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Drinking Water
Engineering and Science
Discussions

Interactive comment on "Functioning conditions of the Casale pumping station in Mantova, Italy" *by* C. Capponi et al.

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The authors did a nice job clearly presenting the results of their analysis of the Casale pumping It's good to see a paper based on real data.

My first observation is on the lack of agreement between the data collected and the "pump characteristic curve", which I assume was provided by the pump manufacturer. From Figure 5, it appears that there may be some serious mechanical/hydraulic problem with the pump that is causing it to not behave on its curve. It could be that the tolerances on the impeller clearances may have changed, the bearings may be worn, the interior of the casing may have serious tuberculation, the pump impeller may have been modified or one of the measurements could have a systematic error. I would verify that the measurements are correct and the impeller wasn't changed. Then I

would compare it with the adjacent pumps in Figure 1 to see if they have similar issues. Finally, if I could not identify a cause for the discrepancy, I would recommend maintenance work on the pump.

The next issue is with the "inverter" which I believe is a European term for what we call a variable frequency drive (VFD) in the US. If it is not, the authors should clarify. The inverter itself introduces inefficiency into the system which cannot be accounted for by the affinity laws. (Just stand next to the inverter when it is running and feel the heat being given off.) The inverter is not 100% efficient and the efficiency decreases with the speed. At 100% of speed, the efficiency may be 95% efficient but the efficiency drops off significantly as the speed decreases. Given the wide range of speeds reported in this station, the inverter could be a significant source of energy loss. From the photo, it looks as if there may also be smaller pumps in the station. If so, they should be operated when the demand drops instead of slowing down a larger pump. The inefficiency from the inverter could explain a great deal of the scatter in Figure 10. The inverter efficiency could be determined from

efficiency (inverter) = efficiency(measured)/efficiency based on affinity laws

It would be good to know if there is any storage in the distribution system. Usually the most efficient way to run a correctly sized pump is at full speed to fill a tank and then turn the pump off until the tank level drops. In general, the most efficient speed to run a pump is OFF.

What type of flow meter was used in this station (Venturi, ultrasonic, etc.) and has it been calibrated recently?

Overall, this was a very nice study, clearly reported.

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