- Gold
- White Gold
- Diamond
- Platinum

For depth on installation from 150 feet to 1500 feet



Jain Thread Loc Plus



## Jain PE Coils

- Only Indian company to manufacture PE Coils from 16mm to 160 mm
- Pipes available in pressure class of PN 2.5 to PN 25 kg/cm<sup>2</sup>
- Pipes available in material grade PE63, PE 80& PE 100
- Pipes available in ISI, ISO and DIN standard
- Pipes are UV stabilized, high crack resistance
- India's largest exporter of HDPE Pipes



Jain PE Coils

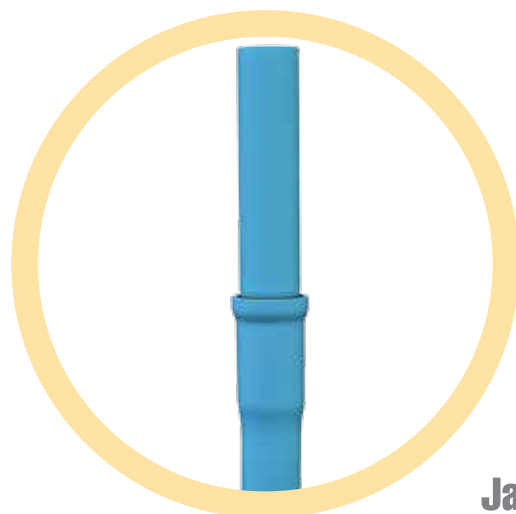


## Jain Riser Pipes

Jain uPVC Riser pipes for India Mark II & Mark III Hand pumps are unique in design with dual socket arrangement to make a perfect sealing arrangement without compromising the pipe strength.

### Features & Advantages

- Very light in weight
- Easy to handle
- Easy to assemble and disassemble
- No mechanical tools required
- Perfect sealing is achieved
- No corrosion of pipes
- No contamination of water
- Longer life of the system
- Initial cost is low
- Maintenance cost is low



Jain Riser Pipes



# BLDC Solar Pumping System



Drip Irrigation



Stand alone Pumping



Drinking Water Pumping



Rural drinking water supply



Dual Pump (Hand + Solar)



Irrigation

Jain Irrigation has developed highly efficient permanent magnet brushless DC motor, intelligent controller and data monitoring system. BLDC pump works in low radiance also. It starts early in morning and remains on till late in the evening.

## BLDC Solar Pump Models

Pump Capacity			Surface		Submersible			
Sr.	SPV Array Wp	Pump kW (hp)	Pump Output in LPD using manual tracker					
			10 m	20 m	30 m	50 m	70 m	100 m
1	1200	0.74 (1)	120000	60000	42000	25200	16800	11400
2	1800	1.5 (2)	180000	90000	63000	37800	25200	17100
3	3000	2.2 (3)	300000	150000	105000	63000	42000	28500
4	4800	3.7 (5)	-	-	168000	100800	67200	45600
For Drinking Water application								
Sr.	SPV Array Wp	Pump kW (hp)	30 m	60 m	90 m			
1	900	0.74 (1)	20000	10000	5000			

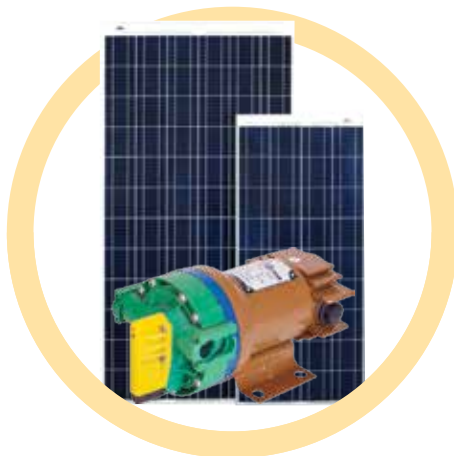
- Note: 1) Above figures are based on the "Average Daily Solar Radiation" condition of 7.15 kWh/m<sup>2</sup> on the surface of the PV array.  
 2) System installed on automatic single axis tracker gives 20-25 % more water output per day as compared to fixed structure and 10-12% more output as compared to manual tracker.



Jain Solar DC Agriculture Pumping System



# Domestic Solar Pumping System



**Jain Nano Pump**



**Jain Sunlight Pump**



Rural drinking water supply



Drip Kits



Domestic water supply



Irrigation

The problem of load shedding, which was till now limited to the villages, is increasing with every passing day in cities. This leads to the problem of water storage. Pumps cannot be operated because of load shedding. To overcome from this day-to-day headache, Jain Irrigation Systems Ltd. has developed a solar operated special domestic surface pump. As fuel prices are rising with every passing day, there is no doubt that this package will be a blessing in disguise.

Nano solar pump and Sunlight solar pump is used to lift the water from the underground tank to the overhead water tank. This is done in a very efficient manner.

**The working:** The pump works directly on solar panel throughout the day. If the pump is to be operated during night time, then power pack can be used. You will need to purchase this power pack separately.

## Jain Solar Nano Pump

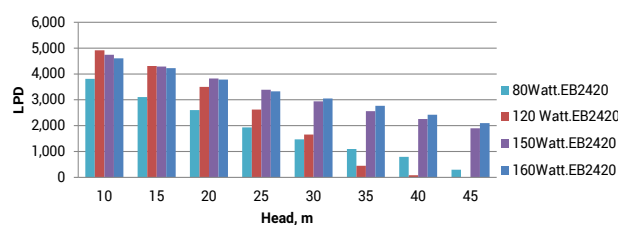
- DC motor - 18-24V, 2.3A
- Positive displacement Pump
- 80-160Wp Solar PV module
- Total max head – 40 m
- Max. discharge – 700 LPH
- Pressure control switch

## Jain Sunlight pump

- BLDC motor – 15-52 VDC
- Positive displacement Pump
- 150-500 Wp Solar PV modules
- Total max head – 40 m
- Max. discharge – 2400 LPH
- Integrated pump controller –MPPT, protections against overload, well dry, tank full, over temperature etc
- Simple & comprehensive human interface–Manual & Bluetooth

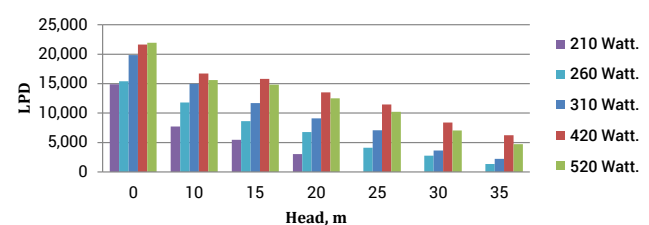
## Jain Solar Nano Pump Performance

Head, m	Discharge, LPD @ 7.15kWh/m <sup>2</sup> /day solar radiation, EB 2420 motor			
	80 Wp	120Wp	150Wp	160Wp
	10	3,811	4,914	4742
15	3,104	4,310	4290	4,227
20	2,601	3,498	3,825	3,781
25	1,933	2,620	3393	3,327
30	1,468	1,654	2939	3,054
35	1,093	448	2,563	2,769
40	790	79	2,258	2,422
45	293	0	1,899	2,101



## Jain Sunlight Solar Pump performance

Head, m	Discharge, LPD @ 7.15kWh/m <sup>2</sup> /day solar radiation, 6M SUCTION					
	160Wp	210Wp	260Wp	310Wp	420Wp	520Wp
	10	6782	14,892	15,413	19,834	21,651
15	3574	7,731	11,787	14,952	16,709	15,585
20	1268	5,443	8,641	11,675	15,819	14,817
25	-	3,023	6,785	9,096	13,517	12,503
30	-	-	4,115	7,086	11,446	10,217
35	-	-	2,745	3,650	8,391	7,029
40	-	-	1348	2,212	6,230	4,728



# AC Solar Pumping System



Lift irrigation scheme



Integrated Irrigation Solutions



Community Irrigation Projects



Irrigation



Stand alone Pumping



Pumping Grid Connect with Backup



Grid Connect Pumping



Urban water supply

The AC Solar Pumping Systems and Solutions are also provided by JISL. In AC pumps, AC motor compatible to variable frequency is used. Energy generated through solar is DC, so to operate AC pump on solar an inverter is used. The major component of AC pump is inverter (pump controller). All controls and protections are inbuilt in pump controller. This AC pump can run at lower frequency than 50 Hz. AC pumps can start only when it receives particular input power. Hence unless there is no sufficient sunlight, AC pumps cannot start functioning. Moreover with additional accessories, AC pumps can also be operated on grid during off sun hours. This segment covers solar pumps up to 10 hp which gives discharge as per MNRE guideline with manual tracking.

