

Major No. 2 – A New Opportunity at Unit 200

October 16, 2000

Update on Previous Problem at Unit 200

The start-up of Unit 200 went successfully, and the problem with the off-spec methanol was resolved. A local gasoline supplier bought the contents of TK-4401, which were contaminated with ethanol, at a reduced rate, and the net loss to the company was \$45,000. The problem was resolved quickly, and no modifications to the process were required. The off-spec methanol was pumped from the tank into tank cars over a period of approximately 3 days and then the tank was refilled with on-spec methanol in time for TK-4402 to be refilled. The “bugs” in the e-commerce system have now been corrected, and a new quality control policy regarding the testing of all shipments to the plant has been implemented

A new Business Opportunity

The problem at the DME facility has generated a lot of discussion, and several interesting ideas that might improve the profitability of Unit 200 have been suggested. The evaluation of one of these ideas is the object of the current project. Specifically, a source of lower-grade but cheaper methanol has been located. Our business group is currently talking to a vendor and requires input from the engineering group regarding the cost of process modifications necessary to process this lower-grade methanol.

Your assignment is to evaluate the highest break-even cost for the lower-grade methanol such that the NPV for this new improvement project is zero under the following economic criteria:

Project life = 6 years

Internal hurdle rate = 12%

Taxation = 45%

Depreciation (on new capital investment) - use 5 year MACRS

Assume construction and installation for any new equipment = 6 months

Currently, we pay \$0.60 per gallon for methanol and \$1.80 per gallon for ethanol. The specification for ethanol purity to be used in our solvent process is less than 100 ppm of methanol per mole of ethanol, and the water content must not exceed 30 wt%. Based on your previous work, the specification for methanol feed to Unit 200 is greater than 99.9 mol% methanol. The methanol being considered for this project has the following specifications.

Methanol 88 mol%

Ethanol 11 mol%

Water 1 mol%

Column T-1104 and the associated equipment are available for use in this project. However, if additional equipment is required it must be purchased and installed. If the existing column, T-1104, is used but associated equipment such as reboilers, condensers, etc., must be purchased, then this

new equipment can be installed in place of the existing equipment. If a new column is to be used, then it should be located in the hatched box shown on the attached plot plan. For all new equipment, you must use the total module cost from CAPCOST as the installed cost.

Additional Economic Data

To estimate the material costs for piping runs to/from the tank farm, to/from T-1104, and to/from Unit 200 use the following data:

Pipe costs:

- 6" diameter, use \$28 per foot for installed piping – this includes flanges, insulation, shut of valves, pipe supports, etc.
- 4" diameter, use \$25 per foot for installed piping – this includes flanges, insulation, shut of valves, pipe supports, etc.
- 3" diameter, use \$23 per foot for installed piping – this includes flanges, insulation, shut of valves, pipe supports, etc.
- 2" diameter, use \$21 per foot for installed piping – this includes flanges, insulation, shut of valves, pipe supports, etc.
- 1.5" diameter, use \$20 per foot for installed piping – this includes flanges, insulation, shut of valves, pipe supports, etc.
- 1" diameter, use \$19 per foot for installed piping – this includes flanges, insulation, shut of valves, pipe supports, etc.

For control valves use 500 foot of pipe equivalent, for other fittings assume pipe cost covers these.

Note: for any new equipment purchased for this project, the total module cost includes piping and instrumentation for that equipment. Do not cost this piping separately.

Assignment

Your assignment is to prepare a written and oral report summarizing your findings and recommendations. The written report is due in 2 weeks time. You should read carefully the guidelines for written and oral reports and Chapters 22 and 23 in the your textbook "Analysis, Synthesis, and Design of Chemical Processes." These chapters cover the required guidelines for written and oral presentations. The written report should not exceed 15 pages of double-spaced text, plus figures and tables. All relevant calculations should be included in a well-indexed appendix. If existing equipment is to be used then detailed performance calculations must be included. If these calculations are omitted you will be penalized 1 letter grade. These calculations should be neat and legible but may be hand written. The form of the report should follow the guidelines for a standard design report, using standard headings, etc. The following information must appear in the main body of the report:

- a. A computer-generated process flow diagram (PFD) showing the configuration of equipment for your recommended case.
- b. A clear summary of all optimizations that you attempted in arriving at your recommended case.

