

ENERGY-EFFICIENT DIRECT CURRENT MIXER GRINDER

BACKGROUND

We use electrical appliances that require Direct Current (DC) while supply from the grid is Alternating Current (AC). Mixer/grinder is one such appliance commonly used by households, restaurants, and roadside juice vendors.

DC-based appliances require far lesser wattage than AC-based appliances to deliver the same output. However, no DC-based mixer/grinder is available in the market today. As part of its technology innovation, CLEAN has collaborated with its members to develop, pilot-test, and demonstrate a mixer/grinder using solar energy.

PROJECT PARTNERS

- CLEAN collaborated with GSH Technologies, a Bangalore-based company, developing mechanical structures for design of motor and blades.
- CLEAN collaborated with EmSys Electronics, another Bangalore-based company, for developing the control circuitry.

PRESENT STATUS

Conventional mixer runs for 300 days, consuming 112.5 kWh of electricity costing Rs 844 (@7.2 Rs/kWh). A DC mixer consume 30 kWh per year costs Rs 216 per year. Here we have taken measurements based on 30 minutes operation to produce 30 liters of juice in a day.

Field testing has been done at the manufacturing facility of EmSys Electronics at Jayanagar. After overcoming a few teething problems, the operational parameters of the new package with DC are now compatible with the conventional package with AC. An added advantage is the lesser sound/noise level of the new DC-run product compared to a conventional AC mixer/grinder. Table 1 gives a comparison between a DC mixer/grinder and a conventional one.

TABLE 1 CONVENTIONAL AC MIXER/GRINDER VERSUS ENERGY-EFFICIENT DC MIXER/GRINDER: A COMPARISON

Grinding material	Energy-efficient DC mixer grinder					Conventional AC mixer grinder				
	Volt (V)	Amp	Time taken (seconds)	Speed (rpm)	Sound level (Db)	Volt (V)	Amp	Time taken (seconds)	Speed (rpm)	Sound level (Db)
Idli batter	12	14.1	150	6907	68.8	230	2.5	40	18000	94.2
Apple	12	14.1	87.5	6880	71.2	230	2.5	52	18000	92.3

TECHNICAL SPECIFICATION

S. no.	Parameters to be tested	Energy-efficient DC mixer	Conventional AC mixer
1.	Motor type	Permanent magnet DC motor	Universal AC series motor
2.	Revolution per minute	7000 rpm	Revolution per minute (rpm): 18,000 rpm
3.	Motor wattage	200 W	750 W
4.	Battery back-up	60 ampere-hours (Ah)	Powered by AC grid directly
5.	Types of blades	Wet and dry grinding blades	Wet and dry grinding blades

EXPECTED IMPACT

The product has already triggered interest from agencies that are working in remote, inaccessible locations, as the product is solar-based. Bhatti Ghar Foundation (Orrisa), E-hands (Tamil Nadu and Uttarakhand) and SELCO (Karnataka) have already expressed interest for commercial pilot to create and meet demand from such end uses.

As the connected load in DC mixer grinder (200 W) is much less than AC mixer (750 W), and the speed of operation is almost the same, over 40% savings in electricity is anticipated.

COST-BENEFIT ANALYSIS

Parameter	Conventional AC mixer	Conventional system with solar integration	DC mixer	Energy-efficient BLDC mixer grinder
Price	Rs 7000 per unit	Rs 14000 per unit	Rs 18500 per unit	Rs 21,000 per unit
Cost of electricity	Rs 150–175/month electricity cost	Need of inverter which will cost Rs 3000	No operational cost. Battery replacement after 5 years. Rs 1500 for battery replacement.	No operational cost. Battery replacement after 5 years. Rs 1500 for battery replacement.
Lifetime	5–7 years	5–7 years	8–10 years (DC motors have longer life)	8–10 years (lifetime of BLDC motor)



Prototype of DC mixer grinder during lab testing



Grinding idli batter with DC mixer grinder

Partners:



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