Next Generation Regulatory Controller for Chemical Processes

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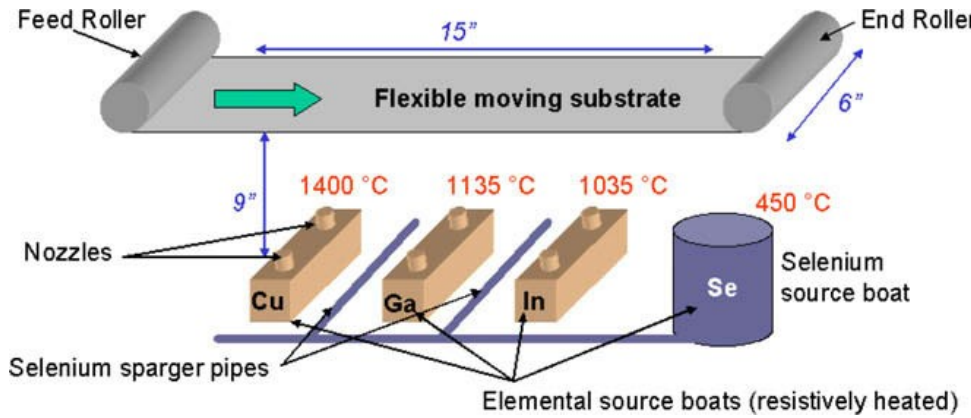
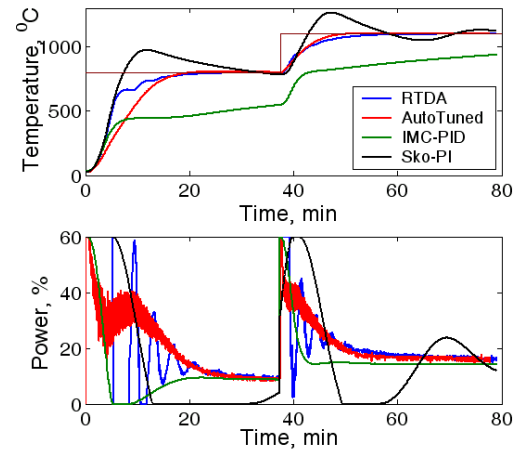
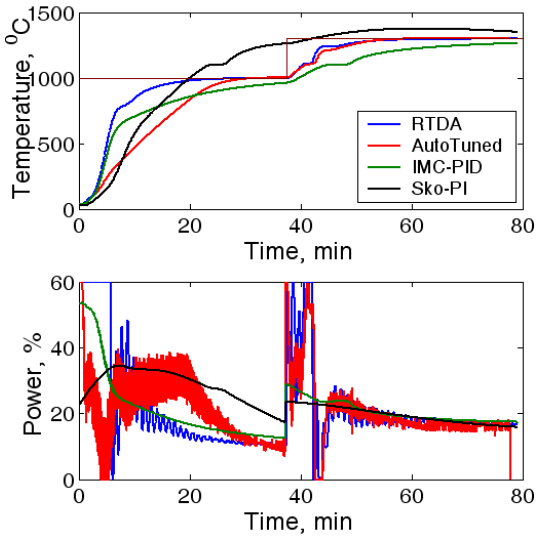
Meeting the stringent demands on manufacturing processes in the 21st century effectively requires a fundamentally re-imagined alternative next generation regulatory controller that takes proper advantage of modern digital electronic technology to overcome the weaknesses of current PID controller technology



Application on a pilot-scale PVD process: Gallium Source Temperature control



Application on a pilot-scale PVD process: Copper Source Temperature control



In the second phase of this work we have built on the results of the first phase (namely: the actual development of a 4-mode control scheme; and the development of easy-to-apply tuning rules) and thoroughly evaluated the controller's performance on a laboratory scale water tank, and on a more complicated pilot-scale physical vapor deposition (PVD) process that is prototypical of 21st century manufacturing. Both sets of experimental results demonstrate the ease of tuning and superior performance of this controller vis-á-vis that of the PID controller tuned using various techniques. Especially with the PVD process, where the process operation requirements were virtually impossible to achieve with the PID controller, the RTDA controller consistently performed as designed, enabling the achievement of the manufacturing objectives, as predicted by the theoretical analyses.