Empowering the water operators with easier access to advanced hydraulic network simulations



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INTRODUCTION



Sustainability Development Goal (SDG) number 17 - Partnership to reach the goals - is maybe the most important of all SDG's. In order to solve the issue with easier access to advanced hydraulic simulation tools for the operators DHI and Volue are partnering to include the MIKE+ engine in Volue's Gemini solutions which are the most common used tools for water-net management in Norway. A crucial aspect is to embed the hydraulic simulation engine in a user-friendly way in the tools the operators also use for other purposes such as documentation, maintenance and asset management.

Calculating the fire flow is an important objective when using hydraulic models. User-friendly tools are therefore convenient for the water engineers as they don't need to have detailed knowledge of hydraulic modelling.

METHODS

DISCUSSION

Much of the data needed for hydraulic simulations are available in the Network Information System (NIS) and good quality of these data is important for establishing and maintaining a high-quality hydraulic network simulation model. Updates in the NIS model should be automatically transferred to the hydraulic model and vice versa.

Godt Vann maintains several hydraulic models for the municipalities participating in the cooperation. With the current implementation, maintenance of these models is done manually, and without any automated routines. Over time, this deteriorates the hydraulic models and reduce the quality of the results. The initiative to bring the model and the NIS tools closer to each other, greatly reduces the time used for maintenance of the models and increases the quality.



The figure above shows the current data flow procedure from NIS to hydraulic model at the Godt Vann collaboration in Norway. This data flow includes several manual steps and is very resource intensive. Many water utility companies and municipalities have this type of manual data flow today.







Figure 2 – Illustrates how we can calculate individual fire flows for 1-3 fire valves/hydrants simultaneously.



Figure 1 – Illustrates how the contents list gives an easy access to the attributes of the fire hydrants



Figure 3 – The results is not only presents for one specific time but gives values for a period of 24 hours which are useful in order to find the critical fire flow value.

This figure shows the new data flow between the NIS system and the hydraulic simulation model. Automated data cleansing routines are established in order to make the process as smooth as possible.



Calculating fire flows is a crucial task. Integrating the hydraulic models into the NIS greatly improves the information and visibility of the fire flow. Also, it can easily identify areas where fire flow are limited and where initiatives for improved water network needs to be taken. It is our assumption that integrating the model into the NIS-system will bring hydraulic modelling closer to water engineers in general.

Figure 4 – The overview map visualizes the capacity of the fire flow valves/hydrants and makes it easy to identify areas with limited fire flow capacity.







Figure 5 – Flow-pressure-curves can be calculated for each of the fire flow valves/hydrants. This feature may be of assistance when engineering the fire sprinkler systems.

RESULTS

The cooperation between Volue, DHI and Godt Vann has now developed a GIS-based tool which integrates the GIS-system and hydraulic modelling. As to now the focus has primarily on calculation and presentation of fire flows for fire valves and hydrants.

CONCLUSIONS

A better integration between NIS and hydraulic simulations models has several benefits for the water utility. An important benefit is resource savings related to more efficient maintenance of hydraulic models.

Automated sync of data between network information system and embedded hydraulic simulation model is still a working in process.

As part of the process the data-quality improves, which also improves the accuracy and the possibility for always having updated models ready for simulations. For the water utility, easier access to advanced hydraulic simulation engines embedded in the tools they normal use contributes to better and faster decisions.

References: Almestad C. and Kvam A. (2021). What are the benefits for utilities for the cooperation between DHI and Volue. Presentation at Gemini conference. 22-23 November 2021. Oslo.

