



**POTTERY WHEEL**

**SECTOR: AGRI ALLIED**

**MODEL BANKABLE DOCUMENT**



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## **1. INTRODUCTION**

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Pottery is one of the oldest traditional livelihoods in India, but still thrives as both an art form and a means to create functional items. The craft has been practiced and passed on over generations with the form constantly evolving. It has been a massive employment generator in both rural and urban India for decades but is slowly diminishing. While various platforms, including government centers, potters' markets and online pottery boutiques have contributed to its continued viability as a livelihood, this trend is steadily declining in rural areas because of increasing costs. Unable to meet their basic needs from the income generated by pottery, potters are opting out of the art. While motorized wheels exist, irregular electricity or complete absence of electricity prevents them from opting to the solution.

As pottery is considered a laborious craft, right from sourcing the clay, firing the article to creating one - plagued by uncertainties in finding clay, wood for firing kiln, and the labor for spinning the wheel, which is making potters choose alternative professions. There is extreme drudgery involved in driving the pottery wheel that amounts to less productivity due to fatigue. The current methods include a driving wheel using stick or by hands or by motorized wheel. However, most villages do not have dependable grid supply to use a motorized potter wheel and due to this, a conventional motorized pottery wheel is not a feasible solution.

## **2.NEED FOR SOLUTION**

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The main problem facing the pottery art is low productivity, low income and lack of efficient technology. The effort of spinning the wheel manually takes a lot of drudgery and that reduces productivity. Many potters are considering alternative profession which poses serious threat in preserving this ancient profession.

The motorized pottery wheel in the market is inefficient posing problems for potters living in areas where there are energy issues. Even several initiatives by the Government has failed to encourage using motorized solution because of lack of timely service and proper.

## **3. CRITERIA FOR SELECTION**

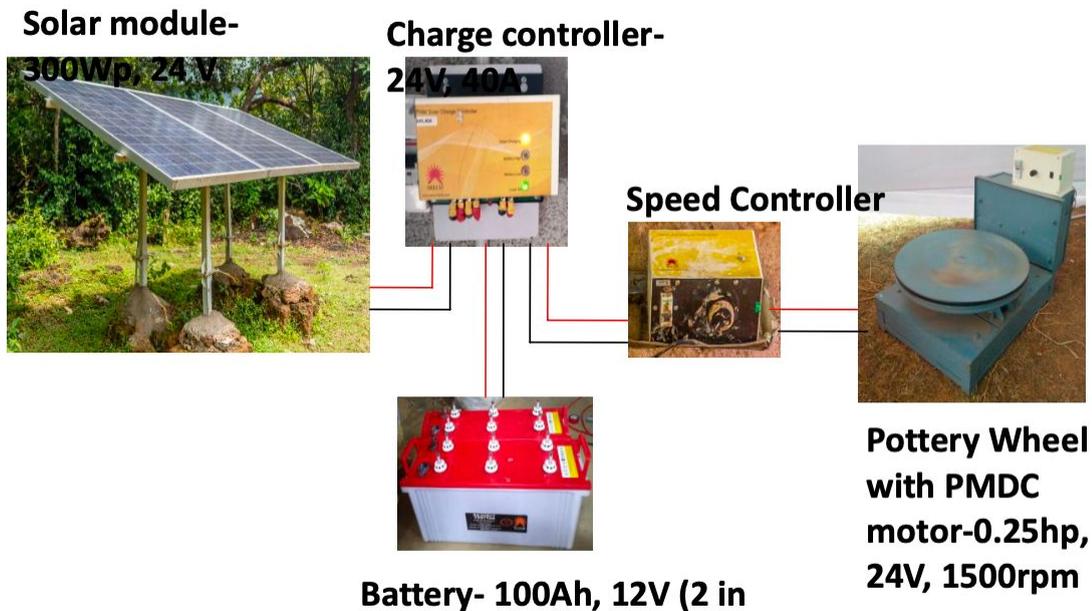
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- Pottery livelihoods is more prevalent in areas where entrepreneur works in a cluster.
- Manual practise of pottery making leading to shoulder, back and leg pain which can be avoided.
- The pottery entrepreneur is not able to meet the market demand.

#### 4. SCHEMATIC DESIGN

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An efficient solution was designed by retrofitting the existing machine with a more efficient PMDC motor and customized speed controller. This intervention has led to an energy efficient and reliable solution which has impacted pot-making entrepreneurs by increasing their productivity and earnings while also reducing the drudgery and fatigue associated with manual work.



#### 5. TECHNICAL SPECIFICATION

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The table below provides the hybrid system designs and details of the components and devices with specifications required for a solar powered pottery wheel machine. The systems design will provide autonomy to the machine for 4 hours per day.

