

PROCESS ENGINEERING ECONOMICS

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Preface

I have found through many years of experience in industry and academe that engineers, after having been promoted in the managerial ranks, are confronted with economic and financial terminology with which they are not familiar. Although in their education they may have encountered some of the principles presented in this text in engineering economics or business college courses, these courses, in general, do not include the broad coverage of topics presented herein. Some technical people will attempt to muddle through, not understanding which information is essential for management decisions. To accommodate this lack of understanding, some engineers have pursued night courses or on-line or self-study correspondence courses in accounting, finance, economics, cost estimation, and others in order to improve their qualifications for promotion.

This book was written to provide a fundamental understanding of these economic topics in one volume. It is designed to provide the engineer with the necessary tools and pertinent references for each of the topics. The text may be used by students enrolled in a two- or three-semester-hour, senior-level process engineering economics or process design course. Chapters 3 through 10 may be used for a two-semester-hour course. For a three-hour course, it is suggested that all the chapters be covered. The book may also be used as a text for continuing-education courses or as a self-study text for practicing engineers who feel they need to have a better understanding of engineering economics. The text contains information of interest to all plant managerial personnel in manufacturing, maintenance, or general management positions.

As may be seen from the table of contents, the material in this book moves from accounting and financial reports to cost estimating—of both capital costs

and operating expenses—to economic analysis through time value of money, cash flow, depreciation, and taxes, and ultimately to profitability measures. For example in Chapter 4, “Estimation of Capital Requirements,” there is a section on sizing equipment, which is an important step in obtaining equipment costs. To assist in sizing equipment, rules of thumb have been included in Appendix B. The depreciation rules are the latest as of manuscript preparation. Sensitivity and uncertainty analysis are presented in simplified form based on errors in forecasting and are treated from a practical industrial standpoint. A feasibility-analysis case study is presented to illustrate the combination of all the foregoing techniques. Chapter 12, “Choice Between Alternatives and Replacement,” and Chapter 13, “The Economic Balance,” will be of particular interest to design and plant engineering groups. The emphasis in these chapters is on the engineering trade-offs. The book includes the “traditional” time-tested techniques as well as “new” economy techniques where appropriate. At the end of each chapter are practice problems.

The English system of units was used throughout this book, since most of the major chemical, petroleum, petrochemical companies, and equipment manufacturers in the United States use the English system.

Appendix A is a glossary of terms used throughout the text. Rules of thumb for preliminary sizing of process equipment are found in Appendix B. Equipment costs in algorithm rather than graphical format are presented in Appendix C, thus eliminating the need for graphs. Also, the algorithm format is adaptable to computer programs for estimating capital costs.

The late Vincent W. Uhl encouraged me to join him in the presentation of continuing-education courses, the content of which ultimately led to the topics in this book. I acknowledge the advice and encouragement of two colleagues, Professor Jim Turpin and Professor W. Roy Penney of the University of Arkansas. I also express appreciation to my wife, Mary, for her patience, counsel, and advice in the preparation of this manuscript.

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