## AC Solar Pump Models

AC Submersible									
Sr.	SPV Array Wp	Pump kW (hp)	Pump Output in LPD using manual tracker						Option
			10 m	20 m	30 m	50 m	70 m	100 m	
1	1200	0.74 (1)	108000	51000	38400	22800	15600	10200	Solar / grid Dual supply arrangement
2	1800	1.5 (2)	162000	81000	57600	34200	23400	15300	
3	3000	2.2 (3)	270000	135000	96000	57000	39000	25500	
4	4800	3.7 (5)	432000	216000	153600	91200	62400	40800	
5	6750	5.5 (7.5)	607500	303750	216000	128250	87750	57375	
6	9000	7.5 (10)	810000	405000	288000	171000	117000	76500	

Note: 1) Above figures are based on the "Average Daily Solar Radiation" condition of 7.15 kWh/m<sup>2</sup> on the surface of the PV array.  
 2) System installed on automatic single axis tracker gives 20-25 % more water output per day as compared to fixed structure and 10-12 % more output as compared to manual tracker.



Jain Solar Pumping Station for Integrated Irrigation Project at Kurani, Uttar Pradesh

# AC Solar Pump Controller

## Features

- Fully Automatic ON/OFF
  - Operates on solar radiation, automatically gets ON when sun rises and OFF at sun set
- High efficiency power electronics
  - Maximum water discharge
  - Minimum power loss
- Maintenance free
  - Sensor less protection against dry running
  - Electronics designed with long life components
  - Naturally cooled power electronics
  - Appropriate inbuilt protections against faults
- Wide operating voltage range
  - Provide more operating hours in a day, even operates in cloudy conditions
- Adaptable in varying climatic conditions
  - IP65 Enclosure
  - Suitable for outdoor installation
- User friendly interface
  - Screw less connection
  - Inbuilt emergency power disconnect switch
  - Digital display for operating parameters
  - Remote ON/OFF through mobile phone
  - Bluetooth interface
  - SD Card Connectivity
  - Online and offline data downloading
- Inbuilt Remote monitoring system
  - Parameters such as module voltage, current, power, energy generated, Pump RPM, UP time and OFF time can be remotely monitored through web portal [www.jains.com](http://www.jains.com)
  - Local or offline data available and can be downloaded through mobile App
  - Dedicated web portal for live data monitoring, with graphical and tabular parametric data
  - Historical data is available on web portal
  - Report generation facility
  - Fault logging
- CE compliance - Conforms to CE requirements
  - Ensures user safety. Since system is powered by high voltage and operating in the outdoor fields



## Specifications: 3.7 kW (5 hp)

Sr.	Parameter	Specifications
1	Motor Wattage	3700 W
2	Minimum I/P Voltage(Voc-)*	250 Vdc
3	Maximum I/P Voltage(Voc-)	850 Vdc
4	Startup Voltage*	500 Vdc
5	O/P Voltage (maximum)	380 Vrms
6	Minimum RPM of Motor	600
7	Maximum RPM of Motor	2950
8	Electronics Efficiency	> 95%
9	Operating temperature range	-20°C to 60°C
10	Storage temperature range	-20°C to 85°C
11	Dimensions (l x w x h)	482x337x260.50 mm
12	Weight	13 kg approx

\* At Minimum Operating Voltage controller unit starts functioning and waits for Voc to reach Motor Startup Voc to start Motor.

## Protections

- **Panel reverse polarity Protection:** The controller is protected against PV panel reverse polarity condition.
- **Overload or Short Circuit protection:** When overload condition or short circuit at motor terminal occurs, controller trips and the overload is indicated on display. User needs to check whether motor is jam or motor wires/windings are short. The pump controller will attempt to start automatically after 2 minute, also user can manually restart by switching the controller OFF and ON again.
- **Dryrun protection:** Low yield will get dry when more water is pumped out. Dropping of water level below the pump causes dry run and may damage the pump. This is sensed and controller gets off with display indication on front panel. The controller again starts automatically after 20 min if water is restored.
- **Phase out protection:** If any wire or coil of motor gets open, controller goes off for 2 min and indicates the same on display on front panel. After 2 min controller automatically attempts to start by re-check.

## Available Range

2.2 kW to 7.5 kW (3 hp to 10 hp)

# High Capacity Solar Pumping Solutions



Lift irrigation scheme



Integrated Irrigation Solutions



Community Irrigation Projects



Urban water supply



Commercial



Industrial

Jain Irrigation Systems Ltd., being an irrigation & solar expert, provides tailor made solutions for higher capacities more than 37 kW (50 hp) single unit solar pumping stations used in agricultural and water supply sectors. JISL provides the solution as per the requirement and site conditions without constraint of duty points i.e. head and discharge. To achieve the desired pumping capacity, several pumps are connected in parallel and its operation is controlled by PLC. JISL has in house capacity to design & develop the electrical and control panels required for high capacity pumping.

The high capacity solar pumping station contains various sub systems like solar power generation system, power conversion system, power controlling system, hydraulic controlling system, filtration system, electrical & hydraulic safety and protection system and SCADA system. There are various options as per customer requirement are available for high capacity pumping stations like stand alone solar pumping, solar and grid dual supply mode, grid sharing mode and grid feed mode. These options are configured to achieve long term sustainable project viability. The Solar AC Pump Set & Pump Controllers > 7.5 kW (10 hp) are sourced from outside.

Sr.	Sub-system	Major Components
1	Solar power generation system	PV Modules, Module mounting structure and accessories
2	Power conversion system	Pump controller / Inverter
3	Power / Hydraulic Controlling System	PLC, Pressure release valves, Pressure transducers
4	Filtration system	Filtration plant as per requirement
5	Electrical & hydraulic safety and protection system	As per requirement
6	SCADA system	As per requirement



Jain Solar Pumping Station for Integrated Micro Irrigation Project, Talwara, Punjab



## Stand Alone Solar AC Pump

### A. Features

- Independent of grid
- Power distribution infrastructure not required
- Capacity from 0.75 kW (1 hp) to 75 kW (100 hp)
- High capacity can be achieved by paralleling of pump hydraulically and synchronizing pump controller

### B. Limitation

- Pump can be operated during Sun hours only
- Discharge varies with time of day and insolation
- Entire set up remains idle when not in use

## DC/AC Dual supply Solar AC Pump

### A. Features

- Independent of grid in solar mode
- Pump can be operated on grid during non Sun hours
- Capacity from 0.75 kW (1 hp) to 75 kW (100 hp)
- High capacity can be achieved by paralleling of pump hydraulically and synchronizing pump controller

### B. Limitation

- Grid feed not possible though power distribution infrastructure is available (set up remains idle when pump is not in use)
- Discharge varies with time of day

## AC Pump with Solar Grid Connected Plant

### A. Features

- AC solar pump can be operated on solar as well as grid
- Pump can be operated during non Sun hours
- No limitation of pump capacity
- When pump is not operated, power generated from solar can be fed to grid

### B. Limitation

- Reliable power distribution infrastructure is required
- Grid availability is must. In absence of grid it will not work on solar also
- Bi-directional meter is required and associated regulations are applicable

## Solar AC Pump with Battery backup

### A. Features

- Any type of pump can be operated on off grid solar power plant independent of live grid
- Pump can be operated during non Sun hours on grid and or partially on battery
- When pump is not operated power generated from solar can be fed to grid if battery bank is fully charged

### B. Limitation

- Additional components like change over, VFD inverter synchronization etc are additionally required
- System is more complicated
- Battery bank has techno-commercial limitations
- Higher maintenance
- Efficiency of system is reduced



