PROCESS ANALYZER SAMPLE-CONDITIONING SYSTEM TECHNOLOGY

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ROBERT E. SHERMAN

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PREFACE

This text is intended to fill a long standing void for a main stream volume on the subject of process analyzer sample-conditioning system technology. It addresses the critical technology of the "**system**" for delivering a stream to the process analyzer as a "**representative sample of the process stream**".

The previous comprehensive text on this subject was the E. A. Houser *Principles of Sample Handling and Sample Systems Design for Process Analyzers*, ISA (1972). P. E. Mix, *The Design and Application of Process Analyzer Systems*, Wiley-Interscience (1984), and D. C. Cornish, G. Jepson, and M. J. Smurthwaite, *Sampling Systems for Process Analyzers*, Butterworths (1981), London, both had good coverage of this subject, but all three works are out of print. The Houser work can be obtained from the ISA Analytical Division (AD) through an arrangement with University Microfilms. ISA makes copies available for sale at a nominal cost (U.S. $35.00 each, 108 pages, soft cover).

Works published in the late 1980s each had a chapter dedicated to sample-conditioning. These include K. J. Clevett, *Process Analyzer Technology*, Wiley-Interscience (1986)—Chapter 20; and G. D. Nichols, *On-line Process Analyzers*, Wiley-Interscience (1988)—Chapter 11.

Several works published in the mid-to-late 1990s had one or more chapters dedicated to sample-conditioning. These include Gunnell, in F. McLennan and B. Kowalski (eds.), *Process Analytical Chemistry*, Blackie (1995) London—Chapter 2; Liptak and Liu, in B. G. Liptak (ed.), *Instrument Engineers' Handbook: Process Measurement and Analysis*, Chilton (1995)—Chapters 8.2 and 8.3; R. E. Sherman and J. G. Converse, in R. E. Sherman (ed.), *Analytical Instrumentation: A Practical Guide for Measurement and Control Applications*, ISA (1996)—Chapters 3 and 4; G. K. McMillan, in D. M. Considine's *Process Instruments and Controls Handbook: A Practitioner's Guide to Selection, Installation, and Maintenance*, 5th edition, McGraw-Hill (in press)—Chapter 6. A report issued in 1999 provided significant information to those who design sample-conditioning systems (International Electrotechnical Commission, *A Guide to the Design and Installation of On-line Analyzer Systems*, Report IEC 1831/TR Geneva). One volume published over the period 1972 to 1999 was dedicated to the subject of process analyzer sample-conditioning. That was the work by K. G. Carr-Brion and J. R. P. Clarke, *Sampling Systems for Process Analyzers*, 2nd edition, Butterworth Heinemann (1996), Oxford, England.

I have long felt that the process sample presented to the process analyzer should be of similar quality to the calibration material presented to the analyzer, except that the sample's composition is representative of the process at the time of sampling and analysis (which should be very nearly the same time in a properly designed sample conditioning system). In this volume I attempt to cover each part of a process analyzer sample-conditioning system in great detail. At the risk of dating this text, I offer two or more vendors for most items of equipment reviewed (Appendix A) unless the item is unique to a single manufacturer.

I have been working in the field of process analyzers since 1972 and have not yet made all possible mistakes, although colleagues and customers may argue to the contrary! This volume should provide the novice in this field a basic source of design parameters and performance-proven components while also providing

the experienced technologist in this field a valuable reference source to complement experience gained to date.

As best I can see around me, there are many fewer process analyzer practitioners now than there were in the past. Cheers to the many who have traveled this path before us. May this volume benefit the few yet to travel this path after us. Thanks to My Wife for understanding the hundreds of hours for writing this work.

Robert E. Sherman