<b>DC System for Pottery Wheel</b>		<b>4 hrs. of back-up + 5A Grid Charging</b>	
<b>Max Load that can be connected</b>		<b>160 W</b>	
<b>Max units of energy (kWh) usage per day</b>		<b>0.64 units</b>	
<b>System Voltage</b>		<b>24 V</b>	
<b>System Configuration</b>			
<b>Sl.No.</b>	<b>Products</b>	<b>Capacity</b>	<b>Qty</b>
1	Solar Module (Kotak, 72 Cells)	300 Wp, 24 V	1
2	Solar Battery	100 Ah, 12 V	2
3	MMS	300 Wp, 1M	1
4	PWM CR - Hybrid Charge Regulator with inbuilt speed regulator	24 V 30 A CCR with 5 A Grid Charger	1
5	Pottery Wheel with inbuilt PMDC Motor-	0.25 hp, 24 V, 1500 RPM, Pottery wheel-20"	1
6	Cables red+black (M-C)	4 sq.mm.	20
7	Cables red+black (L-C)	6 sq.mm.	20
8	Cables red+black (B-B)	10 sq.mm.	6
9	Earthing Cable	10 sq.mm.	10
10	Double pole MCB with surface box(Load side)	32 A, 230 Vac	1
11	Earthing Kit		2
<b>Consumables</b>			
12	PVC Pipes	3/4 inch	6 Nos
13	PVC Elbow	3/4 inch	12 Nos
14	PVC Tee	3/4 inch	6 Nos
15	PVC Clamps	3/4 inch	24 Nos
16	Nails	1.5 inch	1 Packet
17	Cable Ties	200mm	1 packet
18	Insulation tapes	R+B	2 Nos
19	AC Socket with switch	5 amps	1 Nos
20	Flexible Pipe	3/4 inch	5m
21	Cable lug- For Battery - Round Type	6sqmm	4 Nos
22	Cable Lug- For CR -U type	6 sqmm	6 Nos

## **6. KEY FEATURE**

- It provides reliable energy efficient power backup
- Increase productivity and hence improved income
- No need of manually rotating traditional wheel
- The setup is low cost and easy to install
- The wheel operates without noise.
- Multiple types of speed controller available based on the customer need.

## **7. INSTALLATION**

### **7.1 Pottery Wheel Machine**

- The pottery wheel machine should be placed on a steady, smooth and parallel surface.
- The base structure should be cushioned to avoid vibration during the operation.
- Speed controller should be placed nearby user for convenience.
- The wheel alignment should be checked before use.

### **7.2. Module:**

- While unboxing module to install two people should care handle module instead of one person.

- Identify shadow-free location on roof top for installation and clean the area. Mark points to place RCC (Reinforced Cement Concrete) on the floor.
- Depending upon geography and type of roof it will be decided whether MMS has to be customized or not.
- If needed with the help of local fabricators it has to be made possible.
- Identify south with the help of magnetic compass and mount the panel facing South.
- Please maintain the optimum tilt angle of the solar panel so as to maintain the efficiency and increase the life of the panels.
- Depending upon the type of footing Roof mounting and ground mounting, configuration of tilting angle in particular angle- Summer Tilt and winter tilt
- The type of footing will depend on the type and angle of roof for rooftop mounting. In case of ground mounting, it depends on the type of soil.
- Isolated footings are most commonly used footings for Reinforced cement concrete column because it is simple and most economical.
- Combined footing: the aim is to get uniform pressure distribution under the footing.
- Earthing of panels: in order to protect the entire solar system and people using it has to be connected to earth.
- Panels are interconnected such that the voltage of the system is achieved. They are connected to the Array Junction Box by MC4 Connectors. Panels are interconnected such that the voltage of the system is achieved.

### **7.3. Charge controllers:**

- Fuse has to be removed prior to installation.
- First connect positive and negative terminal of the battery to the charge controller.
- Then connect the positive and negative terminal of the load to the charge controller.
- Then fuse has to be reinstalled.
- Finally connect the positive & negative terminal of the panels to the charge controller.

### **7.4. Batteries:**

- For ventilation holes are made in the rack to give space for air to pass through.
- Batteries should not stacked one above the other.
- Keep polarities of all the batteries adjacent to each other on the same side.
- Batteries should be stored in a cool, dry and shaded area free from sunlight.
- Best room temperature for storing batteries is 20°C.
- In DC systems, while making connections, always connect negative wire first and then positive wire.

- While disconnecting, disconnect positive wire first and then negative wire. This is for safety reasons and to avoid sparks at the battery terminals while doing connections
- Keep air safety distance between batteries of at least 20mm.
- Use wire lugs at battery terminals to avoid loose connections.
- Do not use grease on battery lugs as it has a high melting point and is a bad conductor of electricity. Use petroleum gel instead.
- Lugs should be dry and should not be hot. Lugs get hot due to loose connections, improper wire size or poor quality of lugs
- Always keep top of batteries clean and keep the lids sealed to avoid contamination by dust.
- To measure battery voltage, first disconnect electric load and solar input
- To get more accurate current readings, connect ammeter in series to the battery and load.
- Battery Connections: Do the battery interconnections such that the system voltage is achieved. Keep them well in the battery box.

