Project: Redesign of a Consumer Good to Reduce Energy Usage

Choose a specific consumer good. The objective is to suggest a re-design of the product that will reduce energy usage (or improve the environment in other ways). Note, that you may save energy usage in the manufacture of good or in the use of the good. The good must be inexpensive enough for your team to buy a copy and take it apart. It must have moving parts, enough parts to make it interesting, not so many parts to make it too difficult. You will be responsible for purchasing one or more of the goods in order to analyze it.

In carrying out the project you should assume that you are working for a large national or international corporation and that you are carrying out this investigation at the request of its chief executive officer (CEO). The CEO wants to make this product more “green”. It may be more “green” by using less energy itself, by requiring less energy or materials in its manufacture, or by being less toxic.

The project has four main parts: Technology, Redesigned product, Energy & Environment, and Economics.

Technology: describe how the original product works. Include assembly drawings using Pro-E of the original product. Be sure to include both the individual parts and the entire product.

Redesigned product: describe your redesign including assembly drawings.

Energy & environment: Discuss the energy efficiency of the product, and how your redesign saves energy or is more “green.”

Economics: Discuss the costs of your product before and after redesign. Include a levelized cost if appropriate.
Example Proposal for 113

Wind Spire: Initial Written Proposal

For our project, we are planning to evaluate the new wind turbine, known as the Wind Spire. The Wind Spire is a thin cylindrical turbine measuring 30 feet high and about four feet wide. It is compact and more affordable than traditional wind turbines and can power an entire household. Wind Spire has the potential to be the next step in wind power technology. We plan to compare this new technology to traditional wind turbines and to the societal norm (i.e. coal power plant).

Our group plans to split up each of the four main parts of this project: technology, energy, environment, and economics. As of right now we plan to have J work on technology, assessing how the Wind Spire operates and how it is different from the technology of traditional wind turbines. A plans to analyze the energy in and energy out of the Wind Spire, discussing energy efficiency or efficiency losses of the Wind Spire compared to that of traditional wind turbines and coal power plants. D is working on the environment part of the project, analyzing the environmental effects of the Wind Spire compared to traditional turbines and coal. B will work on the economics portion of the project, comparing the costs of the technologies and analyzing the factors that determine costs. We also plan to work on an AutoCAD rendering of the Wind Spire to aide with the technology part of the project.

Our group’s timeline is going to be based on the initial timeline of the project outlined by the class structure and including our own milestones to break up the project deadlines. We plan to meet at about the half-way point between each deadline and again the day before the project is due for last minute polishing of the assignment. Therefore, we plan to meet on October 27th and November 3rd before the oral report with slides is due. We plan to have research on each of our individual segments of the project and come with any questions or comments ready on the 27th and begin working on our slides. Then on the 3rd we will pull together all our completed research and do any last minute touch-ups to complete the oral presentation. We have a similar attempt planned out for all the other deadlines for this project. For example, we plan to meet on the 10th and 17th of November before the written draft is due. Also, we are meeting on November 27th and December 1st before the final presentation and final written project is due. If necessary we can meet at other times if it is deemed necessary.

Overall, we are all extremely excited to begin working on this project and everyone has a very positive attitude toward the successful completion of this project! We are excited that we are becoming involved with a technology that is so new and cutting-edge, and that has the potential to be a standard technology in a few short years. Our group, The Purple Cobraz, gets along well and is working hard already to make this project a success!
Project Format – Project II Design of a consumer good.

I. Introduction

The introduction should start with a clear statement of what the paper is about (in the first 1-3 sentences). “In this report we evaluate the effectiveness of using porous materials in sidewalks in order to reduce the problem of storm water runoff.”

Then you can include brief motivation (why this product is interesting or important to redesign) “One of the expected effects of climate change is an increase in extreme precipitation events, leading to problems with excess storm water runoff” etc.

You need to clearly establish the perspective of the analysis. You should also make it clear what you will be comparing your redesigned product to (the current product, other products on the market, etc). This should be done in the introduction.

The rest of the introduction section should lay out what the report is going to do. This is sometimes called signposting. It is a good idea to specifically outline the report by section. “In Section 2 we describe the problem of storm water runoff in detail. In Section 3 we describe a number of alternatives for addressing this problem. In Section 4 we define the evaluation criteria that we will be using. Etc…”

In general: Please number sections and subsections; it makes it much easier to follow the organization.

II. Description of the product.

In this section describe your product. You should have a picture of the actual product; potentially a diagram explaining how it works; and the Pro-E drawings. The pro-E drawings must include the individual parts, an engineering drawing of the entire product, and an exploded view.

After reading this section, the reader should have a good idea of how the specific product works and what it does.

III. Description of the redesigned product

In this section describe your redesign. In general, this should NOT be a narrative (i.e. a narrative says “first we tried this, but it wasn’t strong enough, so then we tried that…”). Rather, describe the redesigned product and give the justification for your choices (“We increased...in order to assure a strength of at least...”). This section should include pro-E drawings of the redesign. If you built a prototype, then include photos.

