CAE Associates Case Study

Parametric Modeling of an Otis Elevator Safety Brake

In 1852, Elisha Graves Otis invented the elevator safety brake which prevents an elevator car from falling if the lifting cables fail. Since that time, all elevator systems have been equipped with a safety brake. The design of these systems can vary widely based on the size and rise of the building in which they are installed.

United Technologies Otis Elevator Company was faced with a design challenge:

- Design a safety brake would perform over a wide range of elevator capacities.
- Make it inexpensive.
- Make it reliable.
- Get it to market as quickly as possible.

To help achieve these goals, Otis Elevator turned to CAE Associates. CAE Associates utilized the ANSYS general purpose finite element software to develop a parametric model of the safety design. The model was used to determine the stopping force of each design in addition to evaluating stiffness loss due to plasticity in the springs.

Of equal importance to Otis Elevator was the ability to continue using the model in-house for future design iterations. CAE Associates paid close attention to this objective while preparing the parametric model, documenting it in a fashion so that it would be suitable for future use by the Otis Elevator engineers. According the senior mechanical engineer assigned to the project:
“We had a difficult situation that required us to determine stress levels and optimize components for a limited space. CAEA Inc. provided technical support to create a modeling system that allowed us to parametrically analyze several families of components to be able to meet our objectives. The expertise to deal not only with the programming but complex analysis was provided in a timely and professional manner allowing us to meet a very tight schedule. We consider CAEA Inc. to be the top experts in their field and will continue to rely on them for our analysis needs.” --- Michael Lang, Otis Elevator Company, Farmington, CT