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Combined Visualization

Ceetron AS
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Outline

- Ceetron in brief
- Visualization of data from coupled analysis
  - GLview Inova &
  - GLview Express
- Visualization of measured and simulated results
  - Using GLview Inova
- Future development of multi-discipline visualization

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CEETRON IN BRIEF

Ceetron Company Profile

Mission Statement

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Business Idea

Ceetron is a software company offering advanced
3D visualization products and solutions for customers
within energy, marine and automotive industries.

Key application areas

Integrated simulation environments
Pre/Post processing and result interpretation
Presentation, communication and data sharing

Company Values

Leading edge technology and know-how
Customer satisfaction and after sales support
Responsible and dedicated professionals

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Ceetron locations

Locations

Pirsenteret (main office)

Trondheim (main office)

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Ceetron Product Line

SOFTWARE DEVELOPER PRODUCTS

GLview 3D Visualization API

Object-oriented C++ class library. For development of full post-processors and visualization solutions. Ideal for OEM solutions and third-party developers.

GLview Express Writer

C++/FORTRAN class library for producing portable VTFx files from within a FEA code. VTFx files are supported by the GLview end-user products.

END USER PRODUCTS

GLview Inova

Full post-processor with direct file interfaces to most common FEA and CFD codes.

GLview Express – Free

Standalone Viewer. For presentation and distribution of 3D models and results generated by GLview Express Writer. Analogous to Adobe Acrobat Reader.

GLview 3D PlugIn – Free

Plug-in for integration with PowerPoint and Internet Explorer. 3D interactivity and animation capabilities similar to GLview Express.

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VISUALIZATION OF DATA FROM COUPLED ANALYSIS

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Visualization of data from coupled analysis – 4 main areas

1. Control of coupling parameters at setup
   - I.e MpCCI Visualizer
2. Monitoring of coupling progress
   - I.e. MpCCI Visualizer with online monitoring
3. Post-processing of results
   - I.e. GLview Inova
4. Presentation and communication of findings
   - I.e. GLview Express and GLview 3D Plugin

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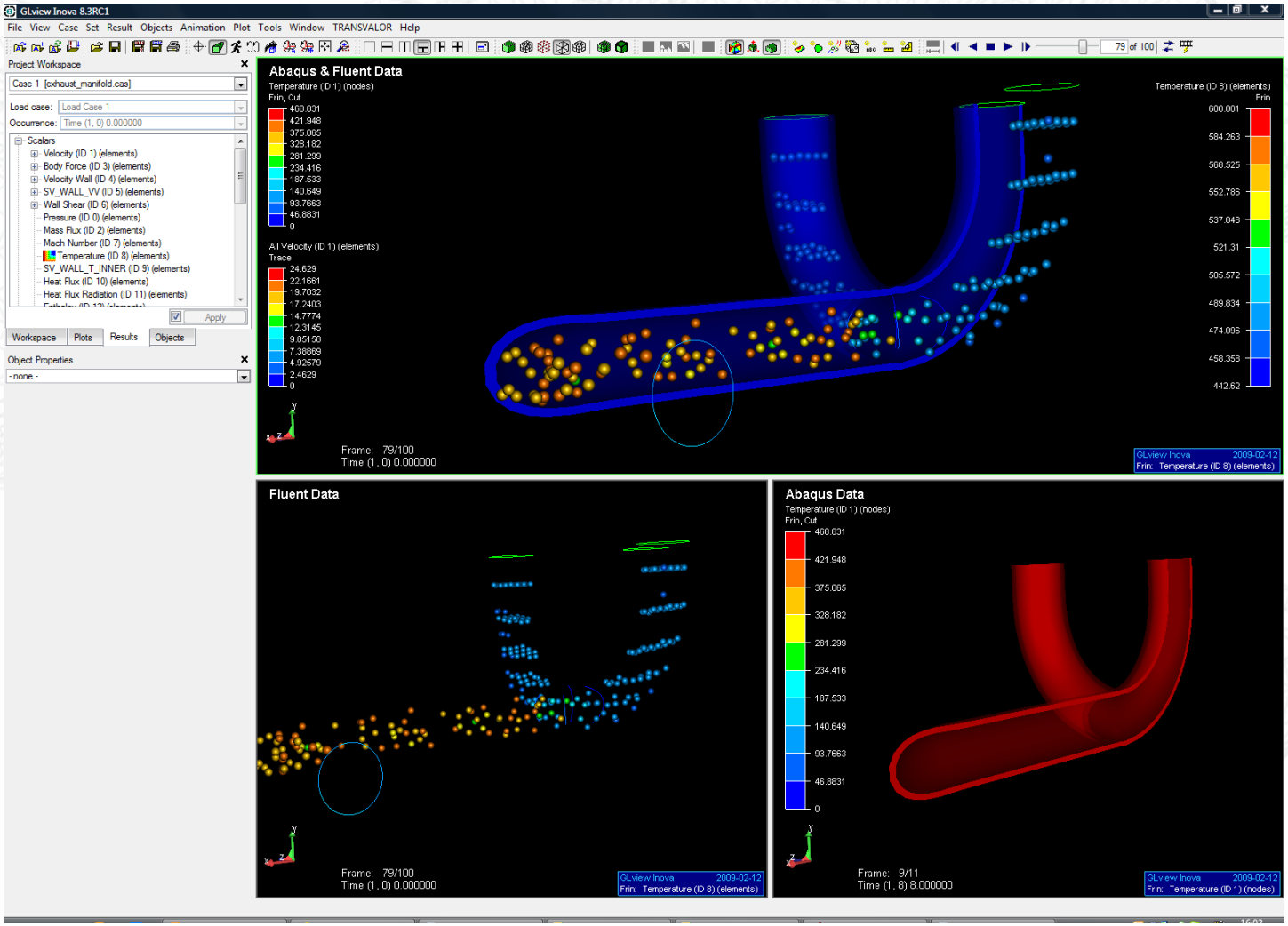
Demo – FSI in GLview Inova