IV. Evaluation of the redesigned product

This section may include any experiments you performed to test the effectiveness of your redesign (i.e. strength, speed, airflow, etc). The experiments may be approximations (that is, if you don’t have a prototype you need to think about how to run experiments that get at the idea of your prototype).

a. Energy &/or the environment
If your product has improved energy usage (either directly or through its manufacture) then discuss it here. Estimate how much energy is saved. Compare with the original product and other products on the market.

If your product is more “green”, then discuss it here. Give specific values for the improvements. Compare with original and others on the market.

Include any other evaluation criteria (looks, lightness, convenience, accuracy, etc)

It may be appropriate to include tables to compare the aspects of your redesigned product, the original, and others on the market.

V. Economics

In this section discuss the economics of the redesign. Do a cost estimate and compare the redesigned product with original and others on market. If the redesign changes the amount of time the product will last or the number of uses it will get, then be sure to calculate the levelized cost per unit of time, or the cost per use.

You can also discuss other issues, such as if the redesigned technology has a higher initial cost than its comparison technologies; or is able to take advantage of subsidies or other incentives.

This is also a good section to include some sensitivity analysis. If you had to make any major assumptions to do the economic analysis, then present graphs showing how these assumptions impact your results.

VI. Conclusion

This section should briefly summarize the report: “In this report, we evaluated multiple technologies for porous surfaces.” It should provide a concise summing up of your conclusions “Replacing existing impervious surfaces with porous surfaces is quite expansive compared to the benefits received; however, using porous materials whenever surfaces need to be built appears to be quite cost effective in terms of…”

It is a good idea to put some kind of summarizing table here, so that we can see how the redesigned product stacks up with the original product and any other comparisons, on all important evaluation criteria laid out.

VII. Bibliography

Bibliographies should follow the CSE format, preferably the citation-name system. For detailed information on this system see: http://www.libraries.psu.edu/psul/lls/students/cse_citation.html

For general information about citation styles see:
http://www.library.umass.edu/services/instruction/instructional-services-for-students/using-citation-styles/

You should include at least two peer-reviewed references (journal articles or books).
VIII. Figures and Tables

