Wind Turbine and Support Tower Performance Data

Section: ___, Team # 2a, Date: 7/25/22, Data collected by (Name): Caden

1.0 *Stiffness (deflection) Measurements*

a. **Tower Height: _____in.**

b. **Tower Net Weight: _____ g. (Total Assembly – Top/Bottom boards)**

c. **Stiffness Measurements:**

Data Points	LOAD (Kg)	LOAD (N)	DISPLACEMENT (mm)	Observations
1	0	0	0	
2	0.1	0.981	0.12	
3	0.2	1.962	0.24	
4	0.3	2.943	0.35	
5	0.4	3.924	0.46	
6	0.5	4.905	0.57	
7	0.6	5.886	0.69	
8	0.7	6.867	0.81	
9	0.8	7.848	0.96	
10	0.9	8.829	1.12	
11	1.0	9.81	1.19	
12	1.1	10.791	1.43	

Table 1.0 – Tower stiffness data

Comments

2.0 ***Power Measurements***

a. **Blade to Fan Distance: (at ~25 mph wind speed)**: _____ (mm)

b. **Wind Speed:** 25.6 mph (In front of the motor and prior to blade installation)

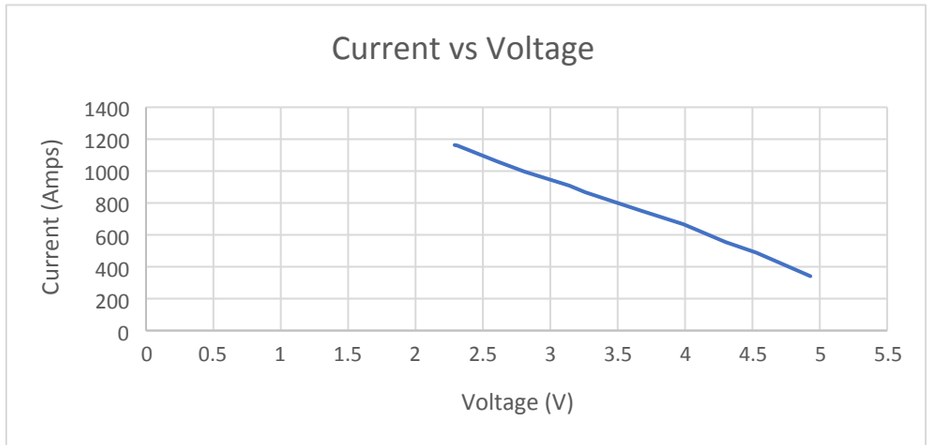
c. **Power Measurements:**
(Note: Wait ~5 sec. between readings for reading stability)

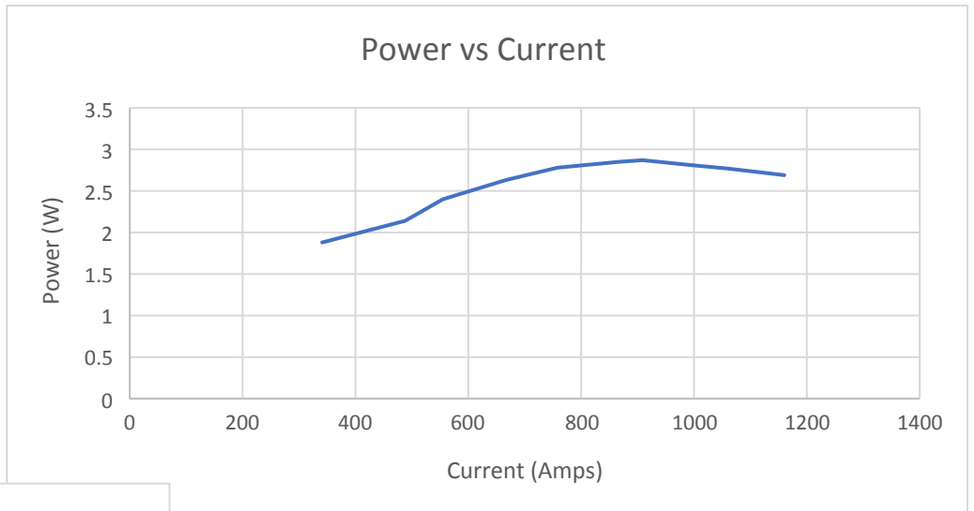
Data Points	Voltage Volts (V)	Current I (Amps)	Power P (Watts)	Blade Speed (RPM)	Notes
0	4.93	341	1.88		
1	4.53	488	2.14		
2	4.3	555	2.4		
3	3.99	666	2.63		
4	3.65	758	2.78		
5	3.26	867	2.85		
6	3.14	909	2.87		
7	3.15	910	2.88		
8	2.81	996	2.81		
9	2.61	1059	2.77		
10	2.31	1160	2.69		
11	2.29	1163	2.67		
12					

