



CASE STUDY /

## Overcoming MEMS Simulation Challenges — A.M. Fitzgerald & Associates, LLC

*“Simulation is much less expensive than processing test wafers in the lab so you will be able to evaluate many more design and manufacturing options early in the design process and bring better products to market in less time. Simulation can easily save hundreds of thousands of dollars in fabrication and testing and months of redesign time. Investing in the development of accurate models for your technology will always benefit your future products.”*

**Alissa Fitzgerald**

Founder and Managing Member / A.M. Fitzgerald & Associates, LLC

Microelectromechanical systems (MEMS) manufacturing and processing are used to create many different types of sensors — temperature, motion, pressure, microphones, etc. — on silicon wafers. MEMS sensors serve as the eyes and ears of today’s smart connected products by acquiring information from the environment, such as the air pressure of an automobile tire or the motion of your body to record your steps. It is anticipated that MEMS sensors will experience a rapid growth curve as the Internet of Things (IoT) makes it possible to capture the information from billions of MEMS sensors and utilize this data to intelligently control devices to improve efficiency, quality, health, safety and the environment.

## / Technology Used

- Ansys® Mechanical™

## / Business Challenges

Even though MEMS are made on a silicon wafer, MEMS development is considerably less rapid and more difficult than conventional integrated circuits (ICs), largely due to a lack of established design practices and the limitations of some current simulation methods.

## / Engineering Solution

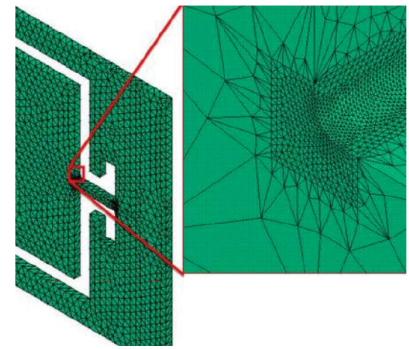
- Use parametric simulation with Ansys Mechanical to quickly evaluate the effects of varying material properties, along with design parameters.
- Estimate device fracture probability for crystalline microstructures using empirical data and custom Ansys APDL scripts.
- Perform force versus displacement measurements to determine the stiffness of the structure, which can then be fed back into the model.

## / Benefits

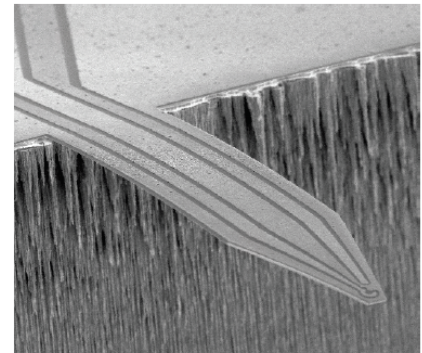
- Avoid recurring MEMS development costs of over \$100,000 per batch.
- Reduce months of redesign time.
- Improve time to market.

## / Company Description

AMFitzgerald develops innovative MEMS and sensor solutions. The company collaborates with customers to create high-value products enabled by customized microtechnology. With integrity, expertise and attention to detail, AMFitzgerald can deliver what has never been done before.



Force-displacement measurements were used to correct the finite element model.



MEMS cantilever sensor designed and prototyped by AMFitzgerald.

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