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To:	Colleagues in Chemical Engineering 4N04
cc:	Alicia Pascall, Yasser Ghobara
Date:	24 September 2012
From:	Kevin Dunn
Subject:	**Self-directed learning project**

Self-directed learning / Life-long learning

We would like to accelerate the schedule for the selection of the (SDL/LLL) process operability project. We are doing this because of the delays caused by indecision and lengthy discussions that have occasionally occurred in past years. These discussions are worthwhile to ensure that each group selects a good project; however, they have occasionally delayed progress. We emphasize that you are not expected to begin work on the project until after the economics topic has been completed.

The operability project provides you with the opportunity to:

1. apply all material in the course (including economics and all the operability topics from the last half of the course),
2. learn a process of interest to you,
3. build your life-long learning skills through independent inquiry, and
4. continue to improve your communication skills via the oral presentation and formal report.

Project Goals

This memo form part of tab 5 from the course notes. The Table of Contents listed at the end of this memo, provides an overview of the topics you are expected to investigate during the project. The specific issues within each topic depend upon the project you select and your interests; you will work closely with a project supervisor in designing and performing your project.

Guidelines for project selection

The project selection provides you with the opportunity to have a "win-win" experience with both good 4N4 learning and knowledge and experience in an area of interest to you. We encourage you to select a process that interests you and not select an "equipment" topic, such as distillation.

Project characteristics of good projects include:

- The topic interests students in the group, which should be easy given how the groups were formed.
- Sufficient information is available in the public domain to complete the project.
- The process has interesting operability issues (safety, reliability, trouble shooting, etc.).
- The process is sufficiently complex to offer challenges for all members of the group. For a very large process, such as a petroleum refinery, the project must be limited to a smaller, manageable section of the process.
- A process exists in the area and the group can arrange a visit and work with a practitioner

Some project characteristics to avoid are:

- A process that is too simple, such as a laboratory experiment (not allowed).
- A process for which one member has experience from a summer or intern work experience. These projects have been disasters, because of poor group dynamics and limited, confidential information.
- A process for which one member claims to be able to obtain all the information from a friend or relative. Usually, the information cannot be supplied, e.g. due to confidentiality or due to corporate time-delays, and the group falls far behind schedule.
- A process for which only one or two members are enthusiastic. Again, poor group dynamics result.

Reporting your selection

You will provide at least three candidates for your project in an **electronic memorandum** to the instructor and TAs. Your candidates will

1. be listed in descending order of preference (1 will be your most preferred)
2. not include 4N4 or 4W4 projects completed in recent years

We are available to discuss your proposals and help you define a project that will be fun and a good learning experience.

Example table of contents for the SDL/LLL Operability Report*

1. Introduction
2. Process Overview (Keep brief!)
    - What is the purpose of the process; what are products
    - What are alternatives?
    - What are typical physical dimensions?
    - Process drawings
    - Process capacity (e.g., production rate)
3. Process Principles (Keep brief!)
    - Assume that the audience has taken an undergraduate ChE program
    - Highlight what is essential and not obvious (e.g., corrosion, reliability)
4. Economics - estimation of capital costs, operating costs
    - What is a typical cost (capital and operating)
    - What are the key capacity factors and why
5. Operability

    Cover the operability issues identified in the course, except for safety and troubleshooting, which are in separate chapters

    - Operating window
    - Flexibility
    - Reliability
    - Efficiency
    - Transitions
    - Dynamic performance

6. Safety issues**
    - Six levels for safety in depth
    - HAZOP Workshop
7. Trouble shooting
    - A table of likely faults with symptoms
    - An important troubleshooting case
8. Conclusions

Appendices: Any detailed calculations, data, and results (e.g., trouble shooting or HAZOPS reports) should be reported in appendices***.

The first appendix, appendix A, must clearly document the report sections and specific pages contributed by each member of the group. Each section and associated pages must be reported as the work of only one student.

* *You may decide to cover some additional issues and decide that some in this table are not relevant for your process. Be sure to reach agreement with your instructor.*

** *Could be safety topic other than those covered during course, for example, hygiene, toxicology, hazardous area classification, or fire and explosions.*

*** *Please remember this is an electronic submission. An electronic document is usually read linearly (unless there are hyperlinks to go forwards and backwards). Contrast this to a paper document which can be read non-linearly (e.g. sticky notes, or using your finger to flip around). It is frustrating to move backwards and forwards electronically; so we ask you to use the general rule: if you think that the reader will want to look at the material, do not put it in the appendix. Appendices, for this report, should be reserved for things which might never be referred to by the reader. This probably goes against what you've been taught elsewhere, but it not surprising that documents that only exist electronically should be different to their paper counterparts.*

Timing

The following dates are critical to note, and have been posted on the course website:

Date	**Event**
27 September 2012	Preliminary selection of projects received
01 October 2012	Project selection finalized
29 October to 02 November	Formal progress meeting of group with instructor/TAs
12 to 16 November 2012	Potentially no classes for 4N4: *to complete project*
20 to 30 November 2012	Group presentations to the class (15 minutes)
03 December 2012	All project reports are due at 16:30 (no later)

More details on the expectations of the formal group meeting with your manager, the class presentation and materials your group creates for the class, as well as the electronic report will be provided soon, with examples. All three activities will be graded.

Potential topics

Your TA, Alicia, has prepared a list of companies and projects that students have worked with in past years:

- Boiler House - Refrigeration and cooling tower
- Boiler House - Boiler and flue gas
- Boiler House - Water treating
- Bartek - Feed and reaction section for maleic anhydride

- Ammonia manufacturing
- Steam Whistle brewery
- Cadburys, next to Fortinos on Main Street West
- Waste water (sewage) treatment
- Municipal (drinking) water treatment
- Production of biodiesel
- Polymer reaction system
- Production of a biomaterial/bio-drug

Further ideas can be found by researching Kirk-Othmer Encyclopedia of Chemical Technology and Ullmann's Encyclopedia of Industrial Chemistry; other standard chemical engineering references are Perry's and McCabe, Smith and Harriott.

You do not need to work with an outside company, but if you choose to do so, this will make your project more relevant and exciting, but working with companies can be frustratingly slow if you are waiting on them for information.

All projects involving outside companies, except for the Boiler House, should get pre-approval from your manager first; i.e. speak with me before 27 September.

Sincerely,

Kevin Dunn