

Case Study



ANSYS

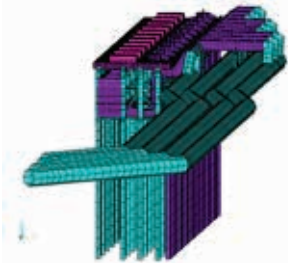
+ Mechanical Solutions, Inc.

Our approach is to identify and mitigate risk early in the design process to reduce the potential for costly modifications after construction has been completed. Using ANSYS software to simulate the vibrational response of the platform helped us meet a rigid deadline, by identifying issues early so the platform could be completed before hurricane season.

William J. Kelly

*Principal Engineer
Mechanical Solutions, Inc.*

Structural Analysis Helps Predict Vibration for Pumping Platforms



Detailed view of ANSYS Mechanical model of pumping station showing piles

After Hurricane Katrina, one of the costliest and deadliest hurricanes in the United States, a design and build contract to increase the capacity of a pumping station in flood-prone New Orleans resulted in a subcontract award to MSI. MSI was responsible for evaluating vibration responses of the platform during operation of high-power mechanical equipment.

Technology used
ANSYS® Mechanical™

Challenges

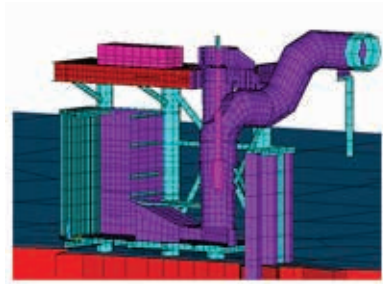
When a major weather event hits, high-power pumping units must work at full capacity to drain excess water out of sub-sea-level areas. The heavy equipment produces vibrations and other stresses that can cause the massive platforms supporting the equipment to fail.

MSI engineers faced a number of challenges in assessing and, when necessary, addressing design problems of the partially submerged pumping station platforms; all design issues had to be identified and addressed before any construction began, and the project needed to be completed prior to the onset of the next hurricane season.

Engineering solution

MSI used ANSYS Mechanical software to simulate pumping platform stresses and vibrational responses to ensure that the system would perform optimally during storms. MSI engineers:

- Imported solid models of the equipment into ANSYS Mechanical



Cutaway view of single bay of platform

- Used a combination of solid, shell, beam and mass point elements to create a mesh of the truss platform support structure; the result was a structural dynamic model with approximately 5 million degrees of freedom (DOF)
- Employed substructuring techniques available in ANSYS Mechanical to significantly reduce DOF without losing accuracy
- Performed modal analysis followed by a superposition harmonic response analysis and identified worst-case loading conditions
- Placed virtual sensors in various locations to provide vibrational frequency response functions in a forced-response FEA analysis
- Performed acoustic evaluation of the discharge piping to assess the potential for acoustic resonance

Benefits

- Analytical results verified that the pumping platform would withstand the loading of the mechanical equipment without excessive vibration at key locations
- When Category 2 hurricane Gustav hit in 2008, the platforms and pumps successfully kept flood waters in check, validating the accuracy of the ANSYS simulation results

Company Information

Mechanical Solutions, Inc. (MSI) is a leading mechanical engineering firm that performs consulting and R&D, along with design, analysis and testing services for a diverse range of project types throughout the world.

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