



ONLINE RELAY AUTOMATIC TUNING OF MULTI-LOOP PI CONTROLLERS

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ABSTRACT—In this paper, an approach for online relay automatic tuning of multi-loop PI controllers is described for multivariable processes. In the absence of significant inter-loop cross-coupling, only one closed-loop experiment may be necessary to tune the controllers to achieve specified closed-loop characteristics. When the inter-loop interaction is significant, multiple relay experiments can be conducted to derive a process model, based on which both the decoupler and the multi-loop controllers can be designed. Simulation examples (on two-inputs-two-outputs (TITO) processes) and a real-time experiment are provided to illustrate the practical appeal of the proposed method. The performance is compared to multi-loop control design based on the *Biggest Log Modulus* (BLT) method.

Key Words: autotuning, PI controller, cross-coupling, decoupler, interactions