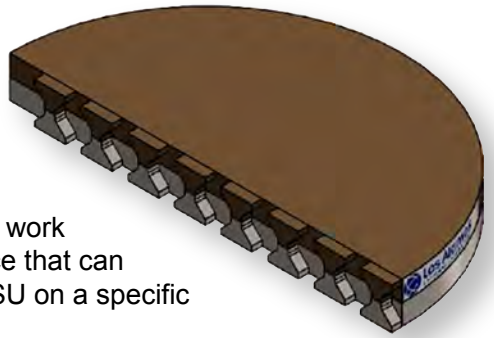
TAO Technical Applications Office

HIGHLIGHTS

Los Alamos NATIONAL LABORATORY

Advanced Dogbone Project

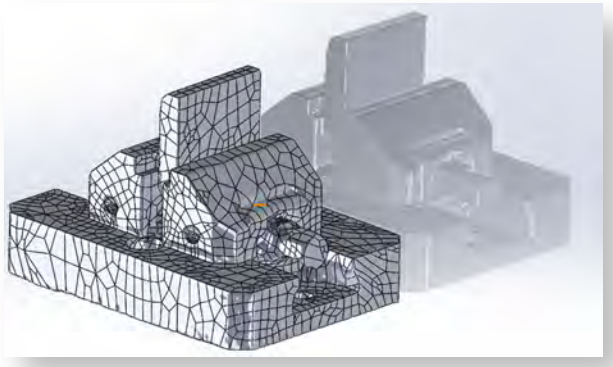
Los Alamos National Laboratory (LANL) and the Associate Laboratory Directorate for Weapons Production's (ALDWP) Technical Applications Office (TAO) have partnered with Montana State University (MSU) to look at future advanced machining platforms (FAMP). The goal of FAMP is to apply future advanced machine tool technologies to future pit production needs of LANL.



Stock sandwich materials.

One of the secondary benefits of the FAMP project is that it has created the necessary infrastructure for other parts of LANL to advance and fund related project work at Montana State University. We have staff, equipment, and funding avenues in place that can be leveraged by any organization within LANL to quickly begin collaborating with MSU on a specific project.

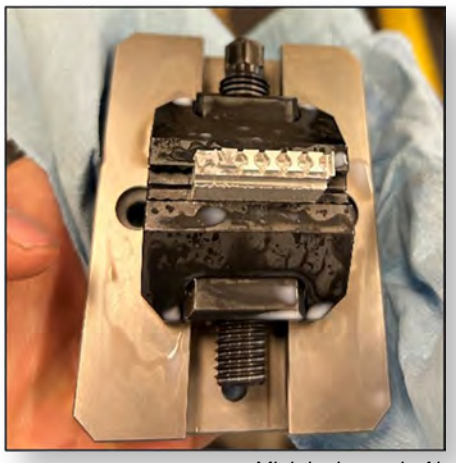
MST-16 and PT-5 tasked MSU with developing a workflow to manufacture tensile samples (dogbones) using the 5-axis CNC Pocket NC 50 milling machine from metals such as Al 1100 & pure Cu 101 and a supplied joined Al-Ti plate. The primary deliverable is a working demonstration of loading a sample, inspecting it, creating tooling paths from the inspection, and manufacturing the samples. This must be accomplished without removing or changing the fixturing of material samples. The desired dog bones are roughly 4mm tall, 3mm wide, and 1.25 mm thick.



3D scan of Al specimen.

A group of four undergraduate engineering students working on FAMP were able to partially demonstrate/test their initial concept within six weeks of the project's start. The project can be divided into 6 major steps:

1. Load the specimen into a vice/pallet system
2. Measure the pallet with the specimen using the Keyence 3D Scanner CMM => generate model for CAM
3. CAM: Create toolpaths for cutting out dogbones from the specific specimen on the pallet
4. Move the pallet into the Pocket NC
5. Cut out the dogbones on the Pocket NC
6. Measure the finished dogbones using the Keyence 3D Scanner CMM



Mini dogbones in Al.

The students have successfully proven that they can execute all six of the individual steps described above, which demonstrates that their approach has a high likelihood of success. Programming the machining toolpaths on top of the scanned model of the sample allows the dogbones to be cut out in the precisely desired orientation relative to the bond line between the two materials. The students have utilized inspection and machining equipment that were purchased under the FAMP project.

The next steps are to combine all the steps into a single process and to verify that it produces the desired dogbones. The goal is for the students to deliver a working demonstration with detailed documentation by the end of this summer.

NA-191 university research has funded the FAMP work. MST-16 and PT-5 funded the dogbones work.

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