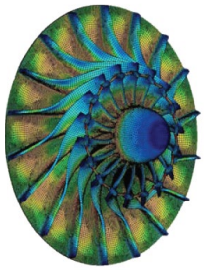

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Centrifuges – Mechanical New Design Evaluation
(Finite Element Analysis, Non-Linear Transient Vibration)

Project Description: A new set of three centrifuges was being installed in one building, on the same level, adjacent to each other. A finite element analysis (FEA) model was created of the housing structure, along with the three centrifuges, each in their own bays. Springs and dampeners per manufacturer specs were included in the model. Various operations were evaluated, including one centrifuge at a time, two centrifuges at a time and all centrifuges operating simultaneously. Evaluations considered normal operating and different load imbalances. Both the structure and the equipment were evaluated for resonance and resultant vibrations, with the later compared to vibration alarm levels.

FEA Model and Results: The first image below image shows a natural frequency check of the housing structure and the three centrifuges. A mock representation of the three centrifuges is shown in the bottom image. One of the transient dynamic vibration signatures is shown in the figure to the right.