

# Development of a Solar Operated Blower for Forging Operation: An Initiative for Sustainable Livelihood of Rural Area



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**Abstract:** Blacksmith generally do the forging operation by hand which requires more time and have survived to exist in rural economy even today. Due to unavailability of electricity and limitation of modern energy sources, economic development of rural area lays extreme poverty line. Development of solar operated blacksmith blower gives a reliable and sustainable solution to blacksmith for their forging operation. This paper represents design and development of solar operated blacksmith blower which was eco-friendly, less time consuming and high efficiency. The main component of solar operated blower is charge controller, battery, solar panel, DC blower and a speed controller. Mathematical calculation had been done for sizing of solar panel, battery, and charge controller and speed controller. The regulation of supplement of air for forging operation with the help of speed controller is the unique design of this research.

**Keywords:** Forging, Solar panel, battery, charge controller, speed controller

## I. INTRODUCTION

The rural economy in India is based on agricultural production and agro processing mostly in tiny scale or domestic units. A substantial majority of agricultural production emanates from small and medium land holdings. But the major issues faced by blacksmiths are:

1. Low income, low productivity and labour shortage.
2. Competition from industrial products, increased cost of raw materials and charcoal, unavailability of charcoal, shortage of labour, additional labour cost to operate the manual blower are all adding to the burden of blacksmiths making it difficult for them to depend on their traditional artisanal work for living.

Increasing the income levels and productivity is an essential measure to be attempted for the survival of this artisanal work. One of the most common issues faced by blacksmiths is shortage of labour to operate the manual blower and huge labour cost which takes away a significant portion of their income.

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Due to dependency on an additional labour and irregularity with labour turning up for work, labour has become a major operational challenge for blacksmith resulting in loss of income. Even though there are motorized blowers available in the market they are very inefficient (attached with 0.25 hp motor) and as most of the blacksmith workshops are not connected to grid supply most of them would still be dependent on traditional bellows or hand cranked blowers. Even if the blacksmith workshops are connected to grid, due to erratic power cuts in rural areas, these blowers won't be useful to full extent instead it further increases uncertainty with labour planning and productivity. Hence there is a need for developing an efficient, reliable, cost effective solution for the blower requirement of blacksmiths.

Properly designed energy efficient blower requires about 92% lesser energy for operation compared to motorized blowers available in the market. Hence the solar powered blower solution is very cost effective and has an attractive payback period of 2-3 months considering the additional labour cost alone thus reassuring better livelihood for blacksmiths. The main component of solar operated blower is solar panel, charge controller, battery, speed controller.

## II. SITE SURVEY

Before installation of solar Photovoltaic System a proper site survey is essential. The following are the site assessment tools.

1. Checklist tools-(i).Compass, (ii) Measuring Tap, (iii) Solar Path Finder, (iv) Solar meter/Pyranometer/Lux meter

**Site assessment: -**

1. Prepare layout of building
2. Mark places available with shading for inverters & batteries
3. Mark the dimension & direction of roof
4. Enquire whether the obstruction can be moved or not
5. Take multiple photographs from different direction
6. Take 2 or 3 of the most suitable available spots on the roof installing photo voltaic array as a reference point.
7. Check the type of mounting structure required for different types of roof
8. RCC roof (normal) (existing pillar & column position)
9. RCC roof (Elevated)
10. Galvanized sheet mounted roof (where the turbo vent & skylight present)