Robust Water Distribution System using Minimal Spanning Tree Algorithm

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Abstract

People living in Numan town draw water for use from River Benue and other sources. An integrated water distribution system is currently needed in place that can supply adequate water to the entire community. The government of Adamawa State had been planning to bring pipe-borne water to the town but unfortunately not much had happened in regard of achieving this noble objective. The objective of this paper is to design an efficient water distribution system that will connect 15 nodes (pumping stations) in the town with a network of pipe lines to ensure that the total branch length is minimized. This will guarantee an optimal distribution of water from source of origin to demand destination at a minimum cost. The problem is viewed as a typical case of network optimization problem. A greedy algorithm is employed to accomplish this objective. Firstly, the problem is converted into a Minimal Spanning Tree (MST) which involves using the edges of the network to reach all the vertices of the network in such a fashion that the total length of all the edges is minimized. The paper shows a combined length of fourteen point five (14.5 km) kilometer of pipe as against thirty five point five (35.5 km) kilometer in earlier proposed TCIA [10]. The capacity to deliver water is tremendously enhanced, since all
the fifteen pumping stations are connected. This will allow maintenance to be carried out easily and routinely, since the possibility of the system to dispense leakages is greatly minimized. The total distance is shorten by twenty one kilometer (21km). The paper is the first to design a water distribution system using minimal spanning tree algorithm in Numan town.

References

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Index Terms

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Planning, piped water, optimization tool