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Drinking Water
Engineering and Science
Discussions

Interactive comment on "Prelocalization and Leak detection in water drinking distribution network using modeling-based algorithms: Case study: The city of Casablanca (Morocco)" *by* Faycal Taghlabi et al.

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On behalf of the authors, I would like to thank the Editor-In-Chief and the reviewer Pr Said RHOUZLANE The comments are addressed below. They will be incorporated into the revised version of the manuscript. Line 61 you have mentioned "Concerning the instrumentation, the network flow and pressure are monitored through flowmeter" the study area is it moduled, micro-moduled, how many critical points, measurement points ?? all this is not clear in your article

The study area is a very low area which is at an average NGM level of 6 m above sea level, it is supplied by a semi buried reservoir which is at the NGM 85 m level, with 4 m in height, around 88 hydraulic head., which generates significant pressure at night (outside normal hours of consumption), the sector also experiences a significant night flow and a high frequency of recurrence of leaks for these three reasons, the study area was modulated, but this first modulation has not halted the reappearance of leaks, this is why, it underwent a second pressure modulation in order to reduce the breakage rate, in indeed the area today is micro modulated. The sector contains a single critical pressure point that is continuously monitored.

line 63 Âń The average age is 40 years, increasing vulnerability and promoting leaks Âż you have to descreibe more scientifficaly. You have to write and talk to selection criteria: (you need to talk about the performance indicators for this area, MNF, ILP for example)

The study area of about 42 km has a significant minimum night flow around 40 LPS between 2:00 and 4:00 in the morning, which implies a high probability of the presence of physical losses as illustrated in Figure 1 below .

Figure 1 MNF in the study area

The study area has a very high linear loss index (ILP) of around 54 m3 / d / km, which implies a very poor network condition.

Line 110 "Roughness coefficient of materials" Physical modeling of your network requires the roughness of the pipes. It should be noted that there is great uncertainty about the values considered. How did you minimize these uncertainties and their impact on the results given by EPANET. Different factors are attributable to the uncertainty of the pressure measured on the network, the most important of which is the fluctuation of the pressure in the network. According to the pressure differences observed on the ground when determining roughness, according to the work of Paquin et al., (2000) this error is estimated at 0.3 mCE. Regarding the error in modeling the reference pressures, a value of 0.2 mCE is considered realistic. The total uncertainty related to the pressure difference between the measured pressure and the reference pressure is therefore 0.5 mCE. The results which have been presented come from a model established from data collected in the field and at the level of a pipe section. This data is believed to be accurate or with great precision, while the rest of the network has some level of uncertainty. This is the case for the roughness of the pipes, the elevations of the nodes and the consumption of the residences. Various factors including the measuring devices and the state of equilibrium of the network can influence the accuracy of the value of the roughnesses measured in the field, as well as for the estimation of roughness for the other conduits of the network. The following figure presents 3 curves which correspond to the pressure drop caused by a leak in the middle of a pipe without a junction, one with roughness as measured in the field, and two others with limit values taking into account a +/- 10% error related to this parameter (ÔŘ + 10%, ÔŘ –10%).

Figure 2 Influence of the error on the roughness of the pipe

When the roughness is increased, the pressure difference caused by a leak is greater. Conversely, when the pipes are smoother (plastic), the pressure difference decreases. Leak detection by the method studied therefore seems more promising on networks whose hydraulic capacity is weakened by corrosion rates.

Line 119 , 120 you have mentioned “. Dynamic simulation is used to describe the operation of the network during a given period, while considering the variation in customers' consumption over time.” Physical modeling of your network requires consumption at nodes. It is important to indicate how you estimated this parameter. It should be noted that there is great uncertainty about the nodal distribution of the study area. How did you develop your consumption patterns for dynamic modeling?

To calculate demand, we base on the billing sectors. The billing sectors correspond to former consumer sectors, and not to the current sectorization. The following figure shows the succession sectors of the study sector.

Figure 3 Billing sectors intersecting with the study area

And even though they do not coincide with the hydraulic sectors specific to the sectoring, we proceed to the calculation of the intersections of the surfaces of these billing sectors with the perimeter to be evaluated to determine their reference volumes Eq (1):

Q_moy (secteur 1)=$\sum (S\_iS\_(secteur1))/S\_i * Q\_(moyi)Eq(1)$

The average flow of each billing sector will then be divided by the number of nodes in this sector and the value will be assigned to all of them so as to have a spatial distribution of consumption close to reality.

