ECHE 362 Senior Laboratory

Fall 2015

***Thoughts for 2015. No long form reports, 3 short, 3 oral***

***No experimental procedures section – just lessons learned, table in appendix of exp. conditions***

***Table of equip / table of utility explicitity shown in table below as appendices***

***One oral as 3 min (one slide) individual presentations, followed by group Q&A***

***Stress analysis of data (comparison to lit / theory) and analysis of design***

Report Formats

You will be preparing three ‘memo’ reports for which you will also do an oral report, and three ‘short form’ reports this semester. The required sections for each type of report are given in the table below.

|  |  |  |
| --- | --- | --- |
|  | Memo Form | Short Form |
| Executive Summary | X | X |
| ‘Quad’ chart | X |  |
| Introduction |  | Condensed |
| Theory/Literature Review |  | If needed |
| Experimental Procedures |  | Condensed |
| Results |  | X |
| Discussion |  | X |
| Table of Capital Equipment | X | X |
| Table of Utilities | X | X |
| Conclusions and Recommendations |  | X |
| Acknowledgements |  | X |
| Author Contributions | X | X |
| Nomenclature/List of Symbols |  | If needed |
| Table of Experimental Conditions |  | X |
| Example Calculations | X | X |
| Excel Spreadsheets/Aspen Files | X | X |

X – required

Memo Report

There are many different styles which are considered ‘memo’ reports. For our purposes, the memo report is an executive summary (not more than one page) and a ‘quad’ chart. Example calculations and your Excel/Aspen files are also required for the memo report, as are the tables summarizing the capital equipment and utilities when appropriate. An example of the example calculations is given below.

Short Form Reports

The basis of the short form report is that it represents a report to your immediate superior, and is not intended for distribution to a wider audience. The short form would be appropriate at the conclusion of a short project, or as an interim report during a longer project. For the body of the report, since your boss can be safely assumed to be familiar with the topic at hand; a lengthy introduction is not required. One paragraph of introduction should suffice to give the scope and objective of the work presented. Similarly, the description of the experimental procedures and equipment used can be condensed, giving only the most relevant information, such as the experimental conditions used (given as a table in an appendix) and describing any ‘lessons learned’ in the lab (what worked, what didn’t, what to watch out for). Greater detail would be necessary only if a new piece of equipment or a new method of operating existing equipment was introduced. The same is true for the theory section, which can be omitted unless your analysis required theory beyond what is general knowledge in the field. The Results and Discussion sections should still be complete, with sufficient detail to support your conclusions and recommendations. Results are included in tabular or graphical form, and should be inserted into the body of the report, or placed at the end of the text when a full page table or graph is required. The report ends with a bulleted list of conclusions and recommendations for action or further experimental work if necessary. A short paragraph acknowledging those people who contributed to your effort (but who are not authors) should be included if necessary. Whenever more than ten symbols are used, a listing of the symbols used and their meaning should be included as an appendix. Example calculations should be included in an appendix. For this semester – the short form report has the following page limits:

Exec Summary 1 pg

Body – Intro through Results and Discussion 4 pgs

Conclusions/Recommendations and Acknowledgements 1 pg

Appendices no limit

Figures/tables do not count against the page limit

Oral Reports

Oral reports will be done as a group. You will prepare a 15 min presentation using Powerpoint. A 15 min question and answer session will follow. The material covered by the oral report should roughly correspond to the short form report described below. As with the short form, assume this is a presentation to your immediate superior, and that he/she is familiar with the project.

Long Form Reports – not applicable for 2015

The long form report is intended for distribution to a much wider audience. As a result, sufficient detail must be given to allow the reader to understand what was done, why and how it was done, and the significance of your conclusions. Long form reports will generally be long enough (8-10 pages of text) that a table of contents is required.

The Introduction states the objective and scope of the work, and also provides important background information. For example, if you were designing a separation process for a particular process stream, the detailed nature of that stream (temperature, composition, flow rate) would be given in the introduction.

The Theory section presents the theory needed in analyzing your results. The equations used are stated, with reference to standard texts. More importantly, the theory section should describe the process used (what calculation comes first, what is done with the result of that calculation, etc) and highlights the assumptions/simplifications made in your analysis. Ideally, this allows the reader to follow your analysis, understand your assumptions, and most importantly, understand the impact of those assumptions on the results. If you have derived any new relationships, or are using theory beyond what is found in standard texts, a more detailed explanation of that theory would be required.

