

## Efficiency of Background Chlorine Residuals against Accidental Microbial Episode in Proto-Type Distribution Network (Rig) Using Central Composite Design (CCD)

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**Abstract :** A quadratic model ( $p < 0.0001$ ) was developed by using central composite design of 50 experimental runs (42 non-center + 8 center points) to assess efficiency of background chlorine residuals in combating accidental microbial episode in a prototype distribution network (DN) (rig). A known amount of background chlorine residuals were maintained in DN and a required number of bacteria, Escherichia coli K-12 strain were introduced by an injection port in the pipe loop system. Samples were taken at various time intervals at different pipe lengths. Spread plate count was performed to count bacterial number. The model developed was significant. With microbial concentration and time ( $p < 0.0001$ ), pipe length ( $p < 0.022$ ), background chlorine residuals ( $p < 0.07$ ) and time<sup>2</sup> ( $p < 0.09$ ) as significant factors. The ramp function of variables shows that at the microbial count of  $10^6$ , at 0.76 L/min, and pipe length of 133 meters, a background residual chlorine 0.16 mg/L was enough for complete inactivation of microbial episode in approximately 18 minutes.

**Keywords :** central composite design (CCD), distribution network, Escherichia coli, residual chlorine

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