More Than  
25000 Solar  
Pumps in  
Operation

## A. Solar Powered Community Micro Irrigation in Punjab (Solar Agri Pumping)

**Customer - Department of Soil Conservation, Talwara, Dist. - Hoshiarpur, Govt. of Punjab - first of its kind in the World**

### Solar powered community micro irrigation project

Total no. of solar pumping stations	12
Solar pumping station capacity	750 kW (1000 hp)
Solar power plant capacity	1.2 MWp
Energy saved = Energy Generated (units / year)	17,52,000

## B. Solar Powered Tube Wells, Uttar Pradesh (Solar Agri Pumping)

**Customer - Irrigation and Water Resource Department, Govt. of Uttar Pradesh**

### Solar Powered Tube Wells for Community Irrigation

Pumping Capacity	9.3 kW (12.5 hp) - 16.7 kW (22.5 hp)
No of Pumping Stations	20 nos
Solar power plant capacity	375 kWp
Energy saved = Energy Generated (units / year)	5,13,920

## C. Solar Powered Micro Irrigation, Leh (Solar Agri Pumping)

**Customer- High Mountain Arid Agriculture Research Institute, Leh**

### Solar Powered micro irrigation

Pump Capacity	7.5 kW (10hp) - 11 kW (15 hp)
No of Solar Pump	4 nos
Solar power plant capacity	54 kWp
Energy saved = Energy Generated (units / year)	78,840

## D. Atal Saur krishi Pump Yojana, Maharashtra (Solar Agri Pumping)

**Customer- Maharashtra State Electricity Distribution company Limited**

### Solar Pump for individual farmer

Pump capacity	2.2 kW (3 hp) to 5.5 kW (7.5 hp)
No of Solar Pump	5,130 nos
Solar power plant capacity	21.16 MWp
Energy saved = Energy Generated (units / year)	3,08,93,600

## E. Solar Pumps for individual farmer, Rajasthan (Solar Agri Pumping)

<b>Customer- Rajasthan Horticulture Development Society, Jaipur</b>	
<b>Solar Pump for individual farmer</b>	
Pump capacity	2.2 kW (3 hp) & 3.7 kW (5 hp)
No of Solar Pump	9466 nos installed
Solar power plant capacity	34.93 MWp
Energy saved = Energy Generated (units / year)	5,10,07,436

## F. Solar Pumps for individual farmer, Karnataka (Solar Agri Pumping)

<b>Customer- Minor Irrigation Project, Bijapur</b>	
<b>Solar Pump for individual farmer</b>	
Pump capacity	3.7 kW (5 hp)
No of Solar Pump	1260 nos
Solar power plant capacity	6 MWp
Energy saved = Energy Generated (units / year)	87,60,000

## G. Solar Powered Lift Irrigation Stations, Himachal Pradesh (Solar Agri + Drinking Water)

<b>Customer - Department of Irrigation and Public Health, Govt. of Himachal Pradesh</b>	
<b>Solar Powered Lift Irrigation Stations</b>	
Pumping Capacity	37 kW (50hp) and 75 kW (100 hp)
No of Pumps	5 nos
Solar power plant capacity	450 kWp
Battery Bank	250 units per day
Energy saved = Energy Generated (units / year)	5,74,875

## H. Solar Pumps for Drinking Water Supply, Maharashtra (Hand Pump - Drinking Water)

<b>Customer- Ground Water Survey &amp; Development Agency, Pune, Maharashtra</b>	
<b>Solar Pump for Rural Water Supply</b>	
Pump capacity	0.74 kW (1 hp) solar pump with water storage and hand pump
No of Solar Pump	2750 nos
Solar power plant capacity	1.85 MWp
Energy saved = Energy Generated (units / year)	27,01,000

## I. Solar Pumps for Village Water Supply, Odisha (Hand Pump - Drinking Water)

<b>Customer- Odisha Renewable Energy Development Agency (OREDA)</b>	
<b>Solar Pump for Rural Water Supply</b>	
Pump capacity	0.74 kW (1 hp) solar pump with water storage and hand pump
No of Solar Pump	1229 nos
Solar power plant capacity	1106 kWp
Energy saved = Energy Generated (units / year)	16,14,760

## J. Solar Pumps for Village Water Supply, Madhya Pradesh ((Hand Pump - Drinking Water)

<b>Customer- Madhya Pradesh Urja Vikas Nigam Limited, Bhopal</b>	
<b>Solar Pump for Rural Water Supply</b>	
Pump capacity	0.74 kW (1 hp) solar pump
No of Solar Pump	1003 nos
Solar power plant capacity	1.2 MWp
Energy saved = Energy Generated (units / year)	17,52,000

## Talwara, Punjab

Punjab, the region of five rivers, obtains maximum yields. Contrary to this, 2.5% area of Punjab is not irrigated due to hilly terrain and forest area. Department of Soil and Water conservation was facing challenges in irrigating left bank of Kandi Canal. Since it is at higher elevation, farmers can grow only rain fed crops. Jain Irrigation Systems Ltd. have provided innovative solar based irrigation solution to about 1642 acres of area. In this project, Jain Irrigation is providing complete package of practices from concept to commissioning including training to the farmers and Operation & Maintenance for 7 years.

### Requirement

- 1) Lifting water from the canal and distribution to hilly farms so that farmers can take crop in all seasons
- 2) Establishment of grid distribution network in this hilly area was costlier and challenging
- 3) Avoid cost of maintenance of distribution grid and monthly electricity bill

### Technical specifications

Sr.	Particular	Value
1	Area	1642 acre
2	No. of lifts	5
3	Total Pumping capacity	750 kW (1000 hp)
4	Single Pump capacity	15 kW (20 hp) & 18.5 kW (25 hp)
5	Discharge	12841 m <sup>3</sup> / day
6	Head	58-105 m
7	Pump type	Solar Submersible pump
8	Motor Type	AC motor
9	Total Solar Array capacity	1.2 MW (1200 kWp)
10	Type of controller	Solar pump inverter with PLC controlled operation
11	Energy saved = Energy Generated (units / year)	17,54,000

### Features

- High efficiency solar modules
- Stand alone system completely works on solar
- PLC based pump controlling for maximum utilisation of solar energy
- Full proof inbuilt electrical protections
- 25 years of solar module life
- Automation of complete solar irrigation system up to farm level
- Easy to operate and maintain

### Benefits to farmers

- Running of solar pumping system irrespective of unexpected / unavoidable faults in transmission line
- Inbuilt protections ensure higher pump life
- Automatic operation results in maximum utilisation of solar and water resources
- Socio economic benefit on farmers prosperity
- Dust to dawn working of pump
- Transmission losses avoided
- Theft of power is prevented
- Highly reliable and robust
- Maximum system Up time
- Requires mostly unskilled labour
- No expenditure of laying power lines

### Benefits to government

- Government would save huge amount on creating electrical infrastructure to bring the electricity to the rural areas from the power generation stations, since solar is decentralized way of delivering power for pumping
- This will also avoid /eliminate theft issues
- Farmers will get reliable power for pumping, which will bring sustainability to farming
- Solar power is a green power which reduce GHG effect
- Recurring costs in case of solar systems would be Zero. Hence there is no question of recovery issues.
- Farmers would be able to run other electrical appliances such as tube lights/fans etc., on the solar power
- Government will always have a choice to offer electricity to the farmers at commercial rates

**World's only and the largest integrated community solar powered micro irrigation project providing irrigation to 1200 farmers. This area of Punjab was not feasible for canal irrigation due to higher elevation and undulated terrain. This path breaking sustainable solution has now opened the avenues for Himalayan states and other hilly areas in the country.**



# Solar Operated Community Micro Irrigation



Solar Tracker Installation



Solar Trackers Installation



Solar Pump Assembly



328 kW (245 hp) Solar Pumping Station



Jain Solar Powered Sprinkler Irrigation System

## Kangra, Himachal Pradesh

In Himachal Pradesh, agriculture land is distributed over hilly terrains. In most of the cases, irrigation is being done through lifting water from canal or reservoir. Irrigation and public health department in Himachal Pradesh operates & maintains lift irrigation pumping stations across the state. All these pumping stations are situated in lower level than the farms. Jain Irrigation Systems Ltd. solarised the pumping station without changing or disturbing existing infrastructure. In particular pumping station, there were no space available for installation of solar plant, so plant was installed on canal top.

