-Open- Ended Wind Energy -13-

By :

Michele Tsosie - Blades design / secretarial support

Abdulrahman Alossaimi - Project Manager/Client contact - Control Theory

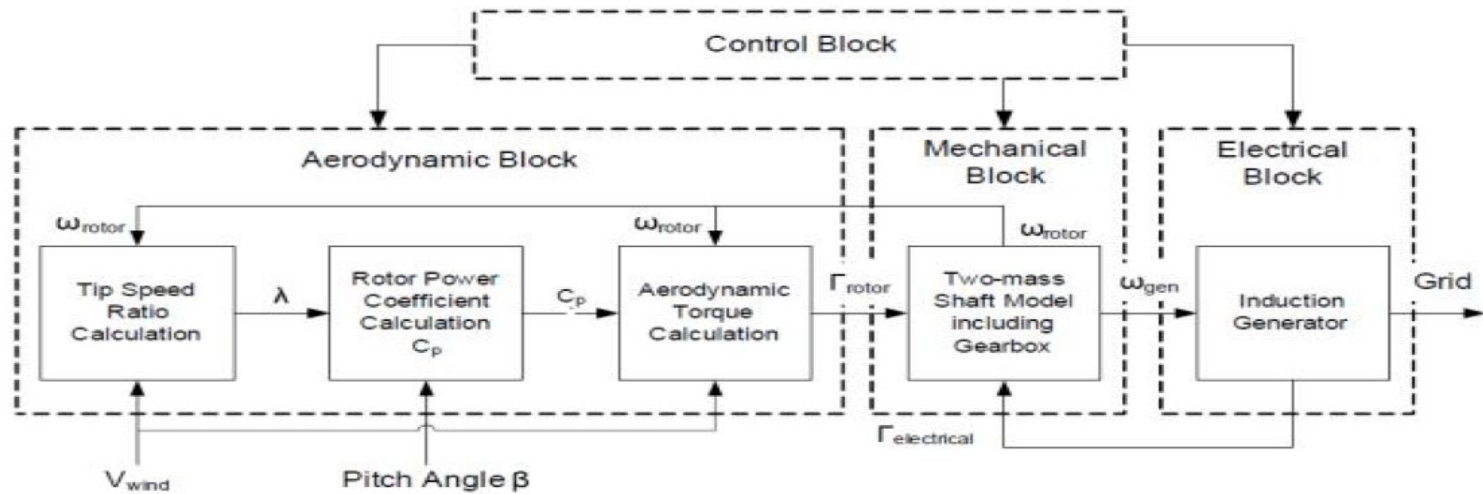Ahmad Saeed - Position: Technical analysis and CAD - Main frame

Fahad Almutairi - Budget Liaison, website developer - Electronic

Besongnsi Ntoung - Project Manager / Position: Technical Analyst and Researcher

Project Description

- Operating Principle
- Efficiency
- Design and Construction

Ahmad
2

Functional Decomposition

Ahmad
3

Black Box Model

| Wind →		→ Electricity
Kinetic energy →	**Convert wind to mechanical**	→ Mechanical energy
Wind velocity ⇢		⇢ Blade turns/Noise

Ahmad
4

Project Client

- The project client is professor: Willy
- Project Expectations.

—

Ahmad

5

Designs Considered

- Blade Element Momentum Theory (2)
- Tip Speed Ratio (3)
  TSR = Blade tip speed / Wind Speed
- Aerodynamic Lift
  Lift produced by air flowing over airfoil
- Airfoil shape

Lift/Drag Forces Experienced by Turbine Blades
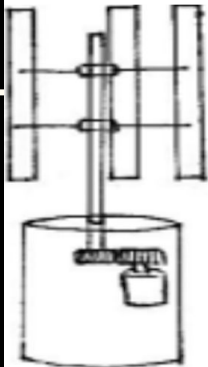
Michele
6
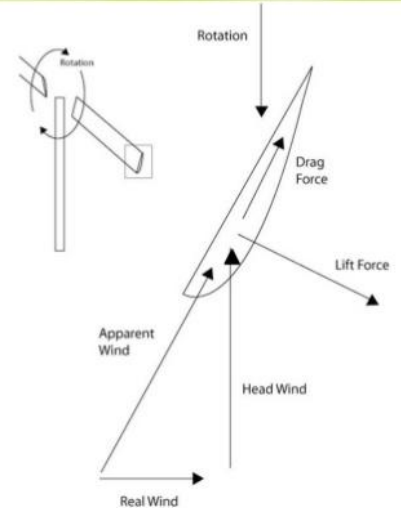
Designs Considered
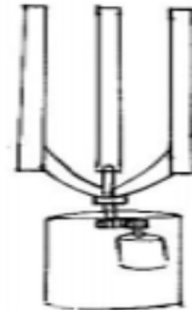

