Solar Recycler

Collin Tastet, Dr. Basel Alsayyed

ABSTRACT

The concept of a Solar Recycler modernizes the method of recycling, to recover the waste of aluminum cans, and recover their material using simple equipment that uses the sun's energy to melt a material instead of using electricity or other traditional sources that uses fossil fuel. The current application uses a Fresnel lens to melt aluminum cans to be recycled. The Fresnel lens focuses energy into a crucible to melt the collected material. Once melted, the product will be poured into a mold to create an ingot. The advantage of this, compared to a general furnace, is the lack of electricity needed and the affordability. Compared to a solar panel setup that uses the energy from the sun to power a heat source, this proposed innovation is much cheaper, as the main functioning component and expense is the lens. This also means it is much more serviceable and portable. Repairs would ideally be general wear and tear maintenance compared to an entire solar panel setup, which would require a specialist. This innovation can be transported easily in terms of portability as you just need the lens and a reservoir to melt materials. This innovation intends to create a portable setup that allows users to recycle aluminum in any outside location. The setup does not use any sort of solar tracking and requires users to aim the lens manually.

GOALS

- To create a solar recycler without using electricity or fossil fuels
- To reduce the amount of aluminum can waste
- To minimize greenhouse gas emissions
- To provide a cost friendly recycling application
- To create a transportable and efficient setup

SIMILAR APPLICATIONS

- High flux solar furnace
- Published in REWAS 2016: Solar Aluminum Recycling in a Directly Heated Rotary Kiln (Germany)

Figure 1: Solar Furnace

METHOD- 49" Fresnel Spot Lens

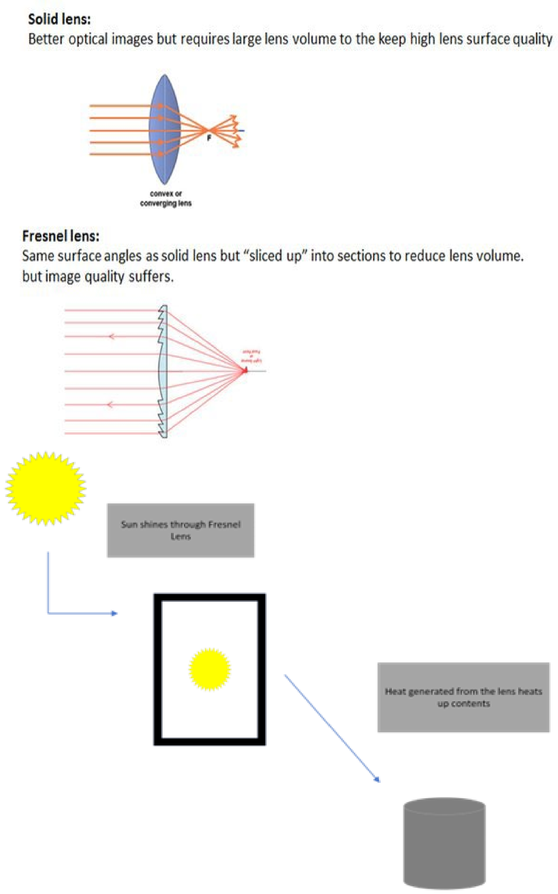


Figure 2: Process description of the application

SPECS

- BEAM SIZE MAX POWER--.4 INCH (2.7" OUTER AREA 900 F)
- FOCAL LENGTH: 29 INCHES
- MAX TEMP. CLIMB: 1950F (IR THERMOMETER)
- MAX COLLECTION: 2107F

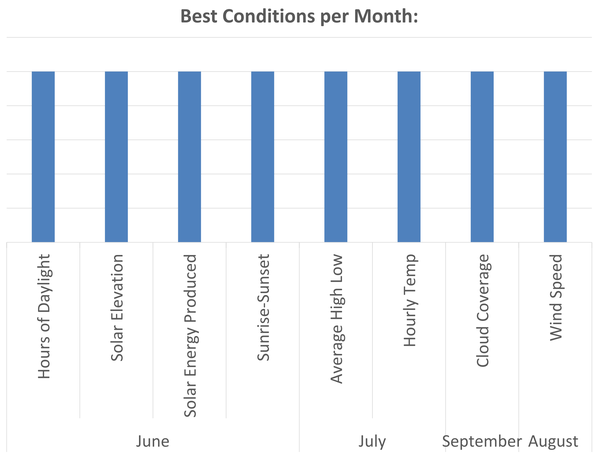
Water	12oz. BOILS- 70 sec.
Wood	FLAME- 0.1 sec.
Zinc	MELTS 14g- 10 sec.
Glass	MELTS 1" x ¼" - 15 sec.
Concrete	GLOW- 15 sec.

*Specs given by manufacturer- GREENPOWERSCIENCE

WEATHER ANALYSIS

Since this project uses the sun as a primary source for this application, it must be noted how dynamic and unpredictable weather patterns can be. To understand the best timeframes for efficiency, weather patterns were analyzed. The data collected referenced data from Cullowhee, NC in 2023. The month with the best application rating would be the most efficient timeframe to use this application. However, conducting experiments within the less applicable months can let us gage how proficient this application will be. As an example, if this application works in January, the least efficient month according to the data, we can safely assume this application can be used year-round.

Month	Best Application Rating
July	1
June	2
August	3
May	4
September	5
April	6
October	7
March	8
November	9
February	10
December	11
January	12



Month	Attribute	Attribute Ranking
June	Average High Low	3
	Hourly Temp	3
	Cloud Coverage	7
	Hours of Daylight	1
	Sunrise-Sunset	1
	Solar Elevation	1
	Wind Speed	3
	Solar Energy Produced	1
		Total: 20 Rank: 2
July	Average High Low	1
	Hourly Temp	1
	Cloud Coverage	6
	Hours of Daylight	2
	Sunrise-Sunset	2
	Solar Elevation	2
	Wind Speed	2
	Solar Energy Produced	2
		Total: 18 Rank: 1

POTENTIAL FUTURE APPLICATIONS

- Personal/ Community Recycling
- "Can Drives"
- Educational Demonstrations
- Facility Recycling

FUTURE DEVELOPMENT

- Filtering of the emissions, resulting from burning the recyclable materials
- Increase degrees of freedom to maximize sun exposure
- Automate the system so that it will unload melted materials and start melting new ones if needed

References

1. Puttkamer, Martina Neises-von, et al. "Solar aluminum recycling in a directly heated rotary kiln." *Rewas 2016: Towards Materials Resource Sustainability*, 2 Feb. 2016, pp. 235–240, https://doi.org/10.1002/9781119275039.ch35.
2. "Weatherspark.Com." *Cullowhee Climate, Weather By Month, Average Temperature (North Carolina, United States) - Weather Spark*, weatherspark.com/y/16321/Average-Weather-in-Cullowhee-North-Carolina-United-States-Year-Round. Accessed 11 Mar. 2024.