## Requirement

- 1) Solarise lift irrigation pumping stations
- 2) Operate Pumping System in case of grid failure and load shedding
- 3) Utilize Renewable Energy and to save natural resources
- 4) Install plant on canal top

## Technical specifications

Sr.	Particular	Value
1	Total Pumping capacity	78 kW (105 hp)
2	Individual Pump capacity (max)	22 kW (30 hp)
3	Pump type	Surface pump
4	Type of solar plant	Off grid solar power generation plant
5	Type of Controller	Solar off grid Inverter, VFD Synchronns and automation panel
6	Solar Plant capacity	100 kWp
7	Battery capacity / Type	240 V, 1000 Ah / VRLA
8	Battery Backup	2 hours
9	Structure Type	Fixed type Canal Top
10	Energy saved = Energy Generated (units / year)	4,92,750

## Features

- Canal top solar power plant
- Plant can work in grid sharing mode
- Utilisation of solar resource to the maximum
- Full proof inbuilt electrical protections
- 25 years of solar module life
- Easy to operate and maintain

## Benefits

- Pumps can be operated during power cuts
- Utilisation of canal top - Land / Open area saved
- Socio-economic benefit on farmers prosperity
- Cost Saving
- Dual purpose system - Drinking water cum irrigation

**Green Energy Solution offered for irrigation and drinking water by Jain irrigation in hilly region of Himachal Pradesh. This innovative solution includes installation of solar panels on canal top and energy availability for 14 hours during summer, including 2 hours of battery backup.**

# Solarisation of Lift Irrigation Pumping Station



Canal Top Structure



Pump House



VRLA Battery Bank



Canal Top Solar Power Plant for Lift Irrigation Pumping Station

## Kurani (Lucknow), Uttar Pradesh

Uttar Pradesh is one of the major states contributing to Indian Agriculture Economy. The Irrigation and Water Resource Department had initiated for installation of solar pumps for Community tube wells used for irrigation. The Department has installed number of tube wells across the state for 50 -100 ha blocks but due to power availability and quality issues most of the tube wells are not utilised fully. Jain Irrigation Systems Ltd. had provided end-to-end solutions to overcome the following challenges and made the project successful.

### Challenges / Obstacles

- 1) Farmers could not irrigate their fields through community based tube wells due to severe power cut.
- 2) Department could not operate community tube wells due to poor power quality
- 3) Monthly electricity bill for irrigation department

### Technical specifications

Sr.	Particular	Value
1	Pump capacity	9.3 kW (12.5 hp) to 18.5 kW (25 hp)(13 Nos)
2	Discharge	102 m <sup>3</sup> / hr
3	Head	21-35 m
4	Pump type	Submersible pump
5	Motor Type	AC motor
6	Solar Array capacity	13.5 -25.5 kWp
7	Type of controller	AC solar pump inverter with AC / DC dual supply
8	Remote monitoring	GSM based
9	No. of farmers	5000 Nos.
10	Energy saved = Energy Generated (units / year)	3,68,577

### Features

- High efficiency high capacity solar modules
- Stand alone system completely works on solar during day time
- AC / DC dual supply input
- Maintenance free sensor less dry run protection
- Foolproof inbuilt electrical protections
- GSM based Remote monitoring and data logging
- 25 years of solar module life
- Easy to operate and maintain
- Micro irrigation systems can be easily integrated

### Benefits

- Assured Irrigation - No hardship
- Independent of availability of grid and power quality
- Inbuilt protections ensures higher pump life
- Same pump can be operated on grid during night time if required
- Higher utilisation of tube well which provides water to farmers
- More value for money
- High system uptime and availability

**Solar pumping system was conceived to address poor power availability, quality and high cost of same. The solution offered by Jain assured reliable & timely irrigation round the year.**

# Solar Operated Community Tube Wells



Community Tube Well Pump House



Community Well-Water Discharge



Fixed Type Solar Structure for Community Tube Wells

# Solar Powered Integrated Micro Irrigation Project in Cold Desert



## Leh, Ladakh

Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST) has High Mountain Arid Agriculture Research Institute in Leh for conducting research on agriculture. This institute is situated more than 14760 feet above sea level. It was challenging to irrigate research farms as there is electricity distribution infrastructure and source of water is river flowing in valley. Jain Irrigation Systems Ltd. had provided the solar powered micro irrigation systems to research farms.

## Requirement

- 1) Lifting water from river and irrigate research farms
- 2) Avoid cost of development & maintenance of distribution grid and monthly electricity bill

## Technical specifications

Sr.	Particular	Value
1	Pump capacity	2 nos. of 11 kW (15 hp) and 7.5 kW (10 hp) each
2	Discharge	240 - 375 m <sup>3</sup> / day
3	Head	40-75 m
4	Pump type	Submersible pump
5	Motor Type	AC motor
6	Solar Array capacity	13.5 kWp per pump set
7	Solar module mounting structure	Automatic single axis solar trackers
8	Energy saved = Energy Generated (units / year)	78,840

## Features

- Stand alone system completely works on solar
- 25 years of solar module life
- Easy to operate and maintain
- No pollution

## Benefits

- Large scale farming made feasible
- Solar powered micro irrigation results in optimum utilisation of solar and water resources
- Enabled scientist to do agriculture experiment and demo farm on temprature crop
- Dust to dawn working of pump
- Highly reliable and robust
- Maximum system Up time
- Saved cost if laying electricity distribution network

**Farming at world's highest peak in Himalayas (far away from main land) was unimaginable and not economical as availability of water & power / diesel was a big challenge. A novel approach of Jain Integrated solution : solar pumping + micro irrigation made large scale farming feasible in cold desert.**

# Solar Powered Integrated Micro Irrigation Project in Cold Desert



Civil Works



Floating Submersible Pump in Indus River



Jain Solar Single Axis Trackers



Jain Filter Station



Jain Solar Powered Integrated Micro Irrigation Scheme of Leh

# Solar Rural Drinking Water Supply

## Requirement

- 1) Provide drinking water to village
- 2) Water requirement up to 10,000 litres per day with maximum pumping head of 90 m

## Technical specifications

Sr.	Particular	Value
1	Individual Pump capacity	0.5 kW (0.75 hp) - 1.4 kW (2 hp)
2	Pumping Head	up to 90 mtr
3	Solar module capacity	300 Wp - 1800 Wp
4	Pump type	Dual (Solar cum Hand pump)
5	Water tank capacity	up to 10,000 ltr
6	Stand Post	as per requirement
7	Input Power	Hybrid - AC/DC
8	Discharge	up to 50,000 ltr

## Features

- Best suitable for small village / remote hamlet
- Integrated hand pump and solar pumping system both can operate
- Water distribution Pipeline & can be laid as per requirement
- 25 years of solar module life
- Easy to operate and maintain

## Benefits

- Independent of availability of grid and power quality
- Inbuilt protections ensures higher pump life
- Same pump can be operated on grid during night time if required
- High system uptime and availability
- Negligible maintenance
- No Hardship



Hand Pump



Stand Post



Rural Water Supply Scheme



Rural Water Supply Scheme

**This solution ensures 24x7 drinking water supply to small villages. This innovation helps to overcome the hardships specifically of women.**



# Nano Pump + DripKit

## Raigarh, Odisha

### Requirement

- 1) Provide irrigation system to small farmers
- 2) Use of natural resources to generate the power
- 3) Reduce water requirement in farm

### Technical Specifications

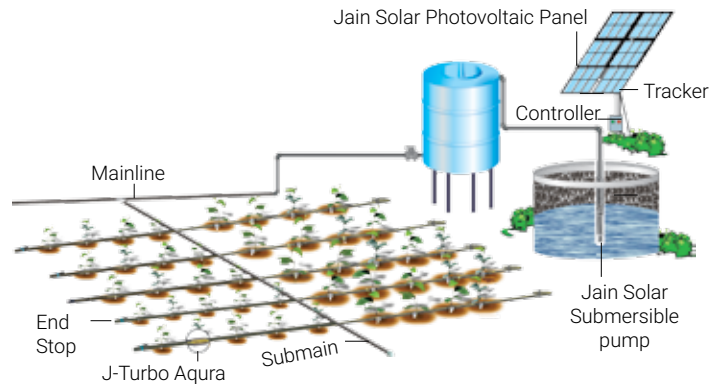
- 12-18 volt, 5 Ampere Motor (D.C.)
- 80 Wp Solar PV Module
- Total maximum head: 30 mtr.
- Discharge: 2500 - 3000 liters/day
- Pressure control switch

### Features

- Best suitable for small farms, nursery, seedlings etc.
- Sunrise to Sunset operation
- Easy to operate and maintain
- 25 years of solar module life

### Benefits

- Up to 50% saving in irrigation water
- Maintenance free
- High system uptime and availability
- No hardship



Schematic layout of Solar Powered Jain DripKit sourced through submersible pump in open well / borewell.