Design A
University of Wisconsin
2017

Design B
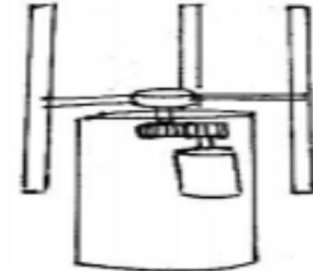Northern Arizona University
2016

Design C
Northern Arizona University
2016

Design D
Universidad del Turabo
2016

Design E & F
Universidad del Turabo
2016

Designs Considered

- Design B - no yaw
- Design C - yaw applied
- Breaking system

B

C

Pugh Chart

TOTAL	Efficiency	Manufactur ability	Reliability	Cost	Blade Design	Yaw	Working	Complexity	Design Concepts
-3	S	-	+	-	-	S	S	-	Design F
-5	S	-	-	-	-	S	S	-	Design E
-4	S	-	S	-	-	S	S	-	Design D
+1	+	S	+	-	S	+	S	-	Design C
0	S	S	S	S	S	S	S	S	Design B (Datum)
-6	-	+	-	-	-	-	-	-	Design A

Pugh Chart

B

9

Decision Matrix

Criterion Weight		Design A		Design B		Design C		Design D		Design E		Design F	
		Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted score
Complexity	0.10	100	10.0	90	9.00	80	8.00	40	4.00	60	6.00	50	5.00
Working	0.10	0	0.00	80	8.00	90	9.00	70	7.00	70	7.00	70	7.00
Yaw	0.15	0	0.00	0	0.00	100	15.0	0	0.00	0	0.00	0	0.00
Blade Design	0.10	50	5.00	100	10.0	100	10.0	40	4.00	70	7.00	40	4.00
Cost	0.15	100	15.0	90	13.5	80	12.0	50	7.50	70	10.5	70	10.5
Reliability	0.15	0	0.00	50	7.50	100	15.0	60	9.00	70	10.5	60	9.00
Manufacturability	0.10	60	6.00	80	8.00	70	7.00	60	6.00	80	8.00	70	7.00
Efficiency	0.15	0	0.00	60	9.00	95	14.25	60	9.00	70	10.5	60	9.00
Totals	1.00		36.0		65.0		90.25		46.5		59.5		51.5
Relative Rank			6		2		1		5		3		4

Decision Matrix

B
10

Budget

- Our Budget for this project is $500.00
- Funding Source: Green Funded
- Estimated Cost:

Manufacturing ($100)

-3D Printing

Materials ($350)

1- Towers

2- Gears

3- Shaft

4-bearing

Prototyping ($50)

Gantt Chart

ACTIVITY	Begin Date	End Date	Assigned To
Project sign up	1/16/2018	1/18/2018	Team
Team Charter	1/18/2018	1/25/2018	Team
project description	1/25/2018	2/5/2018	Ahmad
Background & Benchmarking	1/26/18	2/5/18	Michele
Design and Customer	1/25/2018	2/5/2018	B
Budget	1/25/2018	2/5/2018	Fahad
Gantt Chart	1/25/2018	2/5/2018	Abdulrahman
Presentation 1	1/25/2018	2/5/2018	Team
Peer Evaluation 1	2/8/2018	2/8/2018	Team
Website	2/8/2018	2/25/2018	Fahad
Conceptual Report	2/18/2018	3/1/2018	Team
Analytical Assignment Dission Memo	3/13/2018	3/15/2018	Team
Website 2	3/15/2018	3/29/2018	Fahad
Analytical Reports	3/15/2018	4/5/2018	Team
Peer Evaluation 2	4/5/2018	4/10/2018	Team
Final Reports	4/3/2018	4/26/2018	Team
Website 3, BOM, CAD	4/3/2018	5/1/2018	Team
Peer Evaluation 3	5/1/2018	5/3/2018	Team

References

1- https://energy.gov/eere/collegiatewindcompetition/past-collegiate-wind-competitions

2. https://www.mathworks.com/matlabcentral/fileexchange

3.https://www.windynation.com/jzv/inf/tip-speed-ratio-how-calculate-and-apply-tsr-blade-

4. https://www.bing.com/images/search

5.

Thank you
Any Questions?