MILESTONE 0 (TEAM): COVER PAGE

Team ID: Thurs-48

Please list full names and MacID's of all present Team Members

Full Name:	MacID:
Huzaifa Syed	syedh42
Shafer Honigman Deltoff	honigmas
Shadi El-Fares	elfaress
Elijah James	jamese13
Maheer Huq	huqm6

Insert your Team Portrait in the dialog box below



MILESTONE 0 – TEAM CHARTER

Team ID: Thurs-48

Project Leads:

Identify team member details (Name and MacID) in the space below.

Role:	Team Member Name:	MacID
Manager	Shadi El-Fares	elfaress
Administrator	Maheer Huq	huqm6
Coordinator	Shafer Honigman Deltoff	honigmas
Subject Matter	Elijah James	jamese13
Experts	Huzaifa Syed	syedh42

MILESTONE 0 – PRELIMINARY GANTT CHART (TEAM MANAGER ONLY)

Team ID:



Only the **Project Manager** is completing this section!

Full Name of Team Manager:	MacID:
Shadi El-Fares	elfaress

Preliminary Gantt chart

ART PLAN DURATION 4 4 4 2	ACTUAL START 0 0 0 0	ACTUAL DURATION 0 0 0	PERCENT COMPLETE 0% 0%	Day:	s 2	3	4	5	6	7	8 9	9 1	0 11	12	13	14	15 1	.6 17	7 18	3 19	9 20	21	22	23	24 2	5 20	27	28	29	3
4 4 2	0 0 0	0 0 0	0% 0% 0%																											
4	0	0	0% 0%																											
4	0	0	0%																											
2																														
2	0	0	0%																											
2	0	0	0%																											
4	0	0	0%																											
4	0	0	0%																											
	2 4 4	2 0 4 0 4 0	2 0 0 4 0 0 4 0 0	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2 0 0 0% 0% 4 0 0 4 0 0 0% 0%	2 0 0 0% 0% 4 0 0 4 0 0 0% 0%	2 0 0 0% 0% 4 0 0 4 0 0 0%	2 0 0 0% 0% 4 0 0 0% 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 0 0 0% 0% 4 0 0 0% 4 0 0 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	2 0 0 00% 0% 4 0 0 4 0 0 0% 0%	2 0 0 0% 0% 4 0 0 4 0 0 0%	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2 0 0 0% 0% 4 0 0 0% 4 0 0 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$									

MILESTONE 1 (TEAM) – COVER PAGE

Team Number: Thurs-48

Please list full names and MacID's of all present Team Members

Full Name:	MacID:
Huzaifa Syed	syedh42
Shadi El-Fares	elfaress
Shafer Honigman Deltoff	honigmas
Elijah James	jamese13
Maheer Huq	huqm6

Any student that is not present for Design Studio will not be given credit for completion of the worksheet and may be subject to a 10% deduction to their P-1 grade.

MILESTONE 1 (STAGE 1) – INITIAL PROBLEM STATEMENT Team ID: Thurs-48

Stage 1: Initial Problem Statement:

What is your first draft of the problem statement? Keep it brief and to the point. One or two sentences should be enough. For this initial problem statement, you should be focusing on the main function(s) of the wind turbine.

Design a wind turbine for generating renewable energy from wind power to replace non-renewable energy sources.

MILESTONE 1 (STAGE 3) – REFINED OBJECTIVE TREES Team ID: Thurs-48

For each engineering scenario, you will be submitting a modified/revised objective tree agreed upon by the group. Each branch of objective trees should have a minimum of 3 layers. This can be hand-drawn or done on a computer.

Engineering Scenario #1

The title of the scenario

Renewable Energy for a Large Population

Team objective tree diagram for scenario #1

Please insert a copy of the refined and finalized team objective tree for scenario #1.



	Team ID:	Thurs-48
Engineering Scenario #2		
The title of the scenario		
EWB Humanitarian Aid Mission		

Team objective tree diagram for scenario #2

Please insert a copy of the refined and finalized team objective tree for scenario #2.