âĂć The consumption pattern: This is the daily consumption profile at all the nodes in our sector, we build it from the total flow of our sector imported from the network manager database. The following graph represents the raw signal of the measurement: We proceeded to smooth the curve by moving average of period 7 in order to eliminate small variations and we reported the flows in time steps 30 min then we plotted the daily average consumption of the sector. The multiplying coefficients are calculated by dividing the hourly flows by the daily average in Figures 4 and 5.

Figure 4 flow in the study area with calculation of the average

Figure 5 Curve of pattern demand

Line 135 you have mentioned that you have used the Matlab-software, For EPANET code, please find a better reference For EPANET code, the original work based on: D.G. Eliades, M. Kyriakou, S. Vrachimis and M.M. Polycarpou, "EPANET-MATLAB Toolkit: An Open-Source Software for Interfacing EPANET with MATLAB", in Proc. 14th International Conference on Computing and Control for the Water Industry (CCWI), The Netherlands, Nov 2016, p.8. (doi:10.5281/zenodo.831493).

Line 240 you have mentioned “The model was calibrated without errors” What are the calibration data for your model? Discuss them clearly In the report, I have mentioned just the pressure calibrating, the calibration is also made against the flow at the three inputs of the study area, below the correlation curves of the two parameters figure 6 and 7.

Figure 6 Correlation for flow

Figure 7 correlation for pressure

Line line 241 the calibration results of pressure are presented, you need to complete with the flow calibration

the figure below shows the average demand curve at one of the three inlets.

Figure 8 flow rate calibration

Please also note the supplement to this comment:
https://www.drink-water-eng-sci-discuss.net/dwes-2020-3/dwes-2020-3-AC2-supplement.pdf

Interactive comment on Drink. Water Eng. Sci. Discuss., https://doi.org/10.5194/dwes-2020-3, 2020.

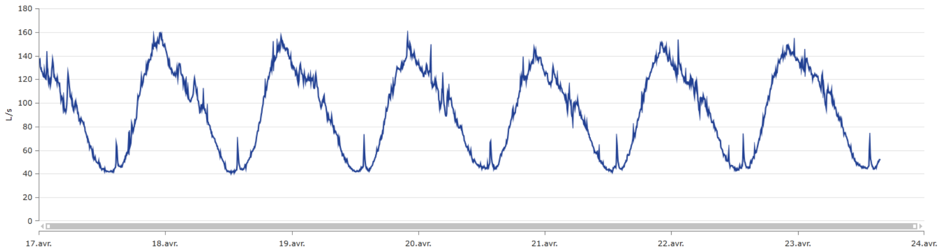


Fig. 1.

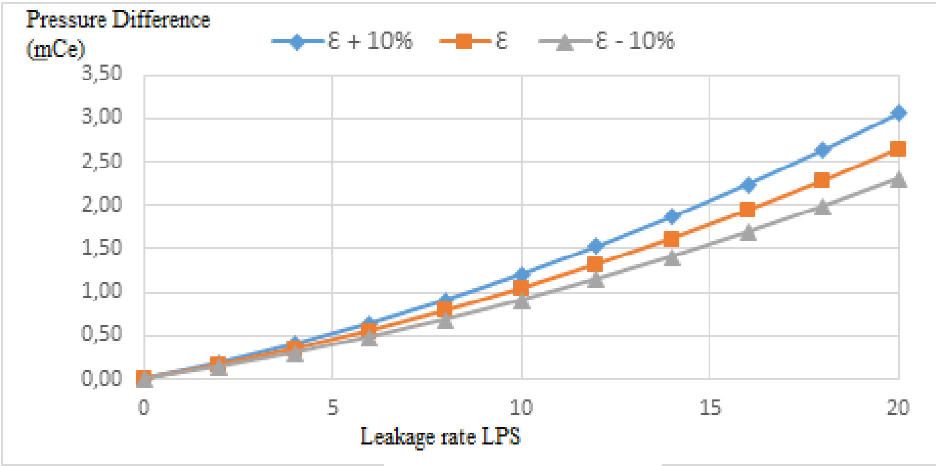

Pressure Difference
(mCe)
Ɛ + 10%
Ɛ
Ɛ - 10%
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
0
5
10
15
20
Leakage rate LPS

Fig. 2.