## **8. MAINTENANCE**

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### **8.1 Pottery Wheel Machine**

- The wheel should be cleaned after usage.
- The bearings should be greased at least once a month
- The condition of the belt should be checked for wear and tear.
- The motor should not be overloaded with the maximum limit of 25-30 kgs.

### **8.2. Module:**

- Clean the panels at least once a month.
- Do not displace the panels from the mounting structure.
- Tilt angle has to be checked.
- Check if there is any deformation in the panels.
- Check if there are any wire/ wires directly exposed to sunlight.
- Do not drop, allow objects to fall on, stand or step on solar modules.
- Do not walk, lean, sit or rest heavy objects on solar panels.
- Prevent the direct contact of the positive and negative terminals of Panels.
- Solar modules have a protective glass front. Broken solar module glass is an electrical safety hazard (electric shock and fire). These modules cannot be repaired and must be replaced.

### **8.3. Charge controllers:**

- Care has to be taken to frequently check the indicators to ensure proper functioning of the system
- Do not place any metallic or fire prone object close to the charge regulator. A minimum of 12" space should be maintained all around for free air circulation.

#### **8.4. Battery:**

- Check the acid level in the battery at regular intervals. Fill with distilled water if the acid level is low.
- Do not overuse the system.
- Apply Petroleum Gel on both terminals of the battery.
- Prevent the direct contact of the positive and negative terminals of batteries.
- Batteries store a large amount of energy. Never short circuit the external contacts of battery under any circumstances

### **9. SAFETY**

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#### **9.1. Pottery Wheel Machine**

- The speed should be regulated such that it remains stable on the wheel and does not fall around due to centrifugal force.
- Wheel speed should be based on user control and safety.
- The wire should be protected from rodents and rats.
- Earthing should be done.

#### **9.2 Module:**

- If wiring line voltage is higher than 70 Volts, it will be Hazardous.
- Wear insulated safety gloves, industrial shoes while working on the system
- Do not touch the panels junction box during day time, as DC voltage is always present when solar modules are exposed to sunlight
- MCB has to be turned off in solar combiner box of the Solar Array before you work on them.
- Always check positive or negative polarity of any wire with multimeter before connecting it to any device
- Do not leave any wire open, it can touch other terminals causing short-circuit.

#### **9.2. Charge controllers:**

- Do not allow water to drip or splash on the charge regulator.
- Avoid children touching the charge controller.
- Keep the machine and other parts clean and free from dust & water.

#### **9.3. Battery:**

- Provide a ventilation in the battery room for the hydrogen gasses generated to move out.
- Do not allow water to drip or splash on the battery.
- Avoid children touching the charge controller.
- No Smoking warning sign has to be hanged if needed outside.
- Wear safety glasses for protecting the eyes from the acid.
- If acid comes in contact with eyes, wash for 15 minutes and report to a doctor immediately

- If acid comes in contact with skin or clothing, rinse off for several minutes and try not to spread the electrolyte. Report to a medic/doctor after rinsing.

## **10. TROUBLESHOOTING**

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### **10.1. Pottery Wheel Machine**

- If the wheels are not rotating, then check the bolts under the wheels which needs to be pulled out and tightened accordingly.
- If the machine is getting heated, switch off the machine for 2-3 hours.

### **10.2. Module :**

- Disconnect the fuse
- Cover solar modules with thick blanket or cardboard
- Check the interconnection polarity between the modules
- Check the bypass and reverse blocking diodes for correct polarity
- Check for any loose connection
- Replace the fuse.
- Uncover the solar modules
- Check the output voltage of individual modules using clamp meter /Multimeter
- Check the output voltage of solar array at terminal blocks.

### **10.3. Charge controllers:**

- Check for Fuse if the wire inside the fuse is shot, replace with new fuse.
- Check for series charging, if not then there might be complaint with the circuit.
- Check for panel, battery and load voltage

### **10.4. Battery:**

- Check specific gravity of the battery if the specific gravity is low then send it
- Check the terminal voltage after the load is disconnected from the battery terminal.
- Remove corrosion on the terminal posts
- Use self-leveling filler that automatically fills the battery to a predetermined level.
- While topping take care not to splash from the cell opening

## **11. COST & ECONOMICS**

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The cost economics based on the service demand translating to profits per month which is required to service the EMI cost of acquisition of the system.