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Further development

- Ability to change or modify units to align and compare results from different sources having different scaling and units
- Extended features for synchronization of time series and animations
- Ability to add cut-planes that intersects all geometries in a view
- Functionality to work with mirroring (symmetry) and feature extraction

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PRESENTATION AND DATA SHARING

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Challenges when presenting analysis results

- Producing large number of images and animations ...
- Moving or accessing the (very large) result files
- Is the post-processor installed in the meetingroom computer?
- Getting a token to run the post-processor when you need it ...
- Remembering to get everything on your laptop ...

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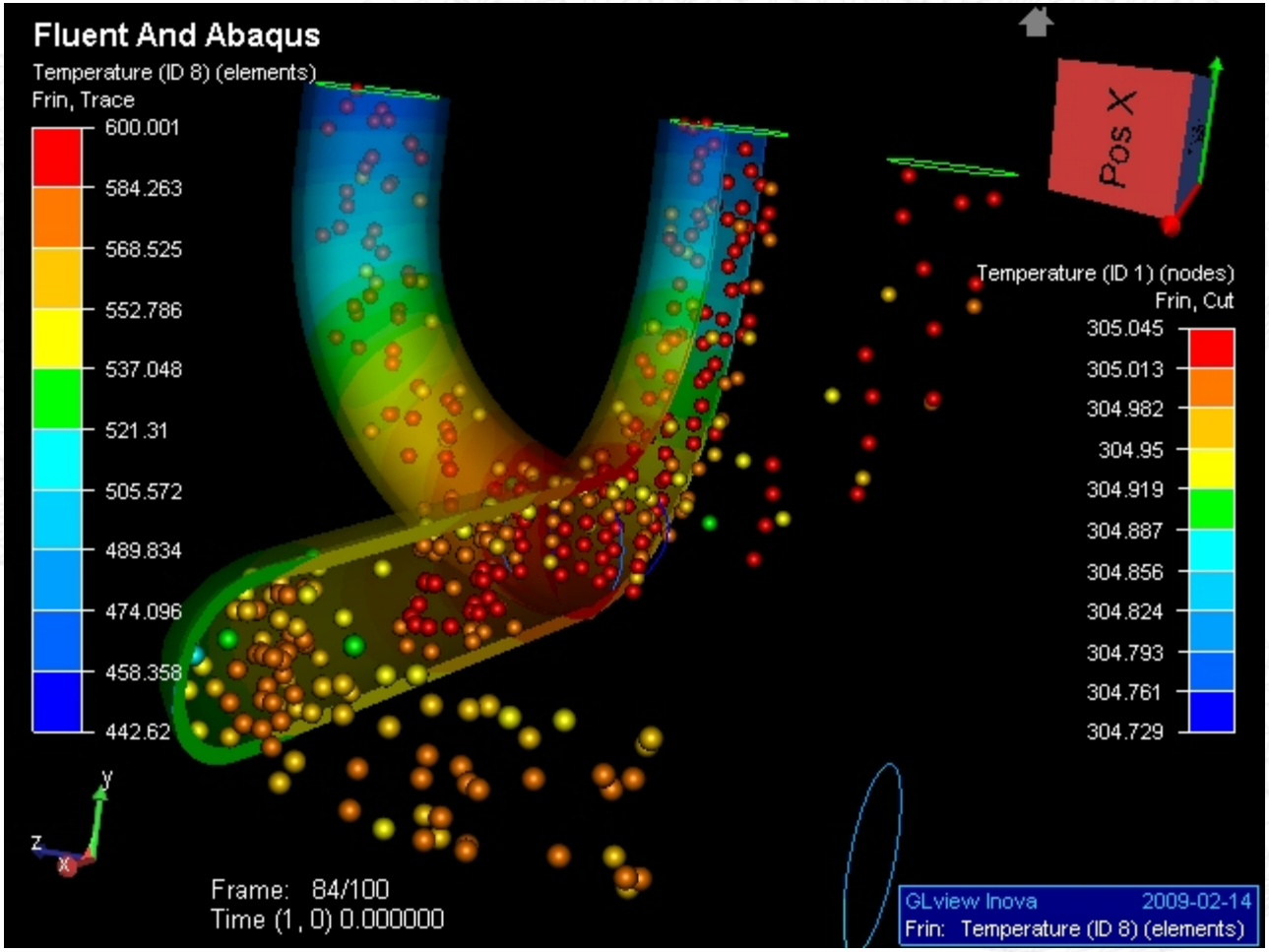
FSI Example in GLview 3D Plugin