Figures and tables should be in the body of the paper, NOT in the appendix. Figures and tables should be numbered and labeled (“Cost of porous materials). If the figure or table is from some other source, then should be labeled as such (usually on the lower right-hand corner you write “Source: EIA [put webpage here]”)
## PROJECT II (Product Redesign)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Distinguished</th>
<th>Proficient</th>
<th>Basic</th>
<th>Unacceptable</th>
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</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>The product is clearly specified. The perspective of the paper, and goals for the redesign are clearly specified; and their relevance is made clear. The groundwork for paper easy to predict because important topics that will be discussed are specifically mentioned.</td>
<td>The product is specified. The perspective of the paper, and the goals for the redesign are specified. An attempt is made as to their relevance, but may be slightly unclear, or lacking in insight or originality. Organization for rest of the paper stated.</td>
<td>May be unclear (hard to tell exactly what the product is or is for, or the purpose of the redesign is), appears unoriginal, or offers relatively little that is new; provides little around which to structure the paper.</td>
<td>No reference to the product, the goals of the redesign, or the relevance.</td>
</tr>
<tr>
<td><strong>Content -- general</strong></td>
<td>Clear examples to support specific topic sentences and to support the overall purpose; reader gains important insight; depth of coverage without being redundant.</td>
<td>Examples support most topic sentences and support general purpose; reader gains some insight; Topics adequately addressed but not in the detail or depth expected.</td>
<td>Examples support some topic sentences; reader gains some insight; The report shows little of the writer’s own work, relying instead on quotes and paraphrasing that are poorly connected.</td>
<td>The report relies on stringing together quotes or close paraphrasing; Failure to support statements, with major content omitted;</td>
</tr>
<tr>
<td><strong>Product Description</strong></td>
<td>Clear description of product and how it works with figures and diagrams. Reader understands how product works and why it is of interest.</td>
<td>Description of product with figures and diagrams, but less clear or dynamic. Reader has some understanding of how technology works and why it is of interest.</td>
<td>Description of product vague or unclear and lacking helpful figures and diagrams. Reader has some understanding of how technology works and why it is of interest.</td>
<td>Very hard to understand how the product works or why we should car.</td>
</tr>
<tr>
<td>Product redesign</td>
<td>A clear description is given of the key goals of the redesign and a description of the redesign itself, referring to figures and diagrams.</td>
<td>A description is given of the redesign itself, referring to figures and diagrams.</td>
<td>The description of the redesign is not clear, no reference to any figures or diagrams.</td>
<td>It is unclear what is being proposed for the redesign.</td>
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<td>Pro-E drawings</td>
<td>Drawings of original (and possibly redesigned) product are present, correct, and clearly presented.</td>
<td>Drawings of original product are slightly incomplete. Drawings are not presented clearly.</td>
<td>Key drawings are missing. Some drawings appear inaccurate.</td>
<td>The drawings are missing, incorrect, or inaccurate</td>
</tr>
<tr>
<td>Economic Analysis</td>
<td>A thorough, rigorous analysis of the economic costs and benefits of the redesigned product versus the original product is presented. A single metric is used to compare the two products. Reader can follow analysis and has all information needed to check calculations.</td>
<td>An economic analysis is presented. A single metric is used to compare products. Analysis is hard to follow or not all supporting information is given.</td>
<td>A single metric is not given to compare the products, leaving the reader unsure about how to compare them.</td>
<td>Economic analysis is missing or impossible to understand.</td>
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<tr>
<td>Analysis of other issues</td>
<td>A thorough, rigorous analysis of any other key issues (such as safety, convenience, environmental benefits) is given. The products are carefully compared. Reader can follow and understand the relevance of different issues.</td>
<td>An analysis of other key issues (such as safety, convenience, environmental benefits) is given; but some points may be missing or not clear. The products are compared. Reader can follow and understand the relevance of different issues.</td>
<td>Key issues are not addressed, or not addressed clearly and convincingly. The redesigned product is not compared directly to the original product. Tables and figures not well thought out.</td>
<td>Analysis is missing or very difficult to understand.</td>
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<tr>
<td><strong>Organization</strong></td>
<td>The ideas are arranged logically to support the purpose. Transitions link paragraphs. It’s easy to follow the line reasoning. Subheadings are used throughout the paper allowing the reader move easily through the text. Paragraphs have solid topic sentences.</td>
<td>The ideas are arranged logically to support the central purpose. Transitions usually link paragraphs. For the most part, the reader can follow the line of reasoning. Subheadings are used throughout the paper to guide the reader without undue confusion; a few paragraphs without strong topic sentences.</td>
<td>In general, ideas are arranged logically, but sometimes ideas fail to make sense together. The reader is fairly clear about what writer intends. While subheadings are used, the content beneath them does not follow; many paragraphs without topic sentences.</td>
<td>Ideas are not logically organized. Frequently, ideas fail to make sense together. The reader cannot identify a line of reasoning. Subheadings not used. Few or no topic sentences.</td>
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<td><strong>Tone for an academic research paper.</strong></td>
<td>Consistently professional and appropriate. No casual language such as “cheap” or “kids.”</td>
<td>Generally professional and appropriate.</td>
<td>Not consistently professional or appropriate.</td>
<td>Not professional or appropriate.</td>
</tr>
<tr>
<td><strong>Sentence Structure</strong></td>
<td>Sentences are well-phrased and varied in length and type. They flow smoothly from one to another with no run on sentences or comma splices.</td>
<td>Sentences are correct with minor variety in length and structure. The flow from sentence to sentence is generally smooth although some run on sentences are present.</td>
<td>Some sentences are awkwardly constructed so that the reader is occasionally distracted. Run on sentences are present or Short, simple and compound sentences prevail.</td>
<td>Errors in sentence structure are frequent enough to be a major distraction to the reader. Run on’s and fragments common.</td>
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<tr>
<td><strong>Word Choice</strong></td>
<td>Word choice is consistently precise and accurate. The writer uses the active voice.</td>
<td>Word choice is generally good. The writer often finds words that are more precise and effective. Unnecessary words are occasionally used.</td>
<td>Word choice is merely adequate, and the range of words is limited. Some words are used inappropriately. Unnecessary words are fairly common.</td>
<td>Many words are used inappropriately, confusing the reader. It is difficult for the reader to understand what the writer is trying to express.</td>
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<tr>
<td>Grammar, Spelling, Writing Mechanics (punctuation, italics, capitalization, etc.)</td>
<td>Essentially free of grammatical errors; The writing is free or almost free of errors.</td>
<td>A few grammatical errors; There are occasional errors, but they don't represent a major distraction or obscure meaning.</td>
<td>Several grammatical errors; The writing has many errors, and the reader is distracted by them.</td>
<td>Pattern of ungrammatical writing; There are so many errors that meaning is obscured. The reader is confused and stops reading.</td>
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<tr>
<td>Conclusion</td>
<td>The writer makes succinct and precise conclusions based on the evidence given in report.</td>
<td>Some of the conclusions are not supported.</td>
<td>Conclusions are uninteresting and some conclusions are not supported;</td>
<td>There is little or no indication that the writer tried to synthesize the information or draw conclusions based on the evidence in paper.</td>
</tr>
<tr>
<td>Reference Quality</td>
<td>All data is referenced. References are papers or well respected websites such as EIA. Multiple sources are cited for important data.</td>
<td>All data is referenced, but some of the references are general web sites. Only a single source is given for most data</td>
<td>Some data is not referenced.</td>
<td>Considerable data is not referenced. The references that exist are of low quality.</td>
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