

# Characterization of Water Reclamation Plant Influent: An Application of Cluster Analysis

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## Abstract

Water reclamation plants (WRP) face the challenging task of simultaneously managing fluctuating influent conditions and satisfying effluent discharge requirements. To better prepare WRP operators for this task, we combined k-means cluster analysis with cross-tabulation analysis to develop an influent classification system for the Calumet WRP in Chicago, IL. We considered weather and influent composition characteristics to identify 25 clusters, nine of which were significant (99% confidence level). For example, dry weather with mid-range temperature characteristics are common after wet weather days, and these conditions typically present low influent concentrations. In addition, compared to cold-weather characteristics, warm-weather flows are more likely to have large precipitation events and more variation in influent quality. The duration of storm events is also important for planning. Large storms during warm weather feature relatively low influent concentrations and have a high probability of lasting only one day, whereas warm and dry-weather conditions that bring relatively high influent concentrations have a high probability of lasting more than one day. We believe the approach used in this study can be replicated and will provide useful risk management information at other WRPs.