- c. A flow summary table showing the amounts and conditions of the streams entering and/or leaving all additional equipment used in your recommended case.
- d. A list of all new equipment with installed costs and material costs for new piping when appropriate.
- e. A detailed summary of the piping arrangement for T-1104 and associated exchangers, pumps, vessels, etc., if this equipment is used.
- f. A signed copy of the confidentiality statement. This should be the very last page of the written report.

Please provide the written report in a 3-ring, spiral or riveted binder (not oversized). You must bring a hard copy of your slides to leave behind after the oral presentation. These should be distributed to your audience prior to the start of your presentation.

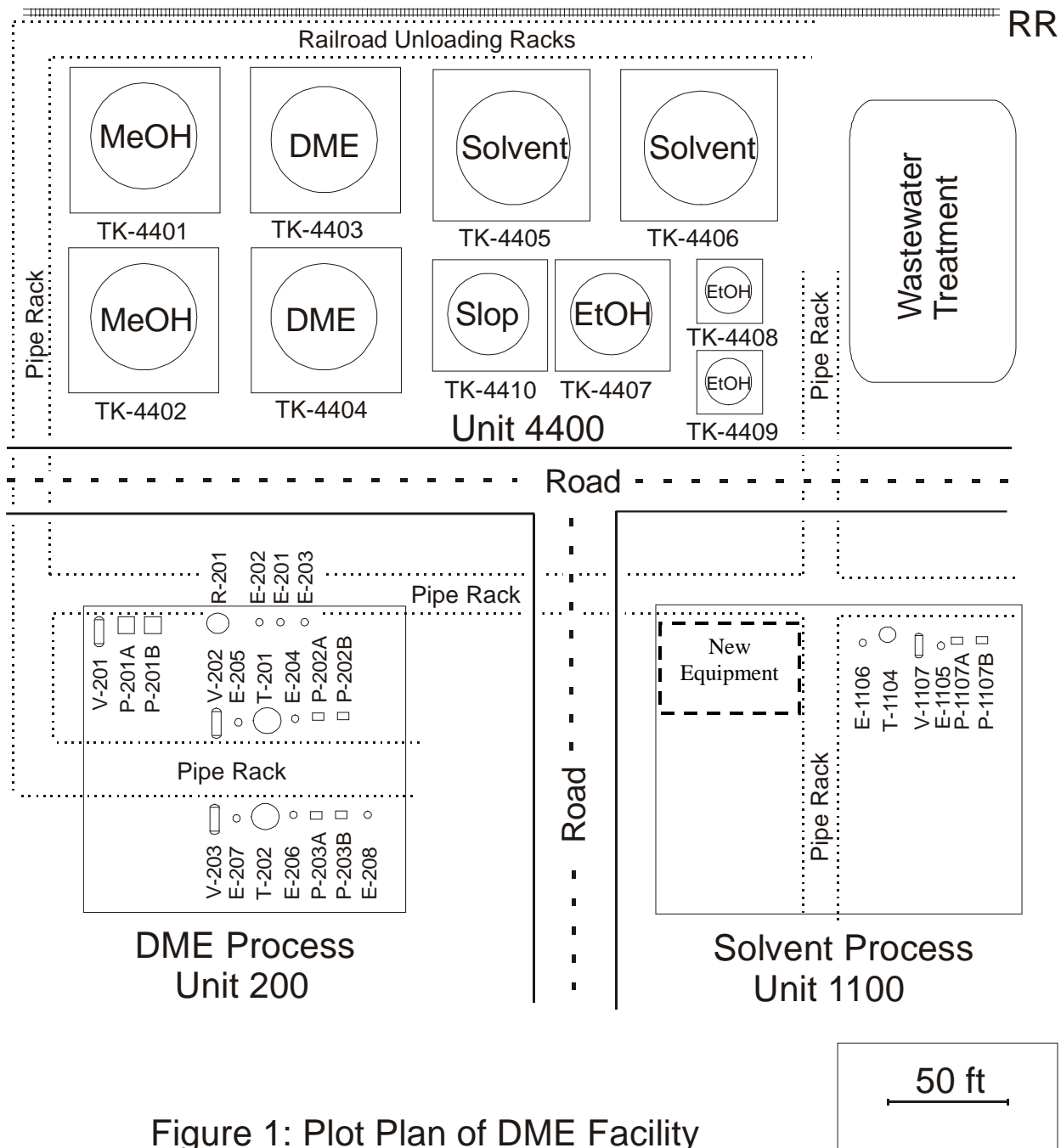


Figure 1: Plot Plan of DME Facility