Jain Solar Nano pump + Jain DripKit



Jain Solar Nano pump + Jain DripKit Farm, Raigarh in Orrisa

**The sustainable solution for small farmers - Solar Powered Nano pump with DripKit enables farmers to cultivate vegetables to earn livelihood.**

# Solar Energy Hub Jain Tissue Culture Park, Takarkheda

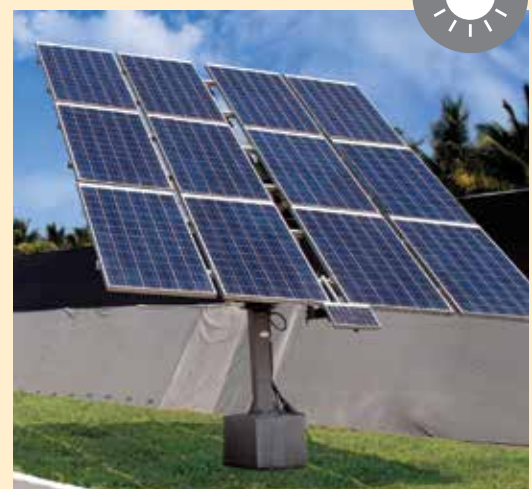
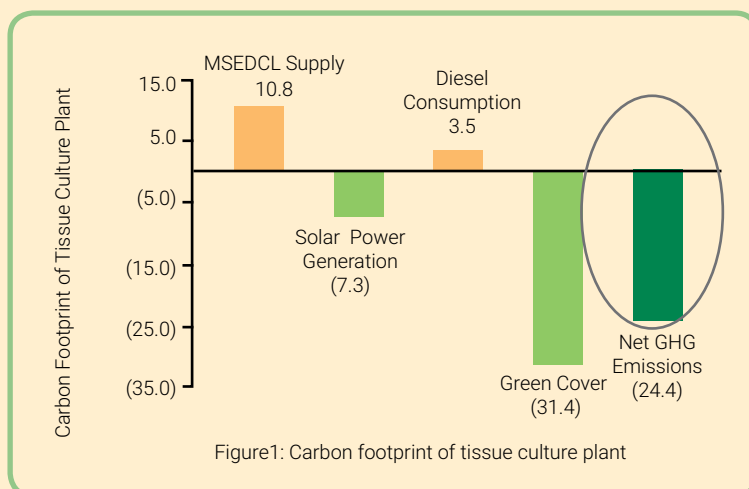


Jain's Tissue Culture Park, started in 1995 for propagation and supply of 'Tissue Culture Planting Material' for Banana, Pomegranate and Strawberry is the world's largest tissue culture facility spread in close to 90 hectare area near Takarkheda village in Jalgaon district and has annual production capacity of 100 million tissue culture plants. Jain Tissue Culture (TC) Park is a unique example of sustainable farm contributing positively to water and carbon cycles, without generating any auxiliary waste stream. Most of the area in TC Park is under hi-tech green houses, poly houses and shade houses where high quality tissue culture plantlets of banana, pomegranate, and strawberry are produced.

## Renewable Energy at TC Park

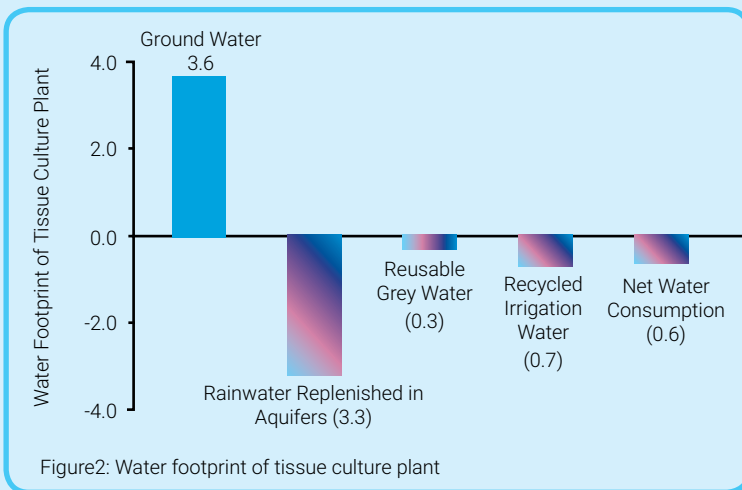
The energy is consumed mainly for cooling and pumping purposes. A significant amount of energy demand is met by off-grid and on-grid solar installations totalling to 500 kW. Entire water pumping is done from rainwater harvesting and recycled water ponds through floating solar pumping systems. During 2017, solar power met 40% energy demand for tissue culture production. In addition to solar power a substantial carbon sink has been created over a decade. The green cover in TC Park includes more 30,000 trees. This green cover removes Greenhouse Gas (GHG) emissions equivalent to 2300 tons of CO<sub>2</sub> per annum from the atmosphere. Solar Power and green cover together make tissue culture production operations net Carbon Positive.

## GHG Emissions per Plantlet (gram CO<sub>2</sub>-eq)



## Water Harvesting & Recycling at TC Park

Ground water recharge through rainwater harvesting is the main feature at TC Park. All the groundwater sources (bore well and open well) get recharged by harvested rainwater. Five percent of the total area in TC Park is occupied with constructed percolation ponds. In addition, water is also replenished to aquifers through out of boundary percolation check dam. Water withdrawal for irrigation of TC plants is done through solar water pumps equipped with solar tracking panels.



Through rainwater harvesting in TC Park, 24% more water was replenished into the ground than the consumption in 2017. The water used for irrigation of plants in poly houses is recycled through a channel of pipes and filters. The grey water resulting from washing of cell culture bottles is also separately collected, filtered through filtration unit and finally reused in the irrigation. Thus each plantlet produced in TC Park becomes net water positive.

## Solar pump

Tissue Culture park consists of green houses of more than 20 acres and poly houses of more than 75 acres. To fulfil the energy requirement of entire campus including irrigation, fan and pad cooling systems and potable water; pumping requirement is more than 187 kW (250 hp). JISL is running all pumps on solar power without using any electricity. The pump capacity varies between 0.746 kW to 18.5 kW (1 hp to 20 hp). Solar pumps are operated during the day time which, fulfils the water requirement of entire tissue culture park. For all solar pumps solar modules are installed on automatic trackers which provided 25-30% more water as compared to fixed structure.

By using standalone solar pumps, JISL saved 187 kW of additional load demand and its associated electricity bill.

## Solar AgroVoltaic Grid connected plants

JISL has installed 14.4 kW AgroVoltaic structure in Tissue Culture Park. It cover 600 sq. m area which is utilised for energy generation as well as banana production. Within the same area, JISL is producing energy as well as food. This is a unique concept demonstrating power generation & farming on the same field. Special design ensures enough sunlight for the crops.



Jain Solar Pumping System



Solar AgroVoltaic Plant

## Solar Roof Top Grid connected plants with net metering



Solar Roof Top Grid Connected Plant

JISL has installed 221 kWp roof top grid connected plant in campus under net metering. Grid connected plant is directly synchronised to LT bus of panel eliminating the battery.

By installing roof top solar plant, the heat load of building is reduced. Grid connected plant produces 800-850 units per day.

