



Process Plant Instrumentation: Design and Upgrade

By Miguel J. Bagajewicz

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This is the first in-depth presentation in book form of current analytical methods for optimal design, selection and evaluation of instrumentation for process plants. The presentation is clear, concise and systematic-providing process engineers with a valuable tool for improving quality, costs, safety, loss prevention, and production accounting.

From Chapter 1 Introduction

"Instrumentation is needed in process plants to obtain data that are essential to perform several activities. Among the most important are control, the assessment of the quality of products, production accounting... and the detection of failures related to safety. In addition, certain parameters than cannot be measured directly, such as heat exchanger, fouling or column deficiencies, are of interest. Finally, new techniques, such as on-line optimization, require the construction of reliable computer models for which the estimation of process parameters is essential.

"This book concentrates on the tasks of determining the optimal set of measured variables and selecting the accuracy and reliability of the corresponding instruments. The goal is to obtain sufficiency accurate and reliable estimates of variables of interest while filtering bad data due to possible instrument malfunction. An additional goal is to observe and diagnose single and multiple process faults."

From the Preface

"There is a vast amount of literature devoted to the selection and good maintenance of instruments. This literature covers the selection of the right instrument for a particular range and system, but only after the desired accuracy and reliability of measurement have been established. Little has been written on how to systematically determine the right accuracy and reliability needed when selecting an instrument, much less how much redundancy is needed for a particular system. The key variables that needed estimation come from control requirements, as well as monitoring needs for safety, quality control and production accounting. These are the starting points of the design methodology. This book concentrates on determining the optimal accuracy and reliability of

instruments and their location. To determine this, certain desired properties of the system of instruments are used as constraints while the cost is minimized. These properties, among others are variable observability, system reliability and precision of certain variables.

"This book is not a textbook. Rather it is intended to be an organized collection of the most relevant work in this area.... It has been written with the intention of making it readable by engineers with some background in linear algebra, mathematical optimization and graph theory. It is organized so that the complexity of the sensor network design is addressed step by step."

The information in this new book serves the needs of chemical and other process engineers involved in instrumentation and control, maintenance, plant operations, process design, process development, quality control, safety, and loss prevention.

Illustrations and Tables

The text is supplemented with more than 100 flow charts, diagrams and other schematics that illustrate procedures, systems and instrumentation. More than 70 tables provide useful reference data.

The Author

Dr. Miguel J. Bagajewicz brings to this new book his extensive experience in design, data management, teaching and writing in the area of process engineering. He received his M.S. and Ph.D. in Chemical Engineering from the California Institute of Technology. He is presently Associate Professor, School of Chemical Engineering and Materials Science, and Director, Center for Engineering Optimization at the University of Oklahoma. He is the author or co-author of more than 100 journal articles, conference presentations, and reports, and the author of articles on data reconciliation and sensor location in the Instrument Engineers' Handbook, fourth edition. He is a member of the American Institute of Chemical Engineers (AIChE), and on the executive committee of the Central Oklahoma Chapter.

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Process Plant Instrumentation: Design and Upgrade By Miguel J. Bagajewicz Bibliography

- Rank: #2283925 in Books
- Published on: 2000-11-27
- Original language: English
- Number of items: 1
- Dimensions: 9.26" h x 1.03" w x 6.32" l, 1.36 pounds
- Binding: Hardcover
- 362 pages

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