CALIBRATION MODELS OF WATER DISTRIBUTION NETWORKS FOR PRESSURE FORECASTING.

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Abstract
In recent years, the scenario designed by water scarcity points to the need for a rational exploitation of this resource. As a strategy for better operation, computational models have applied in several fields of knowledge. However, for the good application of the models, the adjustment of a parameters’ set are required. This adjustment is so-called calibration. Calibration involves a high degree of freedom, with a large number of variables involved, taking into account a deficient set of known values represented by the pressures in the monitored nodes, Which makes the problem indeterminate. Looking to know and measure the loss of precision in current water network hydraulic models, this research proposes to compare the accuracy of a simplified network, built from nodal demand aggregation, with a complete network, modeling the measured demand at all nodes.

Key words: Water distribution networks, hydraulic model, demand aggregation.

Introduction
Basic sanitation and, in particular, the water supply systems, is a fundamental participant in the proper and healthy development of cities and a basic component in the concept of intelligent city management. In developing countries, such as Brazil there are significant losses of energy and treated water, showing a scenario against this concept. According to the Brazilian Association of Sanitary and Environmental Engineering (ABES, 2013), the water losses (real and apparent) in the Brazilian scenario are around 40% in the last twelve years and surpassing 60% in some sanitation companies. The largest part of these losses are leakage results in the distribution networks.

Computer models are important helpers for network control. They facilitate the location of leaks, estimate consumption and, consequently, improve the management of the distribution network.

The computational models used group the demands on some specific nodes, simplifying the network, facilitating the processing of data as well as the duration of the process. This simplification limits the control over the network, for example, by reducing accuracy in the leak location.

This paper proposes the study of calibration models present in the literature comparing a simplified network, predominantly used with a complete network, where the hydraulic calculations procedure will be performed in Epanet Tookit (Rossman, 2000).

The entire process was based on a real network. The data used are all real too, collected hourly by meters distributed throughout the network.

Results and Discussion
The network used in the project is located in Santa Barbara do Oeste - SP, Brazil. The network has a total of 223 nodes and 231 pipes, each consumption point having a meter that collects the consumption hourly. The data used in the project were collected in the months of January and February of the year 2017. The base demand was calculated from the average hourly consumption of the months of January and February. The factors were obtained by calculating the average consumption of the hour in question and divided by the already calculated base demand, thus constructing the demand factor curve of each meter.

The work elaborates two models of the same network by different analyzes. One considering all values of demand node and another simplified network with nodal demand aggregation. The detailed model is an unusual analysis due to the amount of resources spent to install flowmeters for all consumers. While with flowmeters only on some nodes, grouping the demand values into only a few nodes, which is the most common analysis.

Conclusions
The proposed model was crucial to improve current knowledge about the hydraulic models used, increasing the degree of detail from the precision used in the demand. With the research it was possible to know the behavior of the time pattern of individual consumption, facilitating the prediction of leaks by changes in this pattern and reducing losses and facilitating maintenance of the network.

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