**Setup Adjustment Under Unknown Process Parameters and Fixed Adjustment Cost**

Zilong Lian and Enrique Del Castillo

**Abstract**

Consider a machine that can start production off-target where the initial offset is unknown and unobservable. The goal is to determine the optimal series of machine adjustments that minimize the expected value of the sum of quadratic off-target costs and fixed adjustment costs. Apart of the unknown initial offset, the process is supposed to be in a state of statistical control, so the process model is applicable to discrete-part production processes. The process variance is also assumed unknown. We show, using a dynamic programming formulation based on the Bayesian estimation of all unknown process parameters, how the optimal process adjustment policy is of a deadband form where the width of the deadband is time-varying and U-shaped. Computational results and implementation details are presented. The simpler case of a known process variance is also solved using a dynamic programming approach. It is shown that the solution to this case is a good approximation to the first case, when the variance is actually unknown. The unknown process variance solution, however is the most robust with respect to variation in the process parameters.