## Solar off grid plant

JISL has installed 100 kWp solar off grid plant to cater the green house loads. Cooling fans of green house are operated using VFD. There are 2 nos of 50 kW inverter with 600 Ah battery bank. Solar off grid plant supply approximately 300-350 units per day.



Solar off Grid Plant

## Carbon Footprint of Solar Hub TC Park

Type of Solar System	Energy saving per year, kWh	Co <sub>2</sub> saving, ton
Solar pumps,	273020.0	245.72
Roof top Solar grid connected plant	322660.0	290.40
Solar off grid plant	106762.5	96.09
<b>Total</b>	<b>702442.5</b>	<b>632.21</b>



# Future of Agriculture - AgroVoltaic Farming

## Crop Cultivation + Power Generation



### AgroVoltaic Precision Farming

Agricultural pumps have more than 70% share among total water pump market. A solar pump is most suitable solution over conventional electrical and diesel agriculture pumps. In some cases, for installation of solar agri pump, there is limited space available for installation of solar modules in field with shadow free area. In such case, importance shall be given to both agriculture as well as energy generation. Jain has innovated AgroVoltaic concept for crop cultivation + generation of solar power within limited space using special structure. JISL, being expert in agriculture, irrigation, water management and solar pumping, provides solution for customised sustainable AgroVoltaic farming.

### Features

- Optimal use of natural resources such as Land, Water & Sunlight
- Precision Farming Technology Integrated with Renewable Energy
- Architecture of Solar panel & Crop Geometry ensures optimum conditions for crop growth
- A holistic approach to farming: Jain TC Plants, Superior Seeds, Solar Energy, Drip Irrigation, Mulching, Fertigation, Automation & Hi-Tech Horticulture Practices
- Sub-surface drip, Sub-soil drainage, mulching & PV Panel as roof results in 99% water use efficiency
- Lower methane emission due to Drip Irrigated Rice
- Zero Green House Gas emission, reduces Global Warming effect and protects Ozone layer



Banana cultivation + Solar Power generation



Rice cultivation + Solar Power generation

Crop - BANANA	Yield <sup>1,2</sup>	Water use <sup>1,2</sup>	Energy Use <sup>1,2</sup>	Energy Produced in AgroVoltaic Farm	Water Footprint	Carbon Footprint
	(Ton/acre)	(Million Lit/acre)	(Units/acre)	(Unit/acre)	(Liter/kg)	(gm CO <sub>2</sub> /kg)
Conventional Farming	14.36	7.12	2136	0	496	132
AgroVoltaic Precision Farming	34.5	3.93	1179	+264431	114	(7634)
Difference %	140%	45%	81%	100%	335%	5866%

Ref: 1) A. Narayanmoorthy (2004) - <http://www.iwmi.cgiar.org/EWMA/files/papers/Drip-energy-AN-paper%20%282%29.pdf>

2) Vaibhav Malunjar, Santosh K Deshmukh and V. Balkrishnan (2013) Energy Efficiency of Micro Irrigation: Case study of Banana Crop. Lambert Academic Press Publishing ISBN: 978-3-659-45484-4 (M Tech Thesis approved by University of Agricultural Sciences, Raichur).

Crop - RICE	Yield <sup>1</sup>	Water use <sup>1</sup>	Energy Use <sup>1</sup>	Energy Produced in AgroVoltaic Farm	Methane <sup>2,3</sup> Emission	Water Footprint	Carbon Footprint
	(Tonn/acre)	(Million Lit/acre)	(Units/acre)	(Unit/acre)	(kg flux/acer)	(Liter/Kg)	(gm CO <sub>2</sub> /kg)
Conventional Farming	3.1	9.5	467	0	87.5	3065	783
AgroVoltaic Precision Farming	3.8	3.2	226	+53420	9	842	(13950)
Difference %	22.5%	66.3%	52%	100%	90%	263.9%	1881%

1) P. Soman (2012) Drip Irrigation and Fertigation Technology for Rice Cultivation Session 6b: Tools, Techniques, Innovations, Conference on Agriculture, ADB Manila (2012).

2) T K Adhya et.al (1994) Methane emission from flooded rice fields under irrigated conditions, Bio Ferti Soils 18: 245-248, Methane flux : 4-26 mg/h/m<sup>2</sup>, in anaerobic rice conditions. Here for reference the flux of 10 mg /h/m<sup>2</sup> was considered for calculation in black cotton soils in Jalgoan.

3) T. Parthasarathi et al., (2012), Aerobic rice-mitigating water stress for the future climate change Subsurface drip irrigated aerobic rice reduces methane emission by 80-85%. Hence, we have considered 80% emission in this calculations.

**Sustainable Agriculture -Ideal model to achieve Water + Food + Energy Security**

# Frequently Asked Questions



**Q: What is meant by Solar Pump?**

A System which converts energy of Sun rays into electrical energy to fetch /pump the water from Bore well/ Tube well, open well etc. is called as Solar Pump.

**Q: How many types of Solar Pumps are there?**

A: (a) Surface  
(b) Submersible

**Q: Up to what head solar pumps can be used?**

A: Currently solar pumps can be used up to 1000 feet (300 mtr) head.

**Q: How many hours solar pump can work?**

A: Depending on radiation availability, working hours of solar pump varies. On an average, solar works for 7 hours in day. Working of solar pumps starts with Sunrise and stop at Sunset. By adding more solar panels, duration of pump operation can be extended.

**Q: Which system, AC or DC is more efficient?**

A: It is observed that DC pumps deliver up to 50% more water output compared to conventional AC pumps.

**Q: What precaution should be taken to prevent theft of solar panels?**

A: Use anti-theft nut bolts for the solar panels. Moreover, we recommend to take insurance of the entire system.

**Q : Can we operate Drip and Sprinkler on Solar pumping System? Will it generate enough pressure?**

A : Yes! We can generate required pressure to operate drip and sprinkler irrigation systems

**Q : What is the difference between AC and DC solar pumps?**

Sr.	Important points	AC	BLDC	Benefits of BLDC
1	Pump Start time	9.00 am	Sunrise	Starts with Sunrise hence gives more discharge
2	Pump Shut off time	Around 5.00 pm	Sunset	Working hours are more
3	Daily discharge	Less	More	Daily discharge is higher
4	Motor efficiency	Up to 70%	Up to 92%	Maximum water output
4	Pump efficiency	Up to 40%	Up to 50%	Maximum water output
5	Technology of Motor	Alternate current	Brushless DC	Next generation technology
6	Water lifting capacity	Keeps changing	High at low speed	Superior performance
7	Total Weight & size	Bulky	Compact	Easy to handle & can fit in small bore
8	Need of Solar panel for less than 1.5 kW (2 hp)	Up to 40% more	Nominal capacity panels are required	Less capital and maintenance cost
9	Cloudy weather performance	Low voltage result in no or less discharge	30-40% more discharge compared to AC	Works smoothly
10	Control equipments	Inverter is required to convert DC into AC result in high losses	Smart controller negligible losses	Higher safety, No tampering is possible

**Q: What standards are applicable for Solar Panels?**

A: IEC 61730-1,61730-2, IEC-61215, IEC-61701, ISO-9001:2008, ISO 14001: 2004, BSOHSAS 18001:2007.

**Q: What are the special features of the Jain solar water pumping systems?**

- A: Special features of the Jain solar pumping systems.
- a) All components of the system like solar water pump; Solar Panels, controller etc., are manufactured in house only hence being all indigenous.
  - b) We render prompt after sales service through wide network of our dealers and depots.
  - c) Jain Irrigation Systems Ltd is the pioneer & leader of drip and sprinklers irrigation system in the world. It maintains its first ranking all over due to our dedicated efforts of our scientists and engineers and expert manpower is deployed for manufacturing, distribution and maintenance all the time.
  - d) Solar panels supplied by Jain Irrigation are provided with power production warranty\* of 25 years.

**Q: In how many states of India solar pumps are installed?**

A: Solar pumps for agriculture and drinking purpose have been installed in all states of India. Rajasthan leads in Agri solar pump installation.

**Q: Is Panel Cleaning required?**

A: Yes, Regular panel cleaning ensures optimum power generation

**Q: What facility Jains has for testing ensuring solar pump performance?**




A: Please see Annexure -1.