The Experimental Procedures section should not be a detailed, step-by-step listing like that found in the Foreman’s Report. However, it should give enough detail of the apparatus and procedures used that the reader (assumed to be another chemical engineer or similarly trained person) could reproduce what you have done in the lab. Any non-standard equipment should be noted and described in detail; equipment that is commercially available should be mentioned, but not detailed. Your experiences in the lab are valuable, and your observations of any unusual or unexpected behavior should be documented. For example, if you noticed that a particular experimental condition led to un-stable results be sure to mention it. Always include a table of the experimental conditions that you used.

Generic requirements for all written reports

1” margins, single spaced, 12 point font

Executive Summaries

Writing executive summaries is often a source of difficulty in this class. The executive summary is required for any form of report, and is the only part of the report that would normally be widely distributed throughout the company. The executive summary provides a one page (or less) statement of the objective and rationale for the work that was performed and the major results, conclusions and recommendations, followed by a few key details that support your conclusions. It should be written with simple declarative statements, avoiding jargon, and it should not be overly technical. Whenever possible, you should avoid equations. Sometimes it will be necessary to include a figure or table, which is generally placed on a separate page.

1st - your summary must start with your objective - what task where you assigned to do. Stay in the scenario, (you're working for a company, you're not a student) and avoid words like 'lab report' or 'experiment'. Your objective is never to do an experiment – it’s to solve a larger problem, and taking data in the lab is just part of that solution. You should give some detail here about the problem and the motivation for solving it - the executive summary will be read by people who may not be familiar with the issues at hand.

2nd - State your major conclusion/recommendation in clear, direct terms. Do we build a PFR or a CSTR or something else? How much will it cost? What is the design of the heat exchange network and how much cooling water does it use? Do we build a fuel cell power plant or not? Whenever possible, give exact numbers (with reasonable significant digits!). You may need a few more numbers to put these results in context - like a payback period, or a comparison to theory. Note - this is not how Jeter and Donnell suggest you write executive summaries - but it is in my opinion, more realistic - you have to give the major conclusion up front - don't make the reader hunt for it. You also have to state what (if any) major assumptions/limitations have to be understood or studied further before acting on your recommendation.

3rd - anything else (another one or two paragraphs at most) is detail to support your conclusions - what measurements or analyses were made that are important. Not everything you did is going to be mentioned in the executive summary - I'm looking for you to identify the key factors behind your conclusions. If you design something, convince me your design is robust. If you cost something, what were the major cost drivers? Experimental details are almost never important enough to make the executive summary, unless you have developed an entirely new experimental procedure that yields results that were not previously obtainable.

Author Contributions

Details ‘who did what’. Who wrote which sections, who performed which calculations, who was the foreman, etc. The foreman is responsible for drafting this section of the report and discussing it with the group. Everyone in the group should read and agree upon this section before the report is submitted. If there is an issue and agreement cannot be reached, it should be brought to Prof. Wainright’s attention.

Example Calculations

See the next page for a good example of the ‘example calculations’. Your example calculations should be in logical order to show how one calculation leads to the next, shows the correct units and significant digits and should include links to the Excel spreadsheet (if applicable). Example calculations may be hand-written or typed, whichever you prefer.

1) the equation is given

2) a worked example is shown, with numbers (with correct sig figs and units)

3) reference is made to where the calculation takes place in the Excel spreadsheet

The text is minimal, but sufficient to follow the flow of the calculation.

You should always write out hand calculations (and have them checked by a teammate for accuracy) BEFORE working any calculation in Excel. Every year I find mistake after mistake where the formula calculated in Excel is incorrect – missing brackets, referencing the wrong cell, incorrect unit conversions, etc. Doing an example calculation first is an extremely good habit that I would like you to develop. This is where teamwork is very useful. When starting on a piece of analysis – write out an example calculation, and discuss it with other members of your group – have them check your work for errors in either your approach/assumptions or in your calculations. Then, check that the Excel file accurately reflects the example as well.

