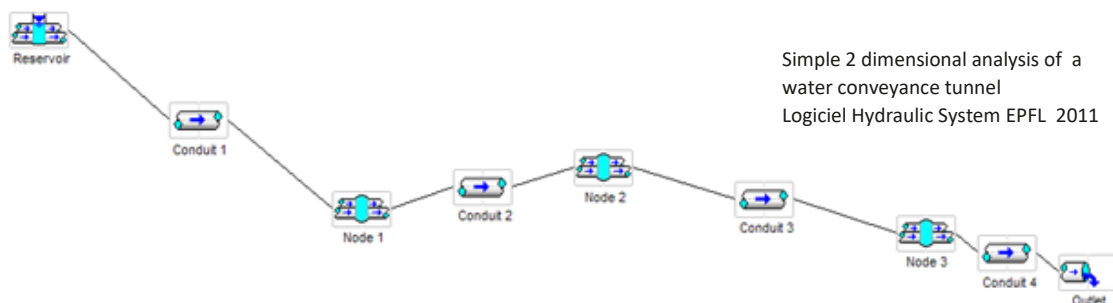


Use Case 08b: Hydraulic simulation

Purpose

Hydraulic simulation and modelling software tools make it possible to analyse the behaviour of water in water transfer tunnels. In hydropower tunnels the optimum tunnel dimensions are related to the tunnel costs and the head losses that occur as the water flows through the tunnel. Static water pressures are less than dynamic water pressures and water hammer calculations are important in the dimensioning of the tunnels and underground facilities. Local features, bifurcations, transitions, openings, gradient changes cause additional losses. Numerical modelling of hydraulic structures is developing and is often a cost-effective alternative to physical models.

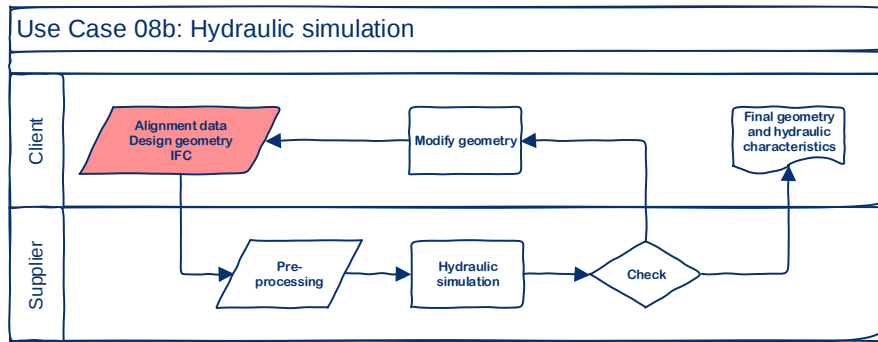
Current software ranges from simple one- and two-dimensional models to full three-dimensional computational fluid dynamics (CFD) software.



Current practice generally involves generating the geometrical input in the simulation application itself. The obvious use case, if more tunnels are modelled as part of the civil design, will be to exchange the geometry from the civil modelling software to the simulation software. This use case is similar to use case 08a (Air flow simulation) but has been separated from it given that the simulation is generally performed by different disciplines solutions.

Requirements for IFC-Tunnel:

IFC Tunnel should be capable of exchanging the geometrical input for the simulation software. The required Level of Geometry will be determined by the needs of the simulation software, but essentially an internal water space needs to be exchanged with information describing the composition of the boundary materials and their surface roughness. Full dynamic simulations could also require information covering the elastic properties of the lining and surrounding rock.



Geometry:

It can be assumed that the existing geometry descriptions for volume objects, triangulated face sets, sweeps and extrusions together with the existing alignment descriptions are sufficient.

Semantics:

Semantics play a minor role for this use case, but spatial containment and an element naming and descriptions are important for locating the tunnel sections. In addition, attributes describing the surface roughness and elastic properties may be required.

Links with other UCs:

Input use cases:

- UC 3 – Exchange of alignment and major road/railway parameters (to be harmonized)