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AIChE
Three Park Avenue
New York, NY
10016-5991
www.aiche.org

The Importance of Measurement

Last month's cover feature was the Back to Basics article, "Measuring Temperature by Direct Contact." Now, in this issue, you'll find two articles that include the quote, "if you can't measure something, you can't manage it."

In "Using Automation to Produce Quality Pharmaceuticals" (pp. 19–26), Joseph Alford explains how process automation based on online monitoring, measurement, and analysis can help the pharmaceutical industry meet customer expectations. He points out that Process Analytical Technology (PAT) can use real-time measurements, models, and the programmed knowledge of subject matter experts to increase online decision-making, which yields such benefits as reduction of manufacturing time, more-consistent processes, and ultimately higher-quality products.

This approach and the general-purpose automation systems that implement it are not new to chemical engineers involved with continuous, steady-state processes. However, many pharmaceutical processes operate in batch mode and involve a large number of manual operations. Furthermore, drug quality often depends on parameters that are difficult to measure in real time (such as the dissolution rate of a tablet) or correlate with the measurements that are available online (*e.g.,* pH). Alford explores some of the benefits of automating such processes and the challenges involved in doing so.

"Reduce Your Compressed Air Costs," by Ron Marshall and Bill Scales (pp. 28–33), points out that the cost of energy to operate a compressed air system is usually much higher than the capital cost of the equipment — in many cases, exceeding the purchase price in the first year of operation. The authors outline a seven-step plan for identifying and implementing efficiency measures that can cut costs. A key element of the plan is developing the system baseline — *i.e.,* taking measurements of power input, pressures, air flowrate, and leakage load to determine the efficiency of the compressed air system. This establishes the current system status, and is the reference point against which the performance of any improvements is evaluated.

The technologies discussed in another article in this issue, "Understand the Fundamentals of Wastewater Treatment," by Mukesh Doble and Venkatachalam Geetha (pp. 36–42), also depend on measurements — the physical, chemical, and biological properties of a wastewater stream. And, if you go back to previous issues, you'll find that almost every technical article in *CEP* (even those that do not include some form of the word measure in their titles) covers a subject for which measurements are essential.

Virtually every task undertaken by a chemical engineer — whether research, design, operations, management, or some other activity — has some type of measurement as its foundation. The foundation of chemical engineering is knowing what measurements to take, and what to do with the measurements.

As I was writing this editorial, I came across another quotation that states the importance of measurements even better than the one cited previously:

"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it." ~ H. James Harrington

Cynthia F. Mascone, Editor-in-Chief