**Supplementary Materials. Additional Explanations for the Case Study**

The case study analyzed in the manuscript was taken from [1], this Appendix intends to describe the case study as much as possible to improve readability.

1. Basic Data

Figure 1 shows the network layout while Table 5 shows the node and line data. The simulations were carried out using the EPANET 2.0 toolkit [2].



**Figure 1**. The general layout of the network.

**Table 1.** Line and node data.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Line** | **Length (km)** | **Diameter (mm)** | **Node** | **Base demand (l/s)** | **Elevation (m)** | **Emitter****coefficient****(m3-α/s)** |
| 10 | 2 | 400 | Node 10 | 0 | 5.8 | 0.003992878 |
| 11 | 2 | 300 | Node 11 | 5 | 5.8 | 0.015971513 |
| 12 | 2 | 350 | Node 12 | 5 | 4 | 0.015971513 |
| 21 | 2 | 200 | Node 13 | 3 | 2 | 0.015971513 |
| 22 | 2 | 200 | Node 21 | 5 | 4 | 0.019964391 |
| 31 | 2 | 200 | Node 22 | 6.5 | 2 | 0.023957269 |
| 111 | 4 | 200 | Node 23 | 5 | 0 | 0199643910 |
| 112 | 4 | 250 | Node 31 | 3 | 4 | 0.011978634 |
| 113 | 4 | 300 | Node 32 | 3 | 5 | 0.015971513 |
| 121 | 4 | 200 | Node 33 | 3 | 0 | 0.011978634 |
| 122 | 4 | 200 | Reservoir | - | 25 | - |
| 123 | 4 | 200 | Tank | - | 32 | - |
| 32 | 2 | 200 |  |  |  |  |
| 1 | 2 | 400 |  |  |  |  |

**Table 2.** Hourly coefficients of water demand modulation.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| Coefficient | 0.6 | 0.5 | 0.45 | 0.45 | 0.5 | 0.5 | 0.9 | 1.3 | 1.4 | 1.1 | 1.5 | 1.4 |
| **Time** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** |
| Coefficient | 1.4 | 1.45 | 1.45 | 1.3 | 1.2 | 1.2 | 1.1 | 1.1 | 1.2 | 1.1 | 0.9 | 0.7 |

The pipe roughness was 0.1 mm. The diameter of the compensation tank was 20 m, and its level oscillates between 2.5 m (initial value for the simulation) and 7 m (maximum value). The minimum node pressure (22 mcw) was maintained by a pump (characteristic curve:
($H=93.33-0.003646⋅Q^{2}$). The pump starts and stops when the water level reaches the limits in the tank.

The leakage flow rates at the nodes were determined supposing that they are proportional both to the pressure in the node (pressure driven demand) and to the length of the pipes linked to it (uniform distribution). Additionally, the continuity equation needs to be fulfilled (and therefore the sum of all volumes leaked through the nodes must be in accordance with the water audit results). Each nodal leak was characterized through the corresponding emitter, which is adjusted by successive approximations in a quick convergence method described in Almandoz et al. (2005) [3]. The characteristics of the emitters follow the EPANET model $q\_{li}(t\_{k})=C\_{E,i}⋅\left[ΔH\_{i}(t\_{k})\right]^{α}$ [2], where$C\_{E,i}$ (m3-α/s) is the coefficient assigned to each node, and $α$ = 1.2 is the emitter exponent that models the characteristics of the pipe material. The resulting emitters’ coefficients are also depicted in Table 1.

**References**

1. Cabrera, E.; Pardo, M.A.; Cobacho, R.; Cabrera, E. Energy audit of water networks. *J. Water Resour. Plan. Manag.* **2010**, *136*.

2. Rossman, L.A. EPANET 2: users manual. **2000**.

3. Javier, A.; Enrique, C.; Francisco, A.; Enrique, C.; Ricardo, C. Leakage Assessment through Water Distribution Network Simulation. *J. Water Resour. Plan. Manag.* **2005**, *131*, 458–466.