**Q: Which certification are available for Jain Solar Pumping Systems?**

A: Please see Annexure -2 .

**Q: How Solar Pump is different than Diesel & Electrical Pump?**

A : Comparison as follows ;

Particulars	Solar pump	Diesel pump	Electrical pump
			
Typical Capacity in kW (hp)	0.5 (0.74) to 75 (100)	3.7 (5) to 11 (15)	0.5 (0.74) to 75 (100)
Capital cost	High	Moderate	Lower
Running cost	No running cost	Very high	High
Maintenance cost	Negligible	High	Moderate
Routine Maintenance	Only panel cleaning once a week	Daily lubrication, Minor & Major servicing required, periodic overhauling must	Electrical failure of motor due to voltage fluctuations.
Part replacement	Moderate	Worn out parts need to be replaced often	Moderate
Operation	No operator required, auto start/ stop possible.	Operator is required	Requires operator
Other utilisation	PV array can be used for electricity generation when pump is not running	Nil	Nil
Environmental aspect	Silent & pollution free green power	High air & noise pollution	Electricity generated through coal is polluting
Limitation	Works on solar during day time only	High fuel & maintenance cost	Dependent on grid availability
Life span	Solar panel 25 years & pump 8-10 years	5 - 8 years	8 -10 years
Efficiency	High	Lower	Medium

**Q : Can we use land under the solar tracker for agriculture?**

A : Yes! we can cultivate land under the solar tracker as below.



Solar Powered Drip Irrigation

# Annexure - I

## Performance Testing Centre



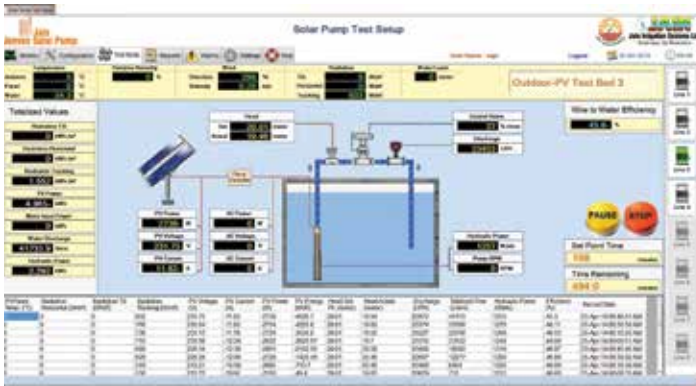
State-of-the-art fully automated SCADA based solar pump testing facility

### Jain Solar Pump Performance testing Centre

- Capacity - 0.5-50 hp pumps (AC/DC)
- Suitable for testing of Submersible and Surface pump performance
- Number of Testing lines -13
- Installed PV capacity – 65kW on Single axis tracker & 125kW On fixed stand
- IEC -62253 based testing procedure
- Testing as per MNRE test procedure or Tender specifications
- Round the clock testing with Solar array simulator
- Auto data logging and Report generation



Submersible pump testing



Surface pump testing

### Real Time Field Testing Centre

- Solar pumps are tested in natural field conditions i.e. pumping head, climate, water quality etc.
- Solar pumps are tested for field performance, reliability and maintenance assessment
- Natural pumping head is created for 20m, 50m, 80m and 100m etc., by running pump delivery on hill tops
- Round the clock testing using PV (daytime) & Power supply (night time)
- Long term testing for life assessment of the pump



Pump testing setup



Real time testing setup





Jain Solar Pumping System Product Range

### Certifications



- ISO 9001: 2015
- ISO 14001 : 2015
- OHSAS 18001:2007
- EnMS 50001



#### Module

- IEC 61215
- IEC 61730 Part I & Part II
- IEC 61701
- Tested as per : IEC 61853, Part 1
- PID Free tested

#### DC Controller

- IEC 60068-2 (1,2,14,30)
- IEC 60529 (IP 65)
- Various Protections / Safety

#### AC Controller

- IEC 61683 – MPPT Efficiency
- Various Protections / Safety
- IEC 60068-2 (1,2,14,30)
- IEC 60529 (IP 65)
- IEC 61683 – MPPT Efficiency

#### Pump Set

Performance test approval : MNRE



### Collaboration



### Business Associates

#### Pump End



#### AC Pump Controller



#### AC Pump Set



#### Solar Grid Connected Inverter



# Limited Warranty



JIS Warranty for Solar Pump

\*JISL\* herein means \*Jain Irrigation Systems Ltd.\*

\*SPS\* Means the \*Solar Pumping Systems\*

- 1) JISL warrants to the customer that the SPS shall materially conform to the description in JISL documentation and shall be free from defects in material and workmanship. Accordingly, customer's sole and exclusive remedy under this warranty is the repair (or at JISL's sole discretion the replacement of the SPS or any part(s) according to the terms of this warranty certificate and no other remedy shall be available. Therefore, if within the warranty period the SPS is proven to be defective by reason of faulty workmanship or materials by JISL, JISL undertakes, with reasonable promptness, to have the defective SPS (or any part/s thereof) repaired, (or at JISL discretion, replaced;) all strictly under the terms and conditions of this warranty certificate.
- 2) JISL shall, for a period of 12 months from the retail purchase date (invoice) of the original (first) purchaser ("the warranty period"), provide limited warranty for the SPS, as provided for and subject to the provisions and limitations of this warranty certificate.
- 3) JISL warranty for the SPS extends only to the original purchaser of the SPS ("the customer") who, while requesting warranty service, must present JISL with a valid and duly signed contract with JISL (or any of its authorized dealers of JISL) together with a valid purchase receipt. Failure to produce the said documentation will result in the request for warranty being null and void.
- 4) JISL warranty for the SPS or otherwise shall not apply to any of the following:
  - (i) any conduct (by act or omission) by user, including any misuse/abuse of any SPS (or part/s thereof), and/or any failure to install and/or use any SPS in full compliance with JISL instructions;
  - (ii) Other systems/components/devices/technologies and/or the integration/interface thereof with any SPS;
  - (iii) Any part/component which has been included/installed in any SPS without JISL approval and/or other than by JISL;
  - (iv) Any actual or attempted change/repair/interference of/ with any SPS (including any use/handling of, and/or interference/dealing with, any code of any software included/used in the SPS) other than by JISL;
  - (v) Disturbing any data/information/content which has been inserted/included in a SPS; malfunction or damage resulting from accidents, which occur during transit and/or handling, and/or malfunction or damage due to fire, earthquake, flood, lightning, hailstorms, windstorms and/or any other natural calamity;
  - (vi) This warranty does not cover damage inflicted by insects, worms, battles, crickets, rodents, squirrels and other/ animals/creatures or by miscreants as well as theft, riot, civil commotion or war etc., unforeseen accidents, wear and tear, or any other external factors beyond JISL reasonable control, or to any SPS installed, repaired, adjusted, rebuilt, modified, changed or converted by any person (including the customer) other than by JISL authorized person;
- 5) In addition and without derogating the provisions of this warranty, JISL warranty is conditioned upon the all of the following taking place:
  - (i) Customer's operating and maintaining the SPS in accordance with JISL instructions.
  - (ii) Customer's not being in default of any payment obligation to the JISL (or its authorized dealer, as may be relevant).
- 6) JISL does not give any warranty or guarantee whatsoever in respect of any SPS (or any part/s thereof) which has not been manufactured and distributed by the JISL and which has not been purchased from the JISL or any of its authorized dealers, whether such SPS are branded with any trademarks similar to any trademark belonging to or used by JISL.

