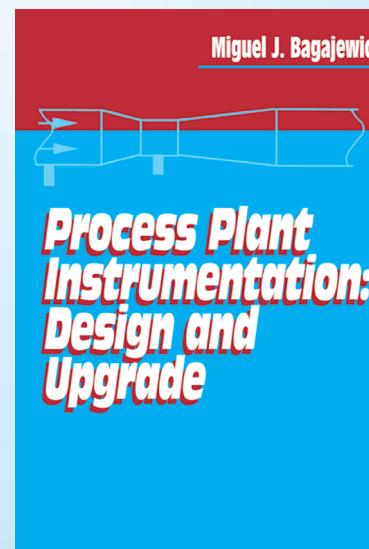## The Author

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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Miguel J. Bagajewicz, Ph.D.,
Associate Professor, School of Chemical Engineering and Materials Science, University of Oklahoma

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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 malfunc-

- Guide to assessment of process plant instrumentation needs, network design and upgrade, selection criteria, and reliability evaluation
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- Plant Data Management
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- Errors in Measurement
- Variable Classification
- Design and Upgrade Sensor Networks
- Data Reconciliation
- Design of Accurate Sensor Networks
- Precision Upgrade of Sensor Networks
- Reliability of Sensor Networks
- Design of Sensors for Process Fault Diagnosis

tion. 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."

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Contents

All chapters end with a section of References. Chapters 2–17 include a section of Nomenclature.

Index

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