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VISUALIZATION OF MEASURED AND SIMULATED RESULTS

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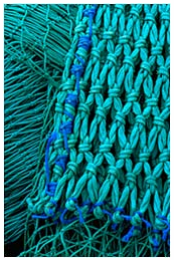
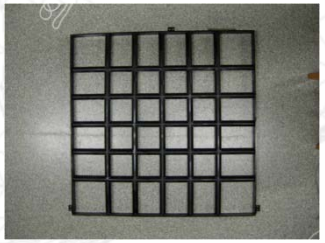
The Study

- The flow through and around aquaculture cages
- Situated in open water, subjected to currents
  - Vortex shedding behind each cage element influence the position and structural integrity of the cage.
  - A grid of intersecting cylinders is used to represent the effect
    - 3x3 grid,
    - cylinder diameter 32mm,
    - spacing 220mm (center to center)





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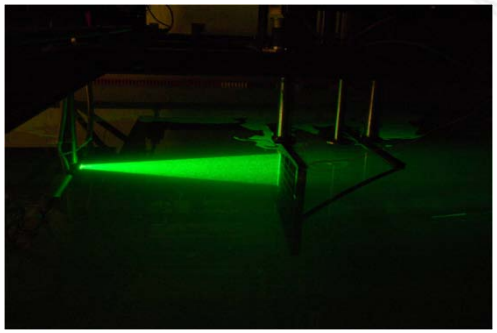
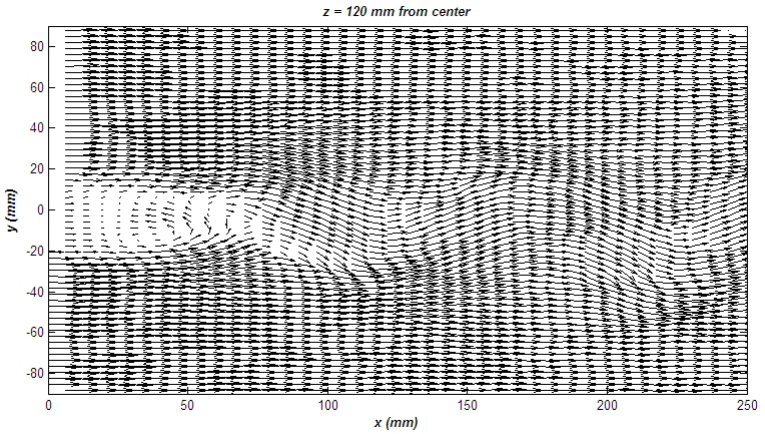
The Experiment

- PIV (Particle Image Velocimetry)
  - Laser to illuminate particles in flow
  - Two digital cameras to capture movement
    - Rate10 Hz
  - In Marine Cybernetics towing tank facility
    - Towing speed: 0,1 m/s





