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Drinking Water Engineering and Science Discussions

Interactive comment on "Leakages and pressure relations: an experimental research" *by* F. De Paola and M. Giugni

J. van Zyl

kobus.vanzyl@uct.ac.za

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While it is great to see laboratory work to further investigate the pressure-leakage behavior of leaks in water distribution systems, the experiments described in this paper suffer from fundamental flaws and thus don't contribute significantly to understanding the behavior of real leaks.

It has been shown convincingly that the area of leaks increase with increasing system pressure (Van Zyl & Clayton, 2007). This, in combination with the higher velocities described by the Torricelli equation, contributes significantly to the observed high sensitivity of leakage to pressure. Unfortunately, instead of creating artificial leaks in the steel and cast iron pipes considered in the paper, the authors place the leaks in (what looks like brass) 'nozzles' that are installed at the end of a small diameter pipe that is

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branched off from the main pipe. This means that the observed behavior has little or nothing to do with the pipes tested. Findings, such as leakage exponents close to 0.5 for metal pipes, are simply meaningless because it was not the pipes' responses that were tested.

The theoretical equation used for the relationship between leakage and pressure (Equation 1) has no theoretical base as the authors claim, but is simply a convenient way of describing the response of system leakage to variations in pressure. We now know that leak areas increase linearly with pressure, irrespective of loading state, pipe properties or leak opening shape (assuming that only elastic deformation occurs). This means that the so called FAVAD equation provides a much better basis for modeling individual leaks – see Cassa et al (2010) for more details. The authors' finding that the "ratio An/Ap varies for nozzles having either square or rectangular section, while for round section it shows a parabolic trend according to d/D ratio" is simply a confirmation of the linear response of leak area to pressure, but for some reasons the authors don't seem to recognize this link.

References

Cassa, A.M., Van Zyl, J.E., Laubscher, R.F. (2010) A numerical investigation into the effect of pressure on holes and cracks in water supply pipes, Urban Water Journal, 7 (2) 109 - 120.

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