

# CADFEM Consulting

Modeling, CFD and FEM Calculations of a Pressure Control Valve Using ANSYS® Workbench™

Geometry Modeling, One Way Fluid-Structure Interaction

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## Task

Grande Dixence S.A. in Sion (Switzerland) is a leading supplier of electrical power and owner of the Grande Dixence dam in the valaisian Alps, the tallest gravity dam in the world. They have to perform a revision campaign for the maintenance of several pressure control valves (large hydraulic installations that evacuate water in case of overpressure in the pipes). These devices are quite old and the present working conditions have changed since their installation. It is therefore necessary to know the new solicitations of the structure due to water flow. In order to understand this behavior, a coupled one way fluid-structure simulation was performed.

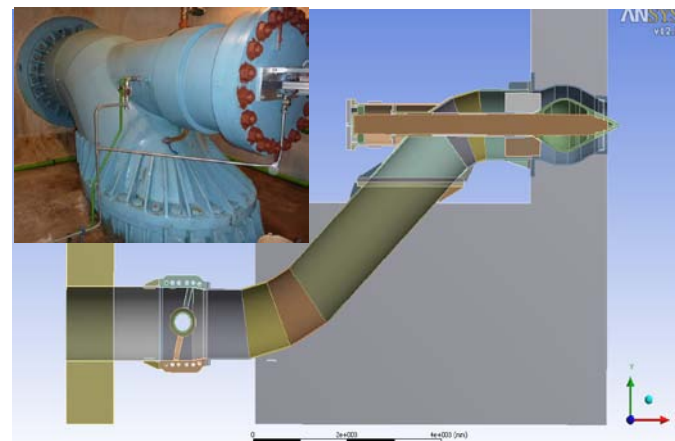
## Solution

The geometry was created with ANSYS® Design Modeler™ based on 55 year old construction drawings. The fluid domain, including downstream pipe section was then transferred to ANSYS® CFX®. The new operating conditions were used to determine the model boundary conditions. With this CFD simulation, the pressure field in the fluid volume and on the internal walls of the ducts was calculated.

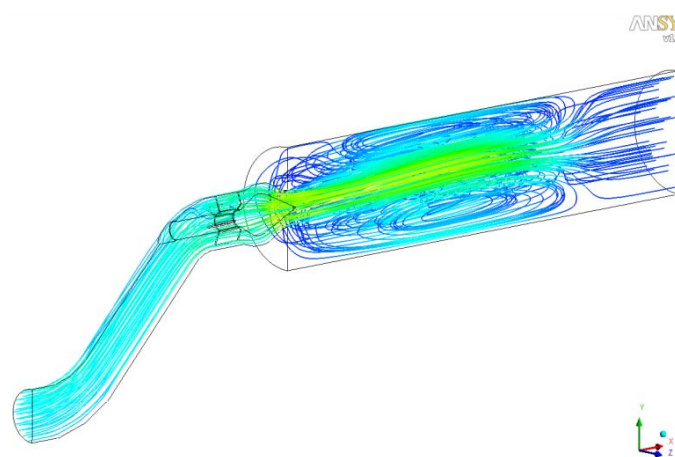
In order to assess structural integrity, a Finite Element Model (FE model) based on the structure of the device was built. The concrete surrounding the pipework was also considered. The pressure field obtained from the CFD calculation was used as load condition on the FE model. This allowed calculating the stress field in the structure using ANSYS® Mechanical™.

## Customer Benefit

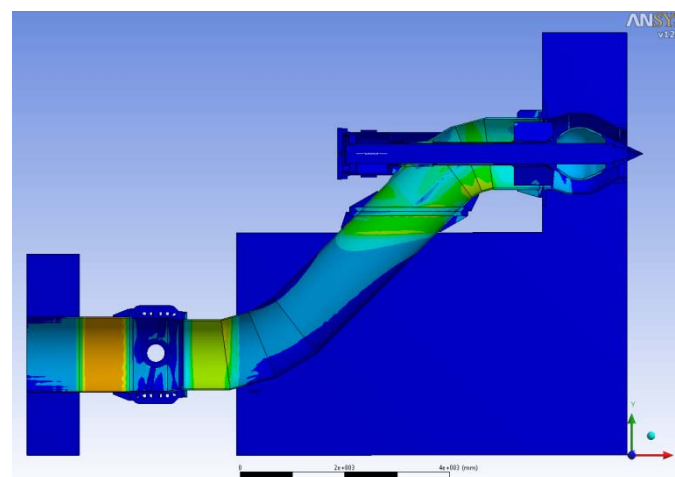
With the contribution of CADFEM (Suisse) AG, Grande Dixence S.A. knows the flow behavior in the pressure control valve and structure solicitations due to the new operating conditions. This allows Grande Dixence SA to identify the most solicited zones of the structure, which have to be carefully checked during the revision campaign.



3D Model of the pressure control valve



Streamlines in the fluid domain



Stress field on the structure due to the effect of fluid pressure



Figures Courtesy of Grande Dixence S.A.