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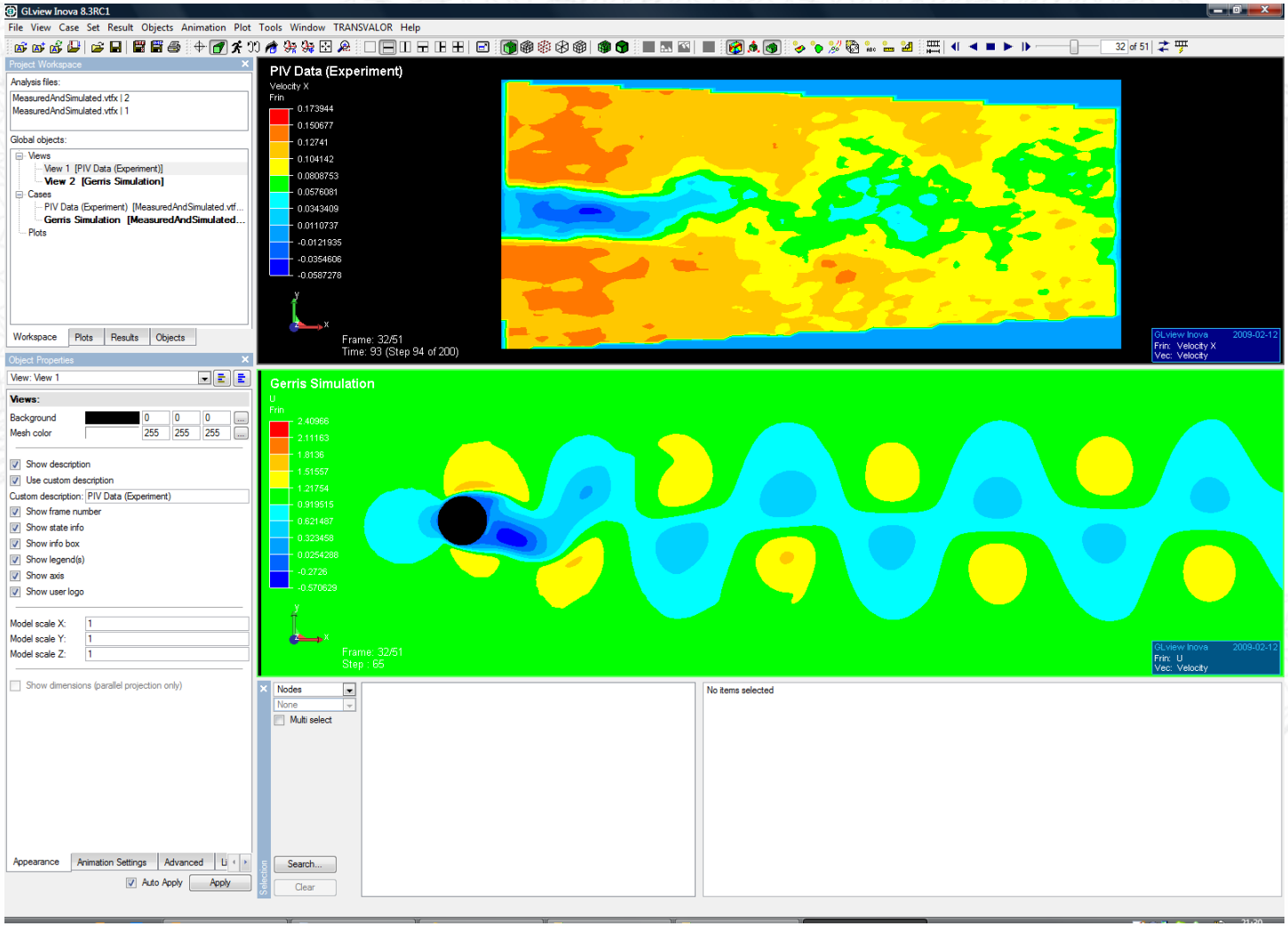
Demo – Measured results GLview Inova



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Further development

- Extending the PIV dataset to full 3D
- Visualization of other measured results (may not be as straight forward as the example shown)
- Change of units in dataset to facilitate direct comparison of data from different sources
- Synchronization of time-steps and animation
- Support for combining Video and Simulated Results
- Features for alignment of geometries

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Thank you for your attention!

Questions?