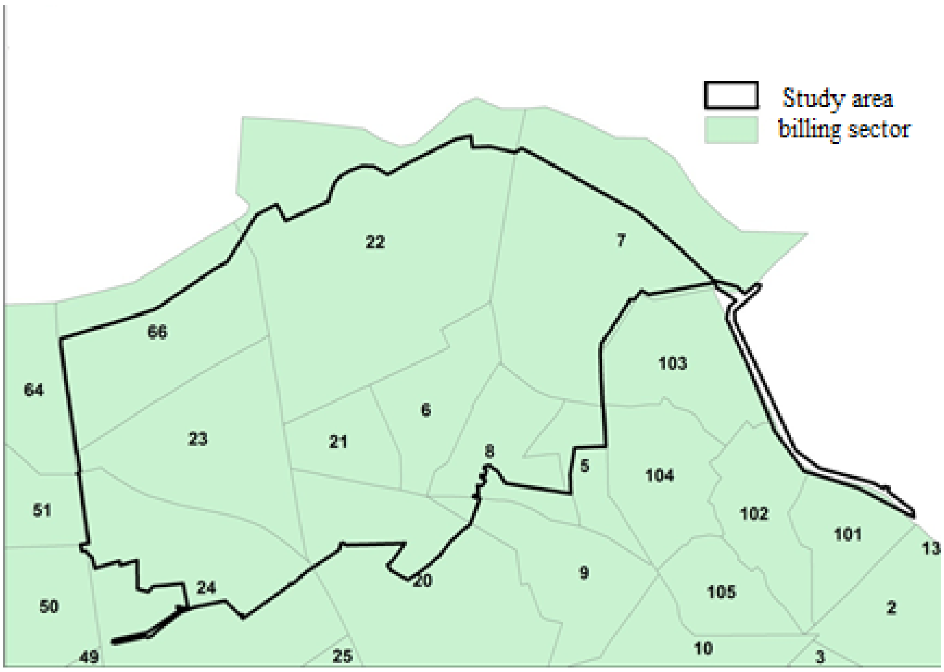
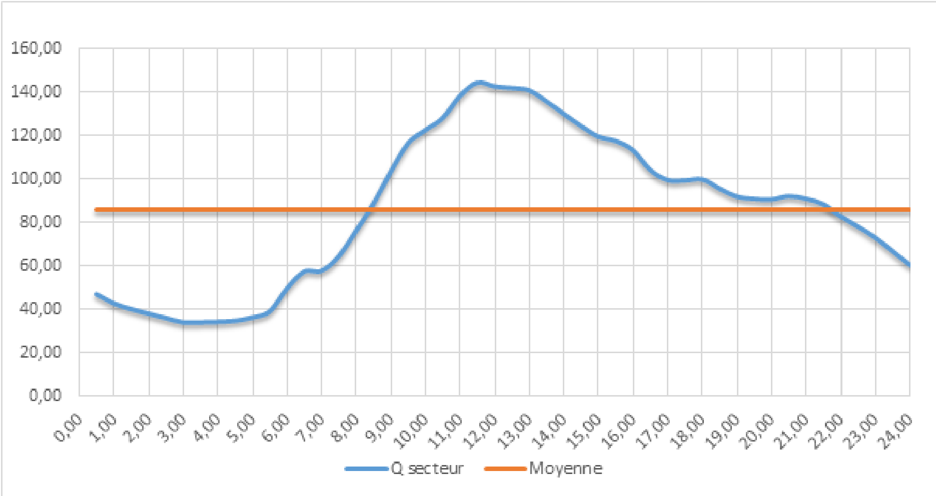

Study area
billing sector
22
7
66
103
64
6
23
21
8
5
104
51
102
101
13
24
20
9
50
105
2
49
25
10
3

Fig. 3.