The cost and economic of pottery business is based on the following assumptions:

- Cost of System (includes solar component): Rs 67,000/-
- Interest rate is fixed at an average of 15%
- Payment tenure is 3 years translating to 36 monthly EMIs
- Based on the calculation, the EMI cost coming to Rs 2225
- No. of working day considered: 20days
- No. of working hours: 8 hours

### Approximate revenue per year

Pots per days	Nos./day	20
Working hours	hours/day	8
Working days	days/month	20
No of Pots per Month	Nos./month	400
Sale value per piece		50
Total sales value of Pots per Annum		240000

### Approximate expenses per year

CAPEX		OPEX	
One-time cost		Annual cost	
Pottery Wheel with Solar System with 4 Hrs back-up	67,000 ₹	Sand	10,000 ₹
		Fuel	15,000 ₹
		Other Materials	10,000 ₹
		<b>Total</b>	<b>35,000 ₹</b>

### EMI Details

EMI Details	
Loan Amount	67,000 ₹
ROI per annum	12.00%

ROI per month	1.000%
Tenure in Months	36
EMI	2,225 ₹

### Revenue post EMI deduction

Annual Income after paying for EMI & Raw Materials	₹ 178,296
Monthly Income after paying for EMI & Raw Materials	₹ 14,858

The intervention is expected to increase the entrepreneurs income by Rs 14,858 on an average.

## 12. CASE STUDY

### Pottery business Entrepreneur at Kundapura

Mr Rahguram Kulal is one of the leading potters in the Aloor Village of Kundapur. Previous generations of his family has been involved in this profession of protecting the local culture. Over the years, Mr Kulal has been able to establish market linkages which have increased his income to almost Rs 30, 000 per month. His corporate clientele includes SKDRDP, Namma Bhoomi, Krishna Dairy etc. He puts up the diverse products, ranging from Terracotta Jewelry to Pots, in exhibitions which significantly increase his monthly earnings. He has registered a proprietor enterprise - "Guruvandana Pottery Products" and has employed one designer for terracotta jewelry making. Namma Bhoomi, a local organization, helps him in training and marketing his products.

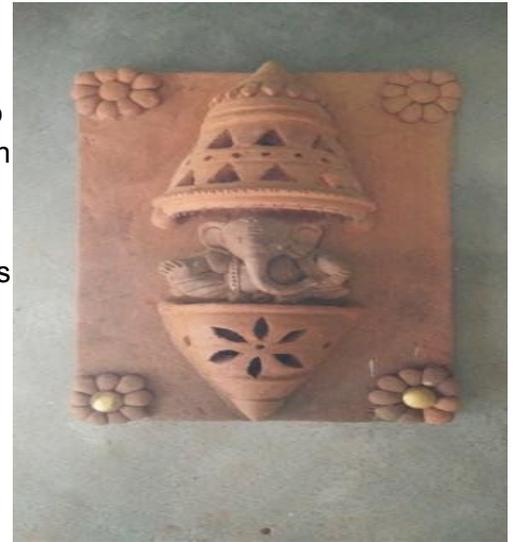
Mr Kulal intends to innovate and reduce drudgery in the production process. Hoping to achieve this, he took a fifteen day entrepreneurship course in RUDSETI Brahmayara. The synergy between traditional rural craft of pottery with SELCO's solar powered pottery solution reduces the manual labour and improves productivity. Pottery involves multiple processes and SELCO has brought in technical innovation which makes the entire process efficient and reliable.



The business underwent a significant upgradation with an investment of Rs.2.58 lakhs that was supported by SELCO Foundation and Mr.Kulal. The intervention included solar powered Pottery Wheel, Solar Powered Blunger, State of the art up-draught Kiln which was developed by Mahatma Gandhi Institute of Rural Industrialization, to reduce the temperature loss in the process. The loan (of Rs 1,00,000) will be used for Capital Expenditure in the construction of the Shed. This will act as an exhibition centre to showcase the local art. The Entrepreneur will also be using the shed to store the finished products.

The Entrepreneur has regular customers who walk – in to buy his products. He also puts up stalls in exhibitions which help him to garner revenue. Bulk orders are given by some offices for decorative products. Namma Bhoomi, a local organization, helps him in training and marketing his products. All these sources help him to garner monthly profits of Rs 32,640.

Post training at RUDSETI, he was able to diversify his product range to include terracotta jewellery, decorative pots, cookware, etc.



### **13. IMPACT**

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- a) There is a 50% reduction in time for the same quantity of production of pots and other vessels.
- b) There is a drastic improvement of 60%-70% in terms of production.
- c) Based on a few surveys, the potter has conveyed satisfaction in able to meet the demand of the market.
- d) There is a reduction in drudgery as the manual work cause shoulder, back and leg pain
- e) In urban areas, the income is seen to increase upto 67% (from INR 30K to 50 K) whereas in the rural areas, the percentage increase is upto 133%. (from 15k to 35K).