	Team ID:	Thurs-48
Engineering Scenario #3		
The title of the scenario		
The Roof Generator		

Team objective tree diagram for scenario #3

Please insert a copy of the refined and finalized team objective tree for scenario #3.

ENGINEER 1P13 – Project 1: Renewable technology challenge



ENGINEER 1P13 – Project 1: Renewable technology challenge

	Team ID:	Thurs-48
Engineering Scenario #4		
The title of the scenario		
A Pioneer in Clean Energy		

Team objective tree diagram for scenario #4

Please insert a copy of the refined and finalized team objective tree for scenario #4.



MILESTONE 2 (TEAM) – COVER PAGE

Team Number: Thurs-48

Please list full names and MacID's of all present Team Members

Full Name:	MacID:
Huzaifa Syed	syedh42
Shafer Honigman Deltoff	honigmas
Shadi El-Fares	elfaress
Elijah James	jamese13
Maheer Huq	huqm6

Any student that is not present for Design Studio will not be given credit for completion of the worksheet and may be subject to a 10% deduction to their P-1 grade.

MILESTONE 2 (STAGE 1) – DESIGN REQUIREMENTS FOR A TURBINE BLADE

Team ID:

Thurs-48

Objective Tree of turbine blade for assigned engineering Scenario

→ Please insert a copy of your team objective tree for the design of a turbine blade based on your assigned engineering scenario.



Turbine Blade Problem Statement:

→ Write a complete problem statement for the design of a turbine *blade* based on your assigned engineering scenario.

Design a clean wind turbine blade optimized to generate large amounts of sustainable energy for multiple Swedish cities.

MILESTONE 2 (STAGE 2) – SELECTION OF TOP OBJECTIVES FOR A TURBINE BLADE

Team ID:

Thurs-48

List the top three objectives of a turbine blade for your assigned engineering scenario

1: High Energy Generation

2: Low Cost

3: Length of the Blade

Include a rationale for selecting each of these objectives

 \rightarrow Write *maximum* 100 words for each objective

Objective 1: High Energy Generation

Rationale:

Supplying energy to multiple cities would require the energy generation output of the wind turbines to be large. This is why the energy generation is one of the main focuses for the Swedish wind farm.

Objective 2: Low Cost

Rationale:

Clean energy not only seeks for clean manufacturing, but additionally a process with an overall low cost. To generate sustainable power for multiple cities calls for long-term maintenance and usage of the wind turbines. This mean low cost is a must for the manufacturing process to ensure these processes can continue for as long as possible, for as cheap as possible.

Objective 3: Optimal Length of the Blade

Rationale:

The length of a wind turbine blade determines many important factors, such as generation capacity, transportability, and environmental effects like noise pollution. With a blade size too short,

there may be issues with capturing enough wind to convert to an effective amount of energy. Whereas a blade too long may be too loud and difficult to transport. Thus, an optimal length is an important objective.

MILESTONE 2 (STAGE 3) – METRICS

Team ID:

Thurs-48

For your selected top three objectives fill out the table below with associated metrics (including units) for each objective.

Objective 1:	High energy generation
Unit/Metric:	$\frac{Kwh}{Day}$

Objective 2:	Low Cost
Unit/Metric:	\$

Objective 3:	Optimal length of the Blade
Unit/Metric:	Meters

MILESTONE 2 (STAGE 4) – REGULATIONS

Team ID:

Thurs-48

Insert your group discussion below

- Height of Turbine not too tall or too short
- Regional plans are approved my regional council (maakinnan liitto)
- Electricity standards regulations for how the turbines connect to the electrical grid.
- Noise regulations turbines should follow local laws regarding noise disturbances.
- Construction permit needed for any turbine taller than 50m
 - Local municipality must be notified.
- Building permit
- Environmental impact assessment
 - o Environmental permit
- Aviation obstacle permit
 - Exemption possible
- Permit for infringements of protected areas under the environmental code
- Considered to be a large wind farm if:
 - Two or more wind turbines stand together and at least one of the turbines is more than 150 metres high.
 - Seven or more wind turbines stand together and at least one wind turbine is higher than 120 metres.
- Large wind farm general permitting process:
 - Consultation process
 - o EIA preparation
 - \circ Application
- Process usually takes 2 years
 - Another 6-12 month extension is possible

