# **COLLEGE OF ENGINEERING**

# **PHYSICAL TESTING**

- Outsourced to OSU Advanced Technology and Manufacturing Institute (ATAMI) and performed with an **Instron 5969** Tensile Strength Testing Machine.
- Tested tag in both cantilever and 3-point bending loading scenarios
- "Location Only" tags were provided as testing samples.



Figure 3. Instron fixture set ups for cantilever and 3-point bending tests

- In cantilever testing, fixturing difficulty led to the tag either rotating out of the fixture or losing its end cap at approx. 1-1.5 kN
- In the bending fixture, failure was typically observed between 7-8 kN



Figure 4. Load v. Displacement graph for ATAMI physical test data.



# **TESTING A MORE ROBUST SATELLITE** WHALE TAG HOUSING

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# **BACKGROUND:**

- "Location Only" tag: Fully implantable, three-piece design; collects and transmits whale location via satellite GPS. • *Delrin* end cap and nose cone
- AISI 316 stainless steel housing tube
- "Dive Monitoring" tag: Features a tri-axis accelerometer and depth sensor to collect and translate dive behavior data.
- Applied with an air-powered applicator near a whale's dorsal fin.
- **Objective:** Quantify current tag failure through physical testing and use results to inform a new, one-piece design to be manufactured using Direct Metal Laser Sintering (DMLS)



**Figure 2.** Side view of the "Dive Monitoring" tag prepared for application with a bladed tip, retention elements, and antibiotic coating.

### **RESULTS:**

- The team generated a prototype computer model for a tag made of one continuous piece of metal.
- The prototype features a smaller Delrin end cap which is flush with the tag's top surface and an increased wall thickness.
- Simulations show the prototype tag to be much more robust when subjected to the same forces as the legacy model, as the former displaces a less than the latter by a factor of 0.0298.







Figure 8. Overlaid Load v. Displacement plots for legacy and DMLS tags generated by iterative simulations.









### **MIME.109**

# SIMULATIONS

- Done in SolidWorks Simulation
- Used to validate/support physical tests.
- Load applied at top of end cap in cantilever fashion.
- Simulations iterated over a range of force values.

Figure 6. Resultant displacement plot from arbitrary force value of 7 kN applied to DMLS prototype.

Figure 7. Overlaid Load v. Displacement plots for legacy and DMLS tags generated by iterative simulations.