

FY-11

August 10, 1995

[Filename: REV_ENG1.DOC]

Reverse Engineering

Contributor: Bill Steffenhagen
Affiliation address: Mechanical Engineering Department
Saint Martin's College
5300 Pacific Ave SE
Lacey, WA 98503
Telephone: (360) 438-4532
Fax: (360) 459-4124
E-Mail: WWSteff@eicbbs.WSEO.WA.GOV

Type: Design Problem
Student Time: Two Weeks
Location: Classroom/Home

Summary

The student may select the device of his/her choosing from a table of used household appliances (which may be purchased for between \$2 to \$5 in recycling stores). The student is to completely disassemble the device selected. The student must then describe the function of each component found and the desirable properties for both the known or unknown materials used for each component. The student is to provide an overall system operational description including the function of each component. The design question is "Based on your disassembly and inspection of the selected appliance, how could this device be redesigned to be more readily recycled?"

ABET Descriptors

Engr Sci Content: First Year Engineering
Type: System and component conceptualization
Elements: Evaluation, conceptualization, synthesis
Features: Open-ended, design methodology, creativity
Constraints: Time, resources
Effort: Individual

Reverse Engineering

The class will be divide into teams of 3-4 students.

Procedure:

The student may select the device of his/her choosing from a table of used household appliances (which may be purchased for between \$2 to \$5 in recycling stores). The student is to completely disassemble the device selected. The student must then describe the function of each component found and the desirable properties for both the known or unknown materials used for each component. The student is to provide an overall system operational description including the function of each component.

Design Problem:

Based on your disassembly and inspection of the selected appliance, how could this device be redesigned to be more readily recycled?

Milestones:

There will be a design review meeting with the instructor after 3 weeks. The final report will be submitted and an oral presentation made after 6 weeks.

Report:

This project is to be reported in both written and oral presentation form. The format should be of the students design. The report should include any expected failure modes for components, any recommended improvements to the design, an explanation of why this devices has its current geometry, guestimates of the processes used to fabricate the components, a sketch should be made of each component and a system electrical schematic diagram should be developed. The student should document as much detail about the chosen appliance as necessary to develop a conceptual presentation.

The project will be evaluated by the instructor and by peer review.

Reverse Engineering

Engineering Notes:

Objectives/Comments:

This project is intended to encourage team building to satisfy a design objective with constraints of time and resources (limited experience with open-ended problems).

The instructor should make note of comparisons between the reporting formats used and accepted Engineering Report Formats, compare the sketches submitted with industry drawing practice, and note if recommendations made are compatible with the industry drivers of "cheaper, better, and quicker". Confirm whether or not Nameplate data has been documented in the report. With regards to the recommendations made, has the student made reference to current technology (comparisons between the device investigated and current state-of-the-art technology)? To the extent possible, students should comment to manufacturing and assembly considerations, and recycling potential for this product. The instructor should discuss how this project may be iterated in follow-up courses where a greater depth of design analysis will be possible (Graphics Class, Material Science, Manufacturing Processes, Electrical Circuits, Control Engineering, Machine Design, etc.).

The instructor should make note of comparisons between the reporting formats used and accepted Engineering Report Formats, compare the sketches submitted with industry drawing practice, has the student team made a comprehensive search of the reference literature for current technologies available. Possible approaches to this problem might include

Expected outcomes:

Group dynamics and interactions should be carefully observed and intervention should be considered wherever it may be constructively applied. Effective time management on the part of the students teams is not expected, but should be encouraged.

Discussion/follow-on:

Note should be made of the iteration potential for this project in follow-up courses where a greater depth of design analysis and conceptualization will be possible (Manufacturing Processes, Material Science, Electric Circuits, Graphics).