MILESTONE 3A (TEAM) – COVER PAGE

Team Number: Thurs-48

Please list full names and MacID's of all present Team Members

Full Name:	MacID:
Huzaifa Syed	syedh42
Shafer Honigman Deltoff	honigmas
Shadi El-Fares	elfaress
Elijah James	jamese13
Maheer Huq	huqm6

Any student that is *not* present for their scheduled Lab-B session will not be given credit for completion of the worksheet and may be subject to a 10% deduction to their P-1 grade.

MILESTONE 3A (STAGE 1) – MATERIAL SELECTION: PROBLEM DEFINITION

Team ID:

Thurs-48	3
----------	---

1. Copy-and-paste the title of your *assigned* scenario in the space below.

A Pioneer in Clean Energy

- 2. MPI selection
 - \rightarrow List one primary objective and one secondary objective in the table below
 - \rightarrow For each objective, list the MPI
 - \rightarrow Write a short justification for your selected objectives

	Objective	MPI-stiffness	MPI-strength	Justification for this objective
Primary	Minimizing Carbon Footprint	$MPI = \frac{E}{\rho C O_2}$	$MPI = \frac{\sigma_y}{\rho C O_2}$	Our goal in scenario 4 is to provide large amounts of energy to multiple cities in a sustainable manner. Minimizing carbon footprint would allow for turbines to be more sustainable throughout the manufacturing process.
Secondary	Minimizing Production Energy	$MPI = \frac{E}{\rho H_m}$	$MPI = \frac{\sigma_y}{\rho H_m}$	Minimizing production energy would allow for the creation of a more efficient turbine blade. This would also make it more sustainable overall, with less greenhouse gas emissions resulting from the process of manufacturing.

MILESTONE 3A (STAGE 3) – MATERIAL SELECTION: MATERIAL ALTERNATIVES AND FINAL SELECTION

Team ID:

Thurs-48

Document results of each team member's materials selection and ranking on the table below.

 All different types of steel (carbon steels, alloy steels, stainless steels) have very similar Young's moduli. For this stage in Project 1, please group all variations of steels into one family as "steel". Please put steel in your material ranking list only once and indicate in a bracket which steels made the top ranks.

Consolidation of Individual Material Rankings					
	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
MPI 1: (carbon MPI footprint) (stiffness) $MPI = \frac{E}{\rho C O_2}$	Wood, typically along grain	Bamboo	Steels (High Carbon, Medium carbon, Low carbon, Low alloy metal, Stainless)	Wood, typically across grain	Zinc Alloys
MPI 2: (carbon MPI footprint) (strength) $MPI = \frac{\sigma_y}{\rho C O_2}$	Wood, typical along grain	Bamboo	Cork	Steel (Low Alloy, High Carbon, Medium Carbon, Low Carbon, Stainless)	Paper and Cardboard
MPI 3: MPI ^(energy) (stiffness) MPI = $\frac{E}{\rho H_m}$	Steels (Medium carbon, high carbon, low carbon, low alloy, stainless)	Bamboo	Wood	Zinc Alloys	Copper Alloys

MPI 4:	Steel	Zinc	Copper	Nickel alloys	Bamboo
MPI ^(energy) (strength)	(low/high/mid carbon, low alloy,	alloys	alloys		
$MPI = \frac{\sigma_y}{\rho H_m}$	stainless)				

As a team, fill out the table below and narrow down the possible materials for your assigned scenario by choosing the 3 materials which showed up the most across all MPI rankings in the table above.

