Frequently Asked Questions

on the **Battle of Background Leakage Assessment for Water Networks (BBLAWN)**

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Q1 - Is this a onetime intervention update/design or the problem should be treated as a rehabilitation scheduling? In other words, should the network update be planned only for one year or I have to plan the updates through the network lifetime? In the latter case the network life span should be specified. [Thanks to Ehsan Roshani]

A1 *- This is a onetime intervention; this is why any time horizon or network lifespan is assigned. In addition capital and operational costs are provided on annual basis. Although this is a simplification, the problem for this battle is already quite complex considering one year planning only.*

Q2 - In the problem description it is mentioned that pressure control valves should be designed and placed in the system. Which type of pressure control valve should be considered? Considering EPANET options it is possible to use Pressure Reducing Valve, Pressure Sustaining Valve, and Pressure Breaker Valve. [Thanks to Ehsan Roshani]

A2 *- Any type of real pressure control valve can be considered, controlling ANY node in the network (i.e. even far from the link where the valve is installed). For this reason EPANET is not strictly required for this competition.*
Pressure control valves should be defined by a pressure set point (Pset), the node where this Pset should be controlled, the pipe where the valve should be placed and its direction, as reported in the supporting file BBLAWN_results.xlsx. Pressure Reduction Valves are assumed to work (i.e. closing) when the pressure is higher than Pset. Pressure Sustain Valves are assumed to work (i.e. closing) when nodal pressure is lower than Pset.
EPANET's Pressure Breaker Valves are not real devices and should not be considered in the design.

Q3 - Is it correct to assume that only pipe duplication and replacing the existing pipes are included in the options list? And no salvage cost and benefit are accounted for replaced pipes? [Thanks to Ehsan Roshani]

A3 *- Yes, pipes can be duplicated or replaced. The benefit from replacing/duplicating pipes is the improved hydraulic performance of the network vs. leakages and relevant operational costs.*

Q4 - Which are the units to be used?

A4 *- The International System units are used, as reported in the Excel files in the supporting material. Demands are reported in L/s in the *.inp file to be consistent the original Town-C version, while their are in m3/s in the supporting Excel file.*
Leakage model parameters Alpha and Beta in Table 3 and in the Excel file are condistent with demands in m3/s.

Q5 - The diameter of the pressure control valves are the same as the pipe in which it is installed? [Thanks to Pedro L. Iglesias Rey]

A5 *– Actually, the diameters for PCV were implicitly assumed to be the same as the pipes since there is no technical reason for it to have a different diameter. This also preserves consistency with system functioning when the valve is completely open.*

Q6 - The problem statement appears to be allowing only PRV's with fixed settings. You can have control valves that are PLC controlled such that the setting changes over time in response to flow and/or time. These can be modeled as a time controlled TCV in EPANET.

A6 *- Pumps and TCV controlled by PLC (by time scheduling or by flow) are not allowed. The only types of controls allowed for pumps and PCV are by hydraulic conditions (i.e. tank levels and set pressure points) since they are assumed to provide a more robust control in face of the uncertainty on boundary conditions (especially demands) unless some predictions are performed; however this is not the case here since the C-Town municipality did not commissioned such kind of models.* ***The pressure set point (Pset) at controlled node can vary over time****, as explicitly reported in the new file of instructions* ***WDSA2014-BWNIII-ProblemDescription_04122013.pdf****.*

Q7 - Closing a pipe (isolation valve) to push all the water through a control valve into a DMA is also part of the solution and should be documented.

A7 *- It is possible to close one or more pipes at no cost since one isolation valve is assumed to be already present on each pipe, as explicitly reported in the new file of instructions* ***WDSA2014-BWNIII-ProblemDescription_04122013.pdf****.*

Q8 - Pump 9 should be controlled by T5, not T6 in the *.inp file. [Thanks to Pedro L. Iglesias Rey]

A8 *- The *.inp file and MS-Excel files has been amended. The correct files are in the attached folder "****Supporting material_update_04122013.rar****"*

Q9 - Is it possible to utilize variable speed pumps? [Thanks to Marco Franchini]

A9 *- Variable speed pumps are not allowed, but only pressure reduction valves.*

Q10 - We understand that it is not allowed to utilize time controlled pumps. However, is it allowed to define rules based on water levels in the tanks which can vary within the generic day and day after day? [Thanks to Marco Franchini]

