Identification Vital Few Causes of Variation in an Industrial Terephthalic Acid Manufacturing Process

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We propose a systematic decision procedure which helps us to identify vital few causes (VFCs) of quality problem in an industrial terephthalic acid process. The previous process improvement strategies require significant time of analysis when applied to a large-scale chemical process with complex causal relationships because they are limited to the finding of simple heuristics to identify VFCs. On the other hand, the conventional variable selection methods cannot guarantee their performance to identify the reasons of the empirical correlation. The proposed stepwise decision procedure enables to reduce analysis time since the focus is systematically shifted to the significant causes for variation. Additionally, accuracy of the identified VFCs is improved using a causal analysis based on technical knowledge as well as a correlation analysis based on a statistical hypothesis test. This procedure has been successfully applied to purified terephthalic acid (PTA) process to discover VFCs. The identified VFCs have been validated, and they have greatly contributed to improve the degraded process.