- For this stage in Project 1, if "**steel**" is one of your three material finalists, please specify which steel your team chose to continue with, based on which showed up the most in your team's consolidated table.
- Remember to save the datasheets of all 3 material finalists

Narrowing Material Candidate List to 3 Finalists			
Material Finalist 1:	High Carbon Steel		
Material Finalist 2:	Wood, typically along grain		
Material Finalist 3:	Bamboo		

Team ID:

Thurs-48

As a team, compare material alternatives and make a final selection based on either a simple decision matrix or a weighted decision matrix (up to your team to decide)

- → As a team, consider *at least* 3 additional criteria that are relevant to your assigned scenario and discuss your 3 materials finalists for each criterion
 - Feel free to pause at this stage and do some quick research on the materials finalists
 - You may refer to the material finalists' datasheets for any relevant information that will enable your discussion.
 - To help you come up with your additional criteria, below are some question prompts that you may consider. Please note that you are not limited to these suggestions, and they may or may not be relevant to your assigned scenario

Additional Criteria	Possible question prompt
Ease of access to material	Is the material easy to source in the country, are there tariffs due to international trade policy?
Chemical, weather and/or corrosion resistance	Will the material degrade over time (e.g. due to chemical resistance, corrosion resistance, fatigue resistance)?
Ease of maintenance	Consider maintenance if the part got damaged. Based on the material, is it easy to fix or will the entire part need replacement?

 \rightarrow Remember that:

- Your MPI ranking takes into consideration both material and mechanical properties relevant to the objectives of your assigned scenario.
- Your additional considerations should not include previously evaluated objectives e.g. If minimizing the carbon footprint was either your primary or secondary objective, then it should not be an additional criterion

- → Compare the material alternatives and make a final selection based on either a simple decision matrix or a weighted decision matrix (up to your team to decide)
 - Applies to a weighted decision matrix only: choose a range for the weighting (e.g., 1 to 5) for each criterion. The higher the number on the weighting, the more important that criterion is.
 - Choose a range for the score (e.g., 1 to 5) for each material on each criterion. Give each material a score based on how successfully it meets each criterion. The higher the score, the better the material is for that criterion.
 - Add additional rows as needed.
 - Add up the total score for each material alternative.

Fill one of the following templates only:

Simple Decision Matrix - Template				
	Material 1:	Material 2:	Material 3:	
Criterion 1				
Criterion 2				
Criterion 3				
TOTAL				

Weighting Range: 1-5 Score Range: 1-5

Weighted Decision Matrix - Template							
	Weighting	High Ca Steel:	arbon	Wood, ty grain:	pically along	Bamboo:	
		Score	Total	Score	Total	Score	Total
Greenhouse Emissions	3	2	6	1	3	5	15
Ease of Access to Materials	2	5	10	5	10	1	2
Durability of Materials	4	5	20	2	8	1	4

Energy Production	5	5	25	1	5	2	10
Weather Resistance	3	5	15	3	9	2	6
	TOTAL	22	56	12	35	11	37

 \rightarrow State your chosen material and justify your final selection

Justification

Chosen Material:

High Carbon Steel

Discuss and justify your final selection in the space below (based on the decision matrix results and any other relevant considerations).

High carbon steel was the logical selection for the specific scenario assigned. This was concluded through many factors, starting with the two main objectives in minimizing carbon footprint and minimizing production energy. When graphing the material charts and sorting by MPI (material property index), the highest materials included bamboo, wood and high carbon steel. This means that these materials were the best for the objectives specified. These three were then compared by looking at various additional criteria to determine the feasibility of each material in the assigned scenario. The weighted decision matrix made sure that energy production and durability of materials were the most important factors in the matrix.

The durability of both bamboo and wood were much lower than the durability of high carbon steel, especially when looking at large wind turbines that would have to generate enough electricity for multiple cities. To clarify, the energy production criterion specifically involves how much energy output is produced by the given material, separate from the objective of production energy. We ranked it as the heaviest criterion given that our scenario description emphasizes the importance of supplying energy to multiple cities. High carbon steel was given the highest rating in comparison to wood and bamboo as the material's durability makes it such that it can endure harsh conditions that come with high performance.