160,00
140,00
120,00
100,00
80,00
60,00
40,00
20,00
0,00
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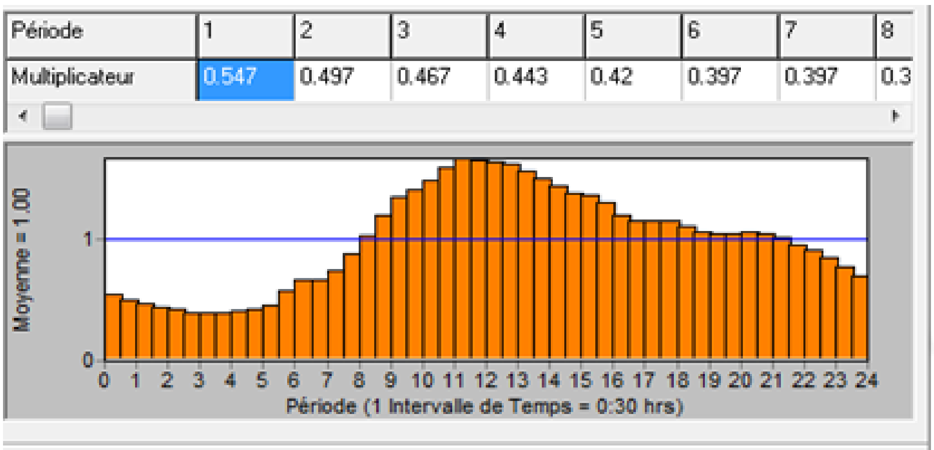
Q secteur
Moyenne

Fig. 4.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Multiplicateur 0.547 0.497 0.467 0.443 0.42 0.397 0.397 0.3
Moyenne = 1.00
1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Période (1 Intervalle de Temps = 0:30 hrs)

Fig. 5.

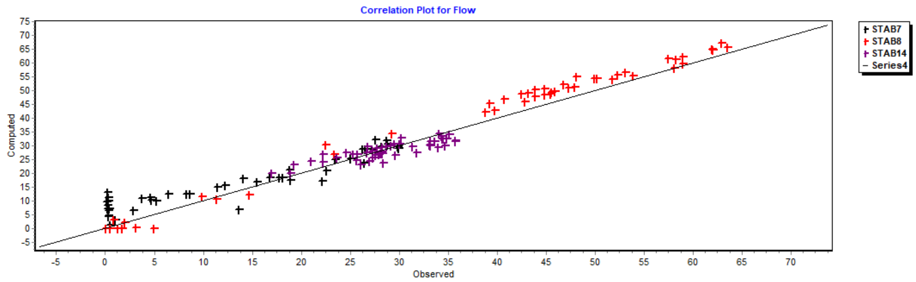
Correlation Plot for Flow
Computed
Observed
STAB7
STAB8
STAB14
Series4

Fig. 6.

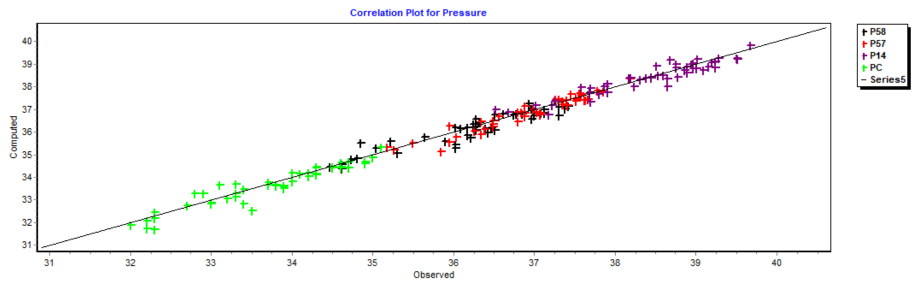
Correlation Plot for Pressure
Computed
Observed
P58
P57
P14
PC
Series5

Fig. 7.

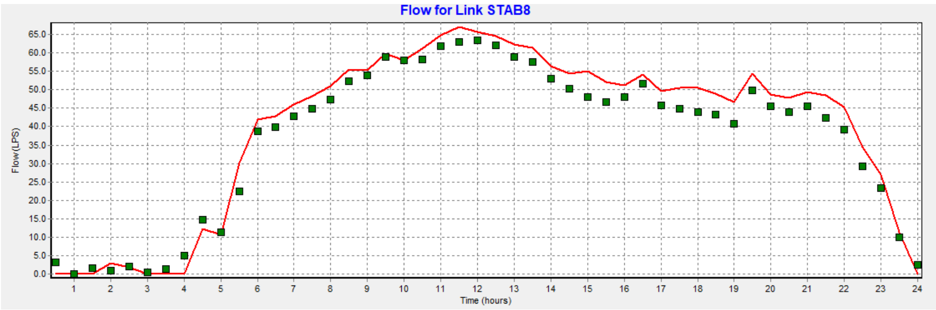

Fig. 8.