A10 *- Pumps can be only controlled by tank levels and levels to switch on/off each pump cannot vary over time. This is because the company did not commissioned a real-time prediction of demands and, then, that kind of control is more adaptive.*

Q11 - We understand that the leakage level is only related to the pressure and not to the age of the pipes. In other words, new pipes and old pipes have the same level of leakages. Is this correct? [Thanks to Marco Franchini]

A11 *- For the new pipes (parallel or not) Beta_k is 20% of those reported in Table 3, as explicitly reported in the new file of instructions* ***WDSA2014-BWNIII-ProblemDescription_04122013.pdf****.*

Q12 - We noticed some inconsistencies between the leakage parameters Beta_k in the Excel file and those reported in Table 3.[Thanks to Stefano Alvisi]

A12 *- The correct values of Beta_k are in the attached folder "****Supporting material_update_04122013.rar****".*

Q13 - In the .inp file, the pump PU11 is controlled by tank T6 when is closed and is controlled by the tank T7 when is opened. Is this a bug? 3. [Thanks to Enrico Creaco and Pedro L. Iglesias Rey]

A13 *- The amended .inp file is in the attached folder "****Supporting material_update_04122013.rar****"*

Q14 - The latest version problem description file indicates that all valves must have the same diameter as the pipe where is installed. The problem occurs in pipes that have different diameters from those defined for valves in Table 6. Do we have to consider the nearest diameter in Table 6? [Thanks to Pedro L. Iglesias Rey]

A14 - *The revised version of Problem Description indicates that "The PRV costs are reported in Table 6 and it is assumed that they have the nearest diameter of the corresponding pipe."*

Q15 - Each pipe can be opened or closed. But can a pipe open or close several times during the simulation? [Thanks to Pedro L. Iglesias Rey]

A15 - *No, you should just indicate which pipe should be closed. Real-time control or time scheduling cannot be defined to open/close pipes.*

Q16 - If there is leakage in the pipes connected to water tanks, is the leakage represented as consumption in the water tanks nodes? [Thanks to Eyal Price and Avi Ostfeld]

A16 - *Yes, also in this case Eq.(1) - (2) apply and the mass balance accounting for leakages must be computed also at tank nodes.*

Q17 - Is it right to assume that the flow-head curves for the new pumps are exactly the same as the current pumps. And only the maximum efficiency of the new pumps is increased to 80%? [Thanks to Ehsan Roshani]

A17 - *Yes.*

Q18 - Is the maximum number of pump that could be added in each pumping station? If there is any limit. [Thanks to Ehsan Roshani]

A18 – *No, there is no limit.*

Q19 - Is it possible to replace the current pumps? From the text it is understood that the pumps could be added to each station, I was wondering whether it is possible to shut off and eliminate the current pumps. [Thanks to Ehsan Roshani]

A19 – *Actually it is possible to switch on/off to eliminate pump.*

Q20- It is understood that PCV setting points could be variable by time. Is there any limitation on the maximum number of changes that each PCV could endure for one week or on a daily bases? I was wondering if we could continuously change the pressure settings on them based on time or based on a pressure of a specific node in the system. If so how should we report the result in the spreadsheet? [Thanks to Ehsan Roshani]

A20 – *The pressure set point (Pset) at controlled node can change at any hour, as explicitly reported in the new file of instructions* ***WDSA2014-BWNIII-ProblemDescription_04122013.pdf****. You need to provide results with the set pressure and node (in the Excel spreadsheet) or the variable pressure set, e.g. hour by hour, (.inp file). Please consider that there are software packages, as EPANET, unable to deal with set points in remote nodes (i.e. not end-nodes of PCV pipe).*

Q21 - As you know PRVs are one way valves. In the C-Town network there are lots of pipes in which the flow direction changes through the time. This makes it impossible to add a PRV to those pipes. I wonder if it is acceptable to add a parallel check valve to these PRVs. This check valve allows the water to flow when the

flow direction is opposite of the PRV direction and it is closed when the flow direction is the same as PRV direction. [Thanks to Ehsan Roshani]

A21 *– As reported in Q7, it is possible to close pipes in order to have one flow direction where the PCV is installed.*

Q22 - The entire set of pipes downstream of "P305" has no demand points. So it is a dead end. Is it possible to close P305 and eliminate the downstream pipes from leakage calculations? [Thanks to Ehsan Roshani]

A22 *– No because that zone has to be maintained under pressure (not empty) consistently with the rules of the exercise.*