Modern Control Started with Ziegler-Nichols Tuning

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When two engineers at Taylor Instrument Co. decided to document the work they had done in finding ways to tune process controllers, they changed the whole control industry.

Up until 1940, most tuning of process controllers was an art conducted by seat-of-the-pants methods on controllers that were a hodge-podge of techniques or add-on components that defied any rigid rules that could be universally applied.

One of the engineers at Taylor was John G. Ziegler, the practical one of the pair with a lot of experience in process applications, and who performed all the simulator tests that led to the methods they were seeking. The other was Nathaniel B. Nichols who was the mathematician and who reduced all of the math to a few simple relationships that could be understood by technicians and operators.

The result was the now famous "Ziegler-Nichols" method of tuning controllers—a method that survived the slings and arrows of its early detractors, withstood the test of time, and works just as well as many of the later, more sophisticated optimizing forms on a great majority of process applications. Most of the work was done in 1940, a paper entitled "Optimum Settings for Automatic Controllers" was formulated and presented in December 1941 at the annual meeting of the American Society of Mechanical Engineers.

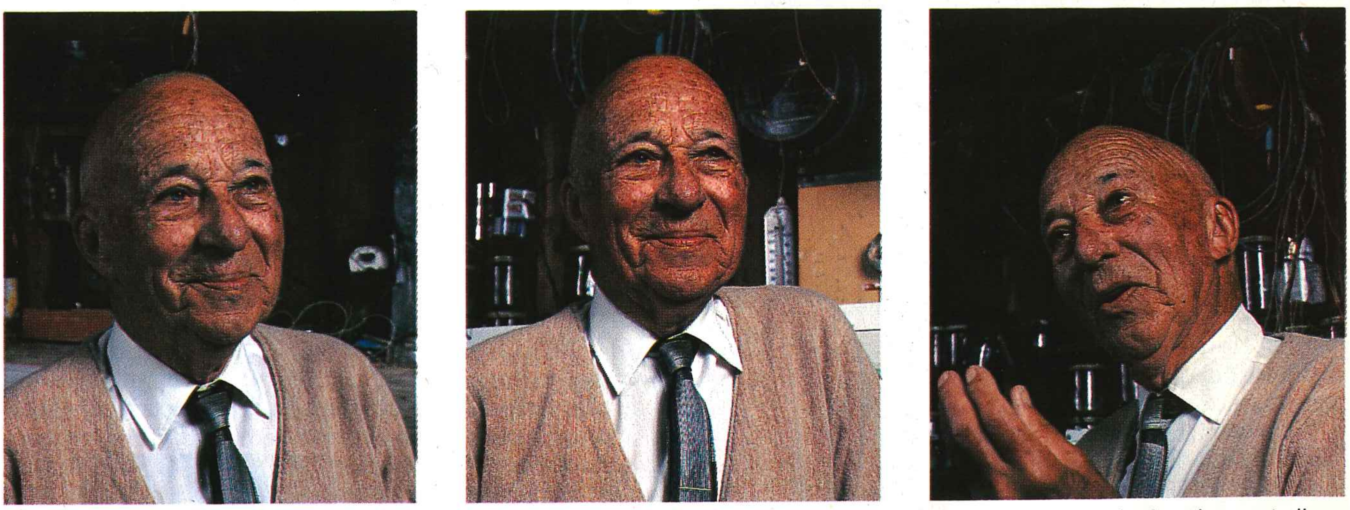
It must be remembered that all of this was done before the theory of servomechanisms was developed, and the paper presented some new terms to the industry, as well as the first—but eminently practical—rules for tuning.

John Ziegler worked for 36 years for Taylor—now known as ABB Kent-Taylor, and still headquartered in Rochester, N.Y., and retired in 1972. We tracked him down to his little piece of real estate on the side of a hill in Walnut Creek, Calif., with a great view of Mount Diable. His shop and lab, as well as his considerable vegetable garden, makes one wonder what the word "retired" means. We asked Mr. Ziegler a few questions, the answers to which may give us some feel for how the roots of present-day automatic control were formed.

What were the predecessors to the integrated three-term PID controller? What were some of the principles used?

The earliest Taylor controller was the Model 10R which was a nonindicating, or blind, proportional controller. It used either a pressure capsule for pressure control or a vapor temperature bulb for temperature control. The set point was changed mechanically by a cam which operated a poppet valve air relay.

This evolved into a recorder, but some people insisted that you could not use the same thermal tube system



John G. Ziegler (above) and Nathaniel B. Nichols (not shown) were the founders of the Ziegler-Nichols method of tuning controllers.