Aside from the two most important criterion in durability and energy production, we have also included greenhouse emissions, ease of access of materials, and weather resistance. Regarding greenhouse emissions, we gave it a medium weighting as it is related to our scenario in that we want to prioritize sustainability, but it also is not the central focus. High carbon steel's carbon footprint was not ideal [1]. Wood also fell short of what is most preferrable [2]. Unlike these two, bamboo suited strongly in minimizing carbon footprint as much as possible [3]. Ease of access of materials was given a low weighting due to its relative importance in comparison to our other criterion. It is important, but not up to par with other criteria. Since bamboo is not native to Europe, it's ease of access is the lowest amongst the three. Conversely, steel and wood are abundant in Sweden given its development and natural greenery. Our final criterion is weather resistance, where the strength of steel has significant advantages over the other two, providing another great reason as to why we chose it. It can be noted that high carbon steel will be prone to rust, but the addition of a protective coating makes it much more weather resistant than wood and bamboo overall.

To conclude, while wood and bamboo have their respective advantages in sustainability and minimized greenhouse emissions, the facets of high carbon steel are overwhelming in comparison. Thus, due to its prominence in durability, ease of access, energy production, and weather resistance, our group agreed that high carbon steel was our best option.

References

- [1] "What is the carbon footprint of steel?," Sustainable Ships. <u>https://www.sustainable-ships.org/stories/2022/carbon-footprint-steel#:~:text=Global%20steel%20emissions&text=Steel%20production%20is%20a%20significant</u>
- [2] "RELEASE: New Paper in Nature: Greenhouse Gas Emissions from Global Wood Harvests are Vastly Undercounted," www.wri.org, Jul. 2023, Accessed: Oct. 17, 2023. [Online]. Available: <u>https://www.wri.org/news/release-new-paper-nature-greenhouse-gas-emissions-global-wood-harvests-are-vastly-undercounted#:~:text=Washington%2C%20D.C.%20(July%205%2C</u>
- [3] J. Marsh, "Bamboo can help us fight both climate change and poverty," *Sustainability Times*, Jan. 27, 2023. <u>https://www.sustainability-times.com/in-depth/bamboo-can-help-us-fight-both-climate-change-and-poverty/#:~:text=For%20example%2C%20studies%20have%20shown</u>

Summary of Chosen Material's Properties

Material Name	Average value
Young's modulus <i>E</i> (GPa):	210
Yield strength σ_y (MPa):	678.5
Tensile strength σ_{UTS} (MPa):	1055.5
Density ρ (kg/m ³):	7800
Embodiment energy H_m (MJ/kg)	16.25
Specific carbon footprint CO_2 (kg/kg)	1.125

SCENARIO SPECIFIC TURBINE BLADE DESIGN (TEAM) -**COVER PAGE**

Team Number: Thurs-48

Please list full names and MacID's of all present Team Members

Full Name:	MacID:
Huzaifa Syed	syedh42
Shafer Honigman Deltoff	honigmas
Shadi El-Fares	elfaress
Elijah James	jamese13
Maheer Huq	huqm6

MULTIVIEW TURBINE BLADE SKETCH AND JUSTIFICATION Team ID: Thurs-48

1. Sketch of Turbine Blade

Insert a multiview sketch of your team's scenario specific turbine design. Multiview sketch must include front, top, and right-side view.



2. Justification of Turbine Blade

Include an explanation on how your turbine blade design meets your assigned scenario. Be sure to discuss the creative elements behind your design and provide justification for them.

When creating clean wind turbines to supply energy to multiple cities in Sweden, there are many key factors to consider. To meet the needs of the community, the blade includes an optimized blade length, pitch angle, and unique extruding curved edges. Altogether, these blade components provide the ideal vessel for immense wind power generation in a clean manner.

