

# CONTROLLABILITY OF PROCESSES WITH LARGE GAINS

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Abstract: There is some disagreement in the literature on whether large plant gains are a problem or not when it comes to input-output controllability. In this paper, the effect of input errors is studied and controllability requirements are derived. The input disturbances can be attenuated by the use of high gain feedback at frequencies where the gain is large, but this may not be possible. The nonlinear effect of limited input resolution causes limit cycle behavior similar to that found with relay feedback. The magnitude of these limit cycles depends on the high-frequency process gain, but is independent of the controller tuning and it can be reduced by pulse modulating the input signal, but this may cause excessive input movement. Thus, large gains at frequencies corresponding to the closed-loop bandwidth may cause control problems, but large steady-state gains are not by themselves a problem.

Keywords: High gain, input disturbance, valve resolution, quantizer, limit cycle, controllability, PI-controller.

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