FSI of Double Curvature Arch Dam Under Seismic Loading

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Introduction: The Fluid Structure Interaction (FSI) is the important role for the seismic analysis and the design of Hydraulic structures. In this poster the acoustic finite element model is analyzed with impounded water considering appropriate boundary conditions between the water & the upstream face of the dam. Here the effect of fluid compressibility and the boundary conditions are used to apply the hydrodynamic pressure by the use of COMSOL multiphysics software.

Computational Physics:

1. Fluid Structure Interaction
2. Acoustic–Solid Interaction
3. Solid Mechanics

Computational Methods:

1. Navier-Stokes equation
2. Helmholtz equation

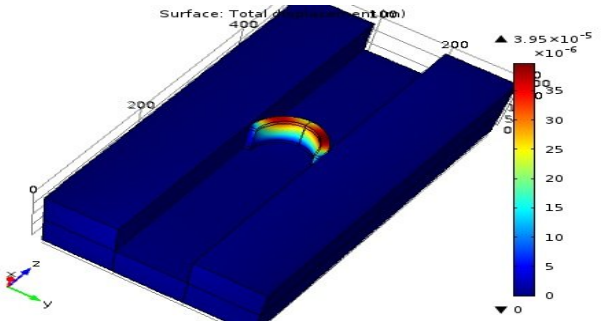

Fig 1.Displacement of the Dam Body

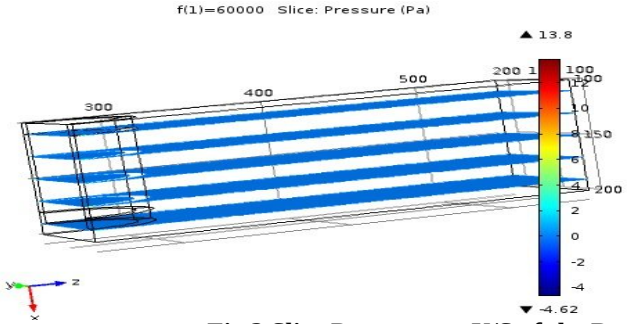

Fig 2.Slice Pressure on U/S of the Dam

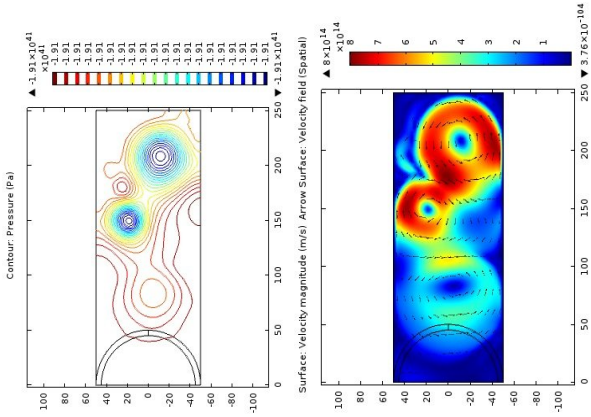

Fig 3,4.Surface Velocity Magnitude and Contour Pressure on U/S of the Dam

Future Scope:

Geo mechanics Module – Advances into Soil and Rock Mechanics Simulations.

Conclusions:

The model captures the Pressure Acoustics and Acoustic-Solid Interaction for the Frequency Domain interface between the concrete arch body of the dam and the fluid .It was used to evaluate the stress strain and also the deformation & displacement for the corresponding follower loads including the impounded water on the upstream face of the dam.

References:

1. 12th ICOLD International Benchmark Workshop on Numerical Analysis of Dams
2. COMSOL Multiphysics, Acoustic Module and Structural Mechanics Module –User's Guide, Version 4.4 ,2013
3. H. Mirzabozorg,A.Kordzadeh,M.A. Hariri-Ardebili,Seismic Response of Concrete Arch Dams Including Dam-Reservoir-Foundation Interaction Using Infinite Elements,Electronic Journal of Structural Engineering 12(1) 2012
4. A.H. Akhaveissy and M. Malekshahi ,Transiant Analysis of Dam-Reservoir Interaction,IACSIT Coimbatore Conferences,2012.