To determine the length of the turbine blade optimized for this scenario, it is important to think about the technicalities of the assigned location. This blade is being designed for multiple cities in Sweden, meaning large farms with high power outputs are required while also following Swedish turbine regulations. In Sweden, wind farms are said to be qualified as large wind farms depending on the height of the turbine. To qualify as a large wind farm, seven or more turbines would have to stand together with at least one of them having a height of 120 m or more [1]. Since energy needs to be supplied to multiple cities, this height of 120 m can be a standard benchmark for the turbines. The height of the wind turbine can be used to determine the blade length. The blade length is optimal when it is equal to half of the height of the turbine [2]. Since the height of the turbine is a standard of 120 m, the blade length is optimal at half of this, which would be 60 m.

The pitch angle of the blade is another vital component to its movement and power generation. This angle between the wind's direction and the blade is sometimes referred to as the "angle of attack," as it enables the blade to generate power from wind incoming at many angles while also using the wind to create a lift force to keep the blade moving [3]. Although substantial amounts of lift are obtained by having a larger pitch angle, after reaching a point of about 20°, this lift begins to decrease [4]. Therefore, the angle of attack used for the blade was concluded to be optimal at 20°, maximizing the lift force while also allowing for wind to hit the blade at various angles.

The curved extruding edges of the turbine blade are a unique design component that provide many of the same benefits as the pitch angle. As the curves extrude out, they can improve the lift force of the blades, which is especially helpful to keep the turbine moving in low wind conditions [4]. This in turn generates more power, helping reach the goal of generating enough energy for multiple cities. In addition, drag is often caused by tip vortices, which are "spirals of air that trail off the tips" of blades [5]. The curved edges negate the formations of tip vortices, allowing for smoother movement with less drag, as there are no tip vortices to steal energy from the motion of the turbine [5].

During the final stages of the design process, it was concluded that an estimated energy output specific to the blade designed would better depict the effectiveness of the turbines in Sweden. Although some components could not be factored in, this rough estimate uses the length of blade, average wind speeds/air density in Sweden, sweep area of the blade, etc. to predict the energy output in kWh [6]. A 3-blade turbine with design-specific metrics is predicted to be outputting 5,153,225 kWh every year before losses [7]. Overall, this unique turbine blade

design supports sustainability and can efficiently generate enough power to supply multiple cities, when produced in large farms.

References

- [1] "Onshore wind power development in Sweden and Finland | Practical Law." https://content.next.westlaw.com/5-521-8954?_lrTS=20210417045720263&transitionType=Default&contextData=(sc.Default)&firstPage=true
- [2] G. Duval, "How big are the blades of a wind turbine?," *Today's Homeowner*, Aug. 2023, [Online]. Available: https://todayshomeowner.com/eco-friendly/guides/wind-turbine-blades-size/#:~:text=Blade%20Size,the%20height%20of%20the%20tower
- [3] "Wind turbine blade design, flat, bent or curved," *Alternative Energy Tutorials*. https://www.alternative-energy-tutorials.com/wind-energy/wind-turbine-blade-design.html
- [4] A. R. Sudhamshu, M. C. Pandey, N. Sunil, N. S. Satish, V. Mugundhan, and R. K. Velamati, "Numerical study of effect of pitch angle on performance characteristics of a HAWT," *Engineering Science and Technology, an International Journal*, vol. 19, no. 1, pp. 632–641, Mar. 2016, doi: 10.1016/j.jestch.2015.09.010.
- [5] "Welcome to How Things Fly." https://howthingsfly.si.edu/aerodynamics/vortex-drag
- [6] "Statistics." https://www.energimyndigheten.se/en/facts-and-figures/statistics/
- T. S. Energy, "Windy physics: how is power of a wind turbine calculated?," *Thunder Said Energy*, Dec. 2022, [Online]. Available: https://thundersaidenergy.com/downloads/wind-power-impacts-of-larger-turbines/#:~:text=The%20best%20overall%20formula%20for,Location%20matters%2 0most

MILESTONE 4 (TEAM) – COVER PAGE

Team Number: Thurs-48

Please list full names and MacID's of all present Team Members

Full Name:	MacID:
Huzaifa Syed	syedh42
Shafer Honigman Deltoff	honigmas
Shadi El-Fares	elfaress
Elijah James	jamese13
Maheer Huq	huqm6

Any student that is not present for Design Studio will not be given credit for completion of the worksheet and may be subject to a 10% deduction to their P-1 grade.

