

# FLOW COMPUTATIONS DRIEL VISOR GATE

## NON-HYDROSTATIC 3D MODELLING USING FINEL

Complex 3D flow patterns may exist in the vicinity of hydraulic structures, which in turn can have impact on bed erosion and dynamic forces on the structure. In view of a long-term maintenance policy for the well-known visor gate structures in the rivers Nederrijn and Lek, Rijkswaterstaat aims to assess the suitability of available 3D flow models to compute flow patterns around the visor gate near Driel. An exploratory study by Svašek Hydraulics has shown that the 3D model FINEL is a promising model for this application.

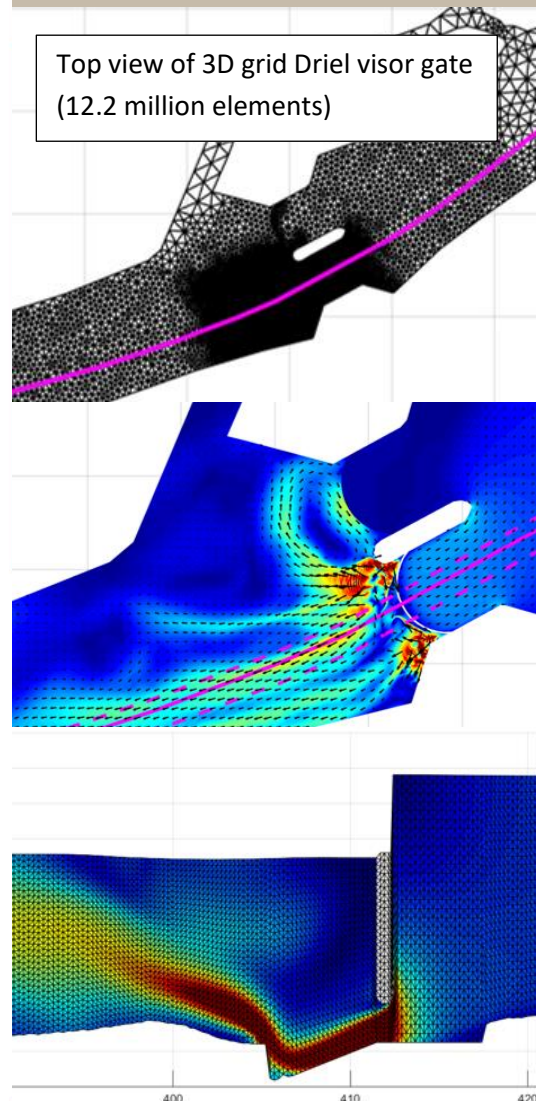
The scenario as explored by Svašek is based upon measurements near Driel by Rijkswaterstaat on January 27, 2023. The northern visor gate was closed while the southern gate had a maximum opening height of 1.10 m. The Nederrijn discharge was measured to be 277.5 m<sup>3</sup>/s at a water level difference of 1.35 m. Horizontal and vertical velocity profiles were measured by ADCP's along a range of downstream cross-sections.

FINEL allows the combination of non-hydrostatic flow with a moving free water surface. Along with the flexible (triangular or tetrahedral) Finite Element grid, this property makes the model quite suitable for flow computations in the vicinity of hydraulic structures.

Measurements by RWS showed that, past the southern visor gate, a concentrated jet bends upward all the way up to the free surface. This effect is reproduced well by FINEL (both in 2DV and 3D), for various resolutions and roughness settings. In the 3D scenario, the asymmetric geometry gives rise to an asymmetric recirculation pattern and a downstream jet that is attached to the southern river bank.

From the present exploration it is concluded that FINEL is a promising model for "intermediate-scale" flow situations near structures, such as the Driel visor gate. FINEL can be seen as a "missing-link" model between detailed but slow CFD modelling on the one hand, and fast but insufficient hydrostatic modelling on the other hand.

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SERVICES	Research and development Technical advice Model validation



Situation overview near visor gate Driel on January 27, 2023 (image: Rijkswaterstaat)



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