

University of Portland
ME 421/521 – Failure Analysis
Main Project

DO NOT do any destructive testing without first discussing it with me.

Many of these parts are on loan from Lisin Metallurgical Services.

Your task is to determine the probable cause(s) of failure of the part you have received and to recommend solution to prevent future failures. Follow the procedures discussed in Section 4 of your “book,” including the data logs. With the limited information you have, and without access to a complete array of investigation tools, you may or may not be able to definitively determine the cause. I do expect the following to be included (as well as all other appropriate elements of a report and presentation):

Background

Discuss what you do know about the part and its history. What is it, how was it used, etc. Conduct a literature search to explain how similar parts typically fail and/or discuss the any significance of the material and manufacturing process. There should be information about many of the parts, manufacturing processes and or materials in ASM handbooks and other books in the library.

Discuss the failure mechanisms you suspect contributed to the failure. There should be general information, not specific to your part. Example, if you think pitting corrosion contributed to the failure, you should discuss what pitting corrosion is, how it occurs, how to prevent it, what it looks like (how you can identify it), and how it can lead to failures.

Discussion

Describe in depth the failure of your part. Discuss each phase of the investigation process, including a complete listing of all hypotheses, your test plan and all testing you conducted and what the results were. Explain how the testing helped you reach conclusions. If you were unable to conduct some test (due to lack of equipment or whatever), discuss that was well – discuss what those tests could have told you, what you would have been looking for. Discuss recommendations for preventing future failures of your part.

You are each required to submit a formal written report and to give a formal oral presentation to the class. The report will be 67% of the project grade and oral presentation will be 33% of the project grade. Both of these are discussed in detail below.

You will need to complete Phases I-III by September 29.
Presentations will start in late October, and should last four or five classes.
The written reports are due November 13.

Written Report

Purpose of Assignment: The purpose of this assignment is to ensure students can obtain, formulate, and communicate in writing knowledge gained from a failure investigation.

Assignment: Each student is to write a report based on their investigation of a failed part. The report should have the following elements:

Title page

Introduction (what are your objectives? why are you conducting the investigation?)

Background (set the stage, what is your part used for, what do you know about it, etc.)

Methodology (what did you do, how did you do it)

Results (what data did you obtain)

Discussion (discuss the results)

Conclusion and Recommendation (what do you conclude regarding the failure? What changes do you recommend?)

Lessons learned (what general lessons can be learned from the investigation?)

Grading Criteria:

Thought and Content (60%)

- A: much effort was put forth in developing the ideas presented; ideas are well supported by data, expert opinions, and/or logical arguments. In other words, you have convinced me your conclusion is valid.
- B: good effort put forth in developing ideas presented, ideas are supported by some data, expert opinions and/or good logical arguments. Your conclusion seems valid.
- C: some effort put forth in developing ideas presented, ideas are supported by minimal data, expert opinion or logical argument. Your conclusion seems to be possibly correct.
- D: little effort put forth in developing ideas presented, ideas are weakly supported by data, expert opinion or logical argument. Your conclusion is weak and lacking support.
- F: no effort put forth in developing ideas presented, ideas are not supported by data, expert opinion or logical argument. Your conclusion appears to be invalid and not supportable.

Writing Style (30%)

- A: Very well written, very well organized, clear and easy to follow, few technical writing errors
- B: Well written, well organized, clear and easy to follow, some distracting technical writing errors
- C: Generally clear, but contains errors in organization and contains distracting technical writing errors
- D: Not clearly written, poor organization, several distracting technical writing errors
- F: Poorly written, nearly unintelligible, numerous distracting technical writing errors

Required Elements (10%)

A: Contains all of the required elements listed above

C: Contains most of the required elements

F: Contains few of the required elements

Oral Presentation

Purpose of Assignment: The purpose of this assignment is to ensure students can obtain, formulate, and communicate, in a formal presentation, technical information relating to a failure investigation. It is also to inform classmates about various failures.

Assignment: You are to give a formal presentation to the class on your investigation. The maximum time you will be allotted is 7 minutes, plus unlimited question and answers by the instructor.

Grading:

Thought and Content (70%)

A: much effort was put forth in developing the ideas presented; ideas are well supported by data, expert opinions, and/or logical arguments

B: good effort put forth in developing ideas presented, ideas are supported by some data, expert opinions and/or good logical arguments

C: some effort put forth in developing ideas presented, ideas are supported by minimal data, expert opinion or logical argument

D: little effort put forth in developing ideas presented, ideas are weakly supported by data, expert opinion or logical argument

F: yeah, right. Did you forget about this assignment until last night?

Presentation Style (30%)

A: Very well organized, clear and easy to follow. Excellent communication of ideas.

B: Well organized, clear and easy to follow. Good use of overheads.

C: Fairly well organized, somewhat difficult to follow, fair use of overheads.

D: Poorly organized, difficult to follow, poor use of overheads.

F: No organization, not follow-able.