Team ID:

Thurs-48

MILESTONE 4 (STAGE 2) – REFINE THICKNESS REQUIREMENT

1. Refine Thickness Requirement to Satisfy Deflection Constraint	
Refined turbine blade thickness t (mm):	26mm
Insert screen captures of the refined deflection simulation and provide evidence that the deflection satisfies the design constraint. Must show scale that is present on the left side of the screen.	
Type: Displacement Unit: mm 2023-10-19, 4:17:38 PM 9.387 Max 7.509 5.632 3.755 1.877 0 Min	
Shell : Shell1 Shell More Remove Faces Automatic Face Chain Solids Thickness Zomm OK Cancel >>	

MILESTONE 4 (STAGE 3) – PEER INTERVIEW

Team ID:

Thurs-48

- \rightarrow Meet another team with a different scenario
 - Discuss differences in your design process
 - Compare:
 - Primary/secondary objectives
 - Chosen materials, thickness, etc.
 - Discuss the relevance of your scenario-specific turbine blade design to your assigned scenario and any design challenges you have encountered.
- 1. Peer Interview Notes

Discuss what you have learned from another group.

While talking to the other group, we learned about scenario 3, which involved the making of a Calgary residential use turbine that was designed to be compact enough to not collide with anything while also saving money for homeowners who want to reduce their electricity bills. Their primary/secondary objectives were minimizing volume and cost. Reflecting on these choices, we believe that they made the right choices of objectives. Minimizing volume would mean smaller dimensions, in turn allowing the turbine to not collide with anything. Minimizing cost was also smart for their scenario, as this was a choice that allowed homeowners to save on their bills as wanted.

The material they chose was low alloy steel. Upon looking at the summary of this material's properties, it looked to be an appropriate material choice. This material was seen to be strong enough due to its Yonge's modulus being higher than 100, which shows that it's stiffness is appropriate for being on top of a roof throughout many types of weather in Calgary. Also, they said their refined thickness ended up being 30 mm.

Reflecting on the difference between our scenario and theirs, we had to look at the blade on a much bigger scale since the turbines we looked to create would be generating electricity for multiple cities, whereas theirs would be for a single residence. Their objectives were also seen to be very different from ours, as they looked to minimize dimensions and cost while we looked to create clean energy on a large scale, minimizing carbon footprint and production energy. We both ended up choosing steel, as it's the strongest when factoring in price, durability, ease of access and more.

In terms of our turbine blade design for scenario 4, we faced design challenges when figuring out how to incorporate the extruding turbine edge. This was a design we thought about a lot, and our main goal was to mix practicality with creativity. As the design evolved and we decided to create it on inventor to easily obtain a Multiview, we found it very difficult to accomplish and extruding edge. We also didn't figure out how to add the pitch angle in the way explained in our justification, so that became more of a theoretical piece that we would look to have.

While talking to the other team, we learned a lot about other methods of keeping a good structure going in the group. The other group we talked to mentioned how divide and conquer was the main method they used in getting their assignments done. They also mentioned some shared calendar system that they found convenient for getting their individual pieces of team assignments done in a timely manner, making it easier for the administrator. They would also assign deadlines for their individual pieces to

make the time they will be done an assignment concrete. In terms of our specific blade, they gave us feedback involving how feasible the blade would be if implemented on as large of a scale as mentioned in scenario 4. They felt as though some parts of the body would need work to make it usable, but also mentioned that they liked our creative outlook on the blade.

Note: Please be mindful that you are expected to write a short reflection on what you have learned from the other team in your final deliverable. Do not forget to discuss your scenario specific design as well.