Recycled Drill Generator

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Team #20

OVERVIEW

Unusable cordless power drills with dead batteries take up space but have useful hardware. This is important to reduce waste and generate quantifiable energy using available drill mechanisms.

Requirements

- Charge a 12V battery
- Battery management
- Thermal protection
- Characterize mechanical and electrical energy within system

Experimentation and Concepts

The method of energy generation is modeled after windmills and waterwheels, which have a general efficiency of around 20-40% due to drag and air resistance.

Charge Rate

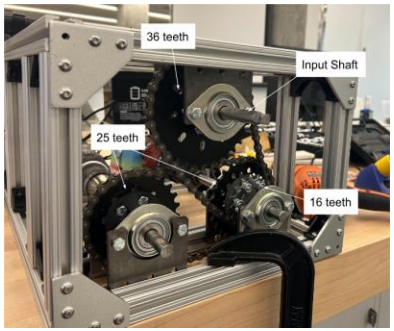
Given a constant input rotation of 300 RPM it will take approximately 3.9 hours to charge the battery from 10% to 100%
7 aH /1.8 A= 3.89 hours

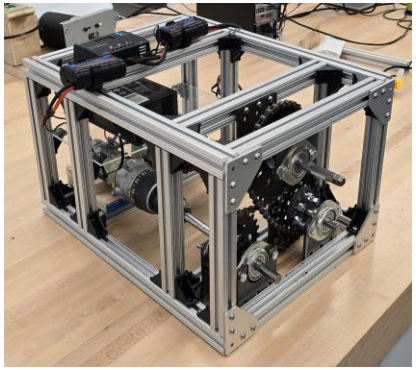
Final Design

Gear 1: 32 teeth Gear 2: 16 teeth
Gear 3 & 4: 25 teeth

32 -> 16 = 25 -> 25 Gear 1 to Gear 2
Gear 2 is on same shaft as Gear 3
Gear 2 to Gear 3

Input: 204rpm * (32T/16T) = 408 rpm
Both drills supplied with 408 rpm



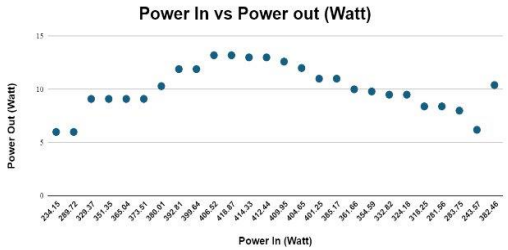


Final Design Description

80/20 aluminum, 3D printed hubs and housings, recycled cordless drills, DC incline meters, and a solar charge controller were used to create a compact but efficient design that would allow us to charge a 12V 7.2 A sealed lead acid battery.

Testing

Amps In	Voltage In	Power In (Watt)	Amps Out	Voltage Out	Power Out (Watt)
10.082	119.79	234.15	0.77	0.77	6
9.938	119.33	289.72	0.77	7.86	6
9.915	119.24	329.37	0.77	9.41	9.1
9.887	119.22	351.35	0.97	9.41	9.1
9.875	119.03	365.04	0.97	9.41	9.1
9.854	119.08	373.51	1.04	9.96	9.1
9.829	119.07	380.01	1.04	9.96	10.3
9.765	118.93	392.81	1.11	10.73	11.9
9.707	118.98	399.64	1.11	10.73	11.9
9.671	119.94	406.52	1.17	11.3	13.2
9.697	119.91	418.87	1.17	11.31	13.2
9.672	118.9	414.33	1.16	11.22	13
9.666	118.88	412.44	1.16	11.22	13
9.671	118.92	409.95	1.15	11	12.6



Budget

Part	Quantity	Keyword	Price per Part	Total Price
32 Tooth Sprocket	1	N/A	$13.99	$13.99
16 Tooth Sprocket	1	N/A	$12.99	$12.99
25 Tooth Sprocket	2	N/A	$12.99	$25.98
1/2" Shaft Flange Bearing	6	N/A	$11.33	$67.98
Solar Charge Controller	1	N/A	$16.99	$16.99
150A Watt Meter	2	N/A	$16.49	$32.98
16 Gauge Wire	1	N/A	$19.89	$19.89
12V 7.2A Lead Acid Battery	1	N/A	$19.99	$19.99
1kg PLA Filament	1	N/A	$20.00	$20.00
Part	**Quantity**	**Keyword**	**Notes**	
Sprocket Hub	2	Printed	Designed in Inventor	
Dual Mount Sprocket Hub	1	Printed	Designed in Inventor	
8" 80/20 T-slot Aluminum	10	Manufactured		
12" 80/20 T-slot Aluminum	9	Manufactured		
18" 80/20 T-slot Aluminum	4	Manufactured		
Plexiglass Sheet (2 of each size)	6	Manufactured	10"x14", 10"x20", 14"x20"	
18V DC Drill	2	Recycled		
Chain Drive Segments	2	Recycled	Recycled from a bike	
Overall Price				
$230.79				