Combined Run-to-Run and Real-time Multivariable Control for Wafer Temperature Uniformity in a 12-inch RTP Equipment

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A combined run-to-run (R2R) and LQG control method has been proposed for a rapid thermal processing (RTP) equipment. The standard LQG objective was modified to include a quadratic penalty term for input deviation from a bias value, which provides the handle of R2R control for improvement of the wafer temperature uniformity. The LQG technqiue has been applied to a commercial 12-inch rotating RTP equipment and resulted in quite precise control performance. Combined R2R and real-time LQG control technique was applied to a non-rotating thermocouple-attached wafer and found to perform as anticipated.