Table 2.0 – Power measurement data

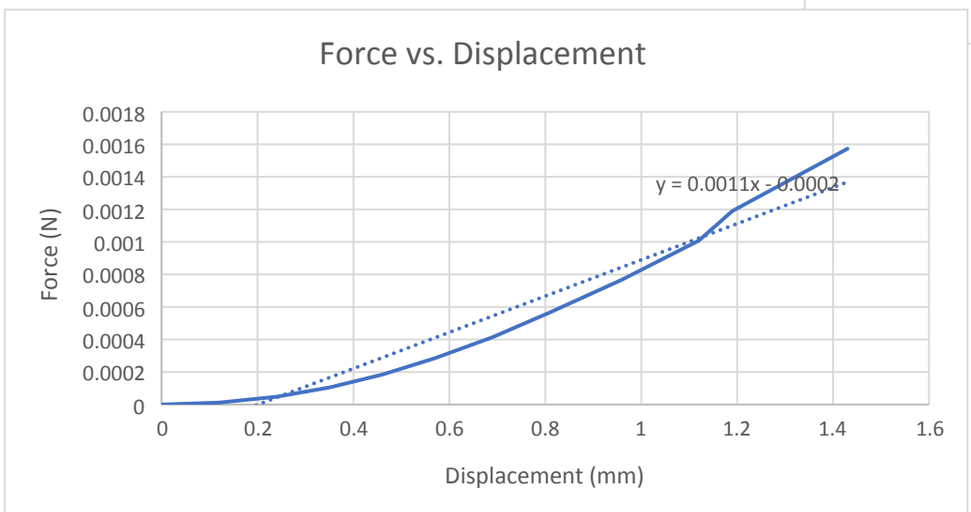
Comments

Voltage V	Current I	Power W
4.93	341	1.88
4.53	488	2.14
4.3	555	2.4
3.99	666	2.63
3.65	758	2.78
3.26	867	2.85
3.14	909	2.87
3.15	910	2.88
2.81	996	2.81
2.61	1059	2.77
2.31	1160	2.69
2.29	1163	2.67





Load Kg	Load N	Displaceme	Force (N)
0	0	0	0
0.1	0.981	0.12	0.000012
0.2	1.962	0.24	0.000048
0.3	2.943	0.35	0.000105
0.4	3.924	0.46	0.000184
0.5	4.905	0.57	0.000285
0.6	5.886	0.69	0.000414
0.7	6.867	0.81	0.000567
0.8	7.848	0.96	0.000768
0.9	8.829	1.12	0.001008
1	9.81	1.19	0.00119
1.1	10.791	1.43	0.001573



Stiffness calculated by linear best fit = 0.0011N/mm

Efficiency = Power In / Power Out x 100				
Power Out = 2.88W (Max Power)				
Power In = 1/2 * P * A * V * 3				
(Density of Air)P = 1.203 kg/m^3				
A = Pi R^2 = Pi x 0.0762^2 = 0.0182m^2				
R = 3in * 1m / 39.37in = 0.0762m				
V - 25.6mi / 1 h * 1609.34m / 1mi * 1h / 3600s = 11.4 m/s				
Power In = 1/2 * 1.203 * 0.0182 * 11.4^3 = 16.219				
Efficiency = 16.219 /2.88 x 100 = 0.056%				