Scale-Down of Phthalic Anhydride Production at STW's Unit 700 - Separation Section

Many thanks for your analysis of the front-end of Unit 700 (see project entitled "Scale-Down of Phthalic Anhydride Production at STW's Unit 700 – Reaction Section".) We are optimistic that 50% scale-down is possible and we would like you to continue your analysis of the scale-down problem. Since you indicated that modifications would be needed in order to achieve the desired scale-down, the plant shut-down has been moved up, and will begin in two weeks. Therefore, we need your final recommendations at that time.

Specifically, final recommendations are needed on the following:

1. A precise plan is needed for the feed section in order to ensure that naphthalene will be fed at 50% of the previous flow rate. We would like maximum flexibility to adjust the air stream, if necessary.

2. A detailed analysis of the molten salt loop is needed so that the scaled-down operating conditions are clearly defined.

3. It needs to be ascertained whether the fluidized bed reactor will remain fluidized.

4. The separation section must be analyzed to determine how 50% scale-down can be accomplished. The switch condensers need not be analyzed as long as the constraints imposed by Condensex®, which were described previously, are met.

5. A clearly defined set of new operating conditions and stream properties must be available.

Assignment

Your assignment is to provide recommendations as to necessary plant modifications during shut down. The goal is to achieve 50% scale-down. You should also recommend any other changes that you feel should be made to improve performance in Unit 700. The equivalent annual operating cost (EAOC) at a before-tax 15% internal rate of return for these modifications should be kept to a minimum.

Specifically, you are to prepare the following by (2 ½ weeks from now)

1. a written report detailing how 50% scale down will be achieved for all of Unit 700, and a clear set of new operating conditions

2. a list of new equipment to be purchased, including size, cost, and materials of construction

3. an analysis of the EAOC created by your recommended modifications

4. a legible, organized set of calculations justifying your recommendations, including any assumptions made

Report Format

This report should be brief. Most of the report should be an executive summary, not to exceed 5 double-spaced, typed pages, which summarizes your diagnosis, recommendations, and rationale. Figures and tables may be included (do not count against page limit) in the executive summary. An appendix should be attached which includes items such as the requested calculations. These calculations should be easy to follow.

The written report is a very important part of the assignment. Poorly written and/or organized written reports will require re-writing. Be sure to follow the format outlined in the guide for written reports. Failure to follow the prescribed format will be grounds for a re-write. See also Chapter 22 of your textbook [1].

Oral Presentation

You will be expected to present and defend your results to STW's management representatives some time after the written report is due. Your presentation should be 10-15 minutes, followed by about a 30 minute question and answer period. Make certain that you prepare for this meeting since it is an important part of your assignment.

Background Information

All necessary background information for Unit 700 is provided in the project entitled "Scale-Down of Phthalic Anhydride Production at STW's Unit 700 – Reaction Section".

References

1. Turton, R., Bailie, R.C., Whiting, W.B., and J.A. Shaeiwitz, Analysis, Synthesis, and Design of Chemical Processes, Prentice-Hall, Upper Saddle River, NJ, 1998.