

ME 7863 – Engineering Failure Analysis

Failure Analysis Project Written report guidelines

Overview of assignment Each pair of students working on a failure analysis project is required to submit a written report describing the results, conclusions, and recommendations of their work. These reports should be written for a professional audience – pretend that the person you are writing the report for is the person that sent you the failed component and that, believe it or not, is paying you for the work you are doing.

There are no page limits on your report (min or max). Strive, as always, to be concise and clear. Figures and tables should be numbered and captioned, and referred to consecutively in your report.

Keep in mind that a failure analysis report is often only as good as the figures it contains. Include lots of photos, and don't be afraid to use circles, arrows, etc., right on the photos to make your points.

Topics covered in a report will vary depending on the component being analyzed. But most reports should contain each of the following sections.

Summary of Conclusions and Recommendations

An executive summary of your most important conclusions and recommendations. Readers who *only* read this section should get a good overview of your findings.

Introduction

The “who, what, when, and where” of your project. Who submitted the project to you, what is it, when and where was it in service. Any other important information your client may have provided to you going into the project. If there are important things that you *don't* know (such as how long a component was in service) state them here.

Initial visual examination

“As received” photos and visual descriptions. Include scales on photos where appropriate.

Sections for other laboratory examinations

Examples: dimensional surveys, metallographic examination, SEM, chemical analysis (from SEM or otherwise), hardness (macro or micro), etc. The sections included here will vary from project to project. Lots of figures!

Analyses

Analyses will vary from project to project. Stress analysis (FEA or otherwise), including free body diagram. CFD, etc.

Discussion

The above sections are “just the facts.” In your Discussion section, tell the reader what the facts mean. The microstructure (for example) described above means that the component was improperly heat treated, for these reasons... The stress analysis shows that the component could have fractured by fatigue cracking in one year, based on these facts and reasonable assumptions... If your discussion is two pages or more, it should probably have subheadings.

Conclusions

1. Please number your conclusions, and keep them short.
2. Each of your conclusions should follow directly from your Discussion. No surprises!
3. Yes, this means there will be some repetition in your report.
4. Write conclusions regarding failure mechanisms, anomalies in the material and/or design, and other factors that played an important role in the failure.

Recommendations

1. Please number your recommendations, and keep them short.
2. Recommendations are typically the most difficult part of any failure analysis report. I nearly always discuss my recommendations with my client prior to writing my report. When the client receives the report, they are thus not surprised by what I am recommending.
3. Tell your customer what to do to avoid (if possible) repeated similar failures. Examples: use a different material, a different heat treatment, a better coating, a different design, different operating procedures (lower temperatures, etc.), improved maintenance procedures.
4. “Do nothing” is often a valid recommendation.
5. It is common, and appropriate, to discuss cost in your recommendations. If you are recommending a more expensive material, for example, explain why it is justified.

References

Include a complete list.