- 7) After replacement or repair of the SPS, the warranty for the new or repaired SPS shall be valid only for the non expired period of the original warranty period. Any defective SPS or part/s, which has been replaced, shall become JISL property.
- 8) JISL reserves the right to charge the customer if any warranty service is requested and carried out but no fault is found in the SPS or if such defect/fault is not covered under JISL warranty certificate.
- 9) Notwithstanding anything to the contrary, JISL shall not be responsible and/or liable, under any circumstances and in any way, for any loss, damage, costs, expenses, expenditures, responsibility and/or liability (including of customer and/or any third party) – including without limitation direct and/or indirect, including incidental and/or special and/ or consequential, however arising, including in respect of damages to or loss of property and/or equipment, loss of profit, loss of use, loss of revenue or damages to business or reputation, whether or not based on breach of contract, tort (including negligence), SPS liability or otherwise, arising from the performance or non performance of any aspect of the SPS or any part thereof; all of the above, whether or not JISL and/or the customer shall have been made aware of the possibility of such loss.
- 10) In any event, any liability which JISL may have in connection with the SPS and/or this warranty certificate, including (without limitation) in connection with and/or resulting from the SPS (or any part thereof) and the use thereof, shall be limited to a value or sum (for all damages, claims and causes of action in the aggregate) equal to the consideration actually received by JISL from the customer for the supply and installation of SPS. The limitations shall apply whether the liability is based on contract, tort, strict liability or any other theory.
- 11) This warranty does not cover consumable required for routine maintenance.
- 12) The customer shall be solely responsible for the selection, use, efficiency and suitability of the SPS(s).
- 13) This warranty does not cover wear and tear caused by fluid abrasive and /or damage caused by over pressurization of pump set
- 14) This warranty does not cover costs of repair or replacement of part &/or product due to misuse of product, including use of product for a purpose not intended as set forth in JISL literature, or improper installation / maintenance, alteration, tampering, modification of the product or unauthorized repairs.
- 15) This warranty and the remedies set forth herein are exclusive and in lieu of all other warranties, remedies and conditions, whether oral, written, statutory, express or implied. JISL specifically disclaims any and all statutory or implied warranties, including, without limitation, warranties of merchantability and fitness for a particular purpose and warranties against hidden or latent defects.
- 16) The provisions of this warranty shall be interpreted and governed, solely and exclusively, pursuant to the laws of the state of India, and no other law shall be applicable. Any and all legal actions shall be litigated within the jurisdiction of the courts of Jalgaon, Maharashtra, India, and no other jurisdiction shall apply.
- 17) Recommended Water Quality limits for warranty

pH	6 to 8
Total dissolved solids (PPM)	1000 max.
Chloride (PPM)	500 max.
Fe (PPM)	2 max.
Co <sub>2</sub> (PPM)	50 max.
O <sub>2</sub> (PPM)	2 min.
Sand content	50 g/m <sup>3</sup> max.

- 18) For details of PV module 25 years warranty contact Company
- 19) Extended Warranty is available at extra cost.



## Integrated Manufacturing Plant



Jain Solar Pump Manufacturing Plant (Automatic CNC Machine) Green Energy Park; Jain Valley, Jalgaon.



Jain Solar Controller and PCB Manufacturing plant, (SMT line fully automatic) Green Energy Park; Jain Valley, Jalgaon.



Jain Solar Pump Inplant Testing Center; Green Energy Park; Jain Valley, Jalgaon.



## The Corporation

There is more to Jain Irrigation than irrigation

Jain Green Energy Park, Jalgaon

**Global Presence:** Jain Irrigation Systems Ltd. (JISL) derives its name from the pioneering work it did for the Micro Irrigation Industry in India. However, there is more to Jain Irrigation than Irrigation. Now Jain Irrigation is a diversified entity with turnover in excess of Rs. 7000 crore. We have a Pan- India & Global presence with 30 manufacturing bases spread over 4 continents. Our products are supplied to over 120 countries with a strong network of more than 8000 dealers and distributors worldwide.

**Micro Irrigation:** The Corporation has pioneered and raised a new Micro Irrigation industry in India and thereby helped harbingers a Second Green Revolution. The Micro-Irrigation Division manufactures a full range of precision-irrigation products and provides services from soil/topographical survey, engineering design, supply, installation and commissioning to agronomic support for millions of farmers worldwide. It is the only company in the world which has the largest basket of product and system solutions that can suit any climatic/topographical/crop conditions. The division's pool of over 1000 agronomists, irrigation engineers and technicians are well equipped to support the farmer customers across the globe. The company nurtures a sprawling 2300 acre Hi-Tech Agri Demonstration farm and a training Institute.

**Plastic Piping:** Presently, JISL is the largest producer in Asia of PVC and PE piping systems for all conceivable applications with pipes ranging from as small as 3 mm to 2500 mm in diameter and in pressure ratings ranging from 1.00 kg/cm<sup>2</sup> to 25 kg/cm<sup>2</sup>. JISL has a production capacity of over 5,00,000 tonne per annum or 8000 km/day of plastic pipes. The Piping Division includes a variety of PVC and PE Fittings catering to irrigation needs of the farmers apart from the urban and rural infrastructure needs. The pipes are manufactured conforming to BIS, DIN, ISO, ASTM, TEC, Australian Standards as well as other customised specifications.

**Plastic sheet:** Plastic sheet division's globally marketed products help conserve forests by providing alternatives to wood in the home building market.

**Biotechnology:** The Tissue Culture Division produces Banana, Pomegranate, Strawberry, Guava, Coffee, Sugarcane plantlets and has established vast primary and secondary hardening facilities and R&D labs.

**Green Energy:** JISL pioneered Solar water pumping systems in the country. Jain Solar water pumping system is a standalone system operating on power generated by Solar Photovoltaic panels which are also manufactured inhouse state-of-the-art facility. JISL has installed more than 20000 Solar Pumps. All these products are in harmony with the group's mission, "Leave This World Better Than You Found It".

Jain Green Energy division also offers Solar Thermal Water Heating Systems, Solar Photovoltaic, Bio-Gas and Bio-Energy alternate energy solutions.

**Food Processing:** Jain Farm Fresh Division processes tropical fruits such as Mango, Banana, Guava, Pomegranate into Purees, Concentrates & Juices. The company also has a Dehydration facility which dehydrates Onions & Vegetables. The Company has also launched a range of fruit pulp based retail FMCG Products under the brand of "Jain Farm Fresh". Agricultural and Fruit processing wastes from these processing plants are converted to Bio-Energy

to partially run the plants. The residue after the Bio-Energy generation is used as an Organic Manure.

**Turnkey Projects:** JISL undertakes Integrated Agricultural Development Projects on TurnKey basis from Concept to Commissioning with value added services. JISL offers cost effective, down-to-earth solutions for complex challenges backed by our core strength of global knowledge and experience combined with local man-power which is an ideal combination of technology, intelligence and common sense. Whatever be the nature of the project requirement, JISL can assure Total TurnKey solutions and maximum value for the farmers. It can also undertake Watershed or Wasteland development projects. Such projects normally begins with selection of site, survey of the command area, identification of appropriate crops, designing of the suitable irrigation systems, determination of agronomic practices, use of other hi-tech agro inputs, providing on-going technical services & training and pre & post harvesting techniques, provide assistance for operation and maintenance of the systems.

The Company has successfully executed large scale turnkey irrigation projects from conception to completion not only in India but also overseas.

### **Jain Irrigation offers following turnkey Solutions:**

- Integrated irrigation solutions
- Integrated agricultural development projects
- Reuse of waste water for agriculture
- Dust suppression
- Lift & Gravity water pipelines
- 24x7 Water Supply
- High-tech Urban Utilities Solutions
- Effluent conveyance & disposal systems
- Gas distribution System
- Industrial fluid conveying systems, sewerage lines etc.
- Marine On-shore & Off-shore piping
- Relining and rehabilitation of existing pipelines
- Plumbing Systems
- Solar Powered Generation Projects
- Solar Powered Integrated Irrigation Projects
- Solar pumping systems
- Solar water heating projects

In a nutshell, the Corporation is the only 'one-stop shop' encompassing manufacturing and marketing of hi-tech agricultural solutions/systems and piping services as well as processing of agri produce. No wonder, it has distinguished itself as a leader in the domestic as well as global markets. The corporate product range improves productivity and adds value to the agri-sector. Conservation of scarce natural resources, protection and improvement of the environment emerge as a blessed outcome. The reward has been over millions of smiling farmers and scores of customers in more than 116 countries.

**Sustainability:** Every business of JAINS, ensures to create shared value, nurtures the environment and contributes significantly to the Water, Food and Energy security of the World.



Toll Free: 1800 599 3000; E-mail: solarpump@jains.com; Visit us : www.jains.com

Connect with us

