Placement of Booster Chlorinator based on water age analysis for the dead-end sections of drinking water distribution network

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The quality of drinking water supplied is as important as reliable supply of water to the people. The key challenge for disinfection lies in maintaining the chlorine level within the permissible limits throughout the water distribution network (WDN). In the event of insufficient chlorine level, excessive biofilm growth is observed whereas at higher chlorine levels disinfectant by-product (DBP) are formed. Designing a single dosing unit at the source exit may not be provide the required optimal chlorination with chlorine. Thus, a system of intermediate chlorination points is necessary to facilitate required concentration of disinfectant in the network. Towards this end, this study proposes a method to identify the locations for booster chlorination based on the water age analysis. The water quality simulation is carried out in the EPANET and the proposed method uses minimum and maximum time required for inter-nodal flow in the WDN. Based on this, the locations of chlorination points in the WDN is optimized using Genetic Algorithm, with the constraints on maximum and minimum chlorine level. The proposed model is superior in terms that it does not require multiple hydraulic and quality simulations during the optimization procedure. The algorithm and the matrix model we have developed were successfully applied to Guwahati water network which is under partial commissioning of 16 district metered area (DMA). This model minimizes the intensive computational effort required for optimal dosing of chlorine in the water distribution network.

A model proposed booster chlorinator location in the Guwahati network is shown in figure 1, where the location is identified based on the matrix, which fulfils the requirement of proper chlorine level in all the locations.

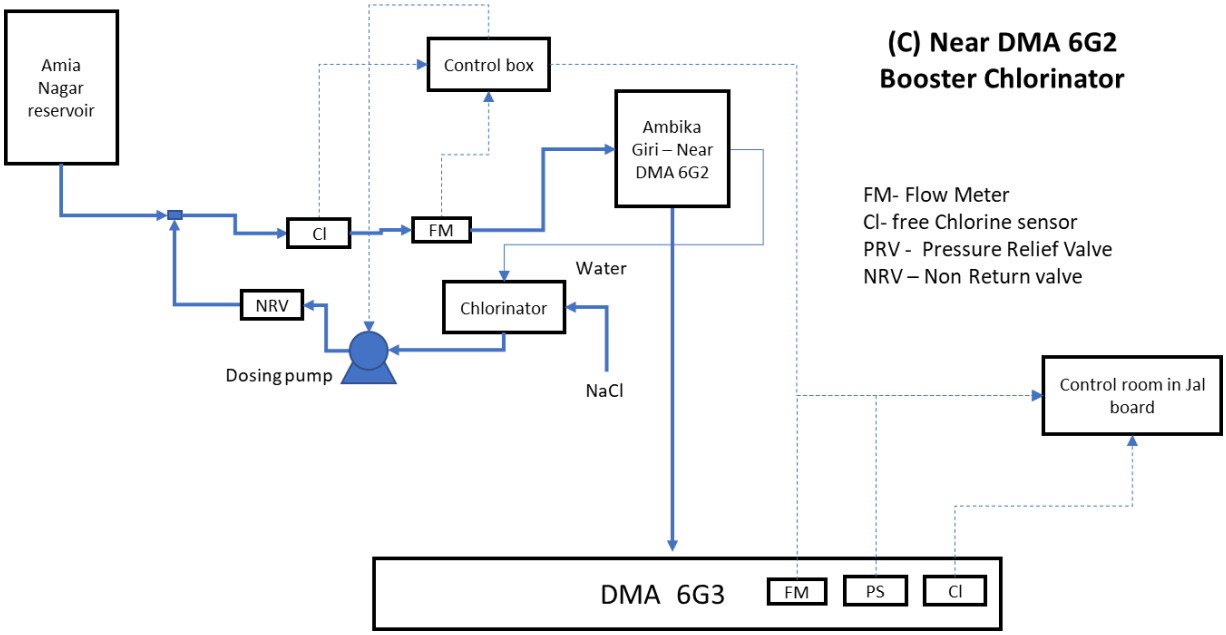

Figure 1 Placement of Booster Chlorinator

Keywords: EPANET; water age analysis; Genetic algorithm; Booster chlorination; WDN optimization;