

MxD 15-16-03	Category: PO to 1 st Article, Recurring Manufacturing
Title:	Developing Weld Predictor tools that allow SMEs to predict weld performance
Completion Date:	2018-03-31
Project Team:	Edison Welding Institute, Inc., Ohio State University Applied Optimization, Inc., Composite Solutions and Digital Manufacturing LLC, Tesla Motors Inc., Scientific Forming Technologies Corp
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Summary:

EWI teamed with OSC and parallel Works to develop new online welding software modeling tools for digital manufacturing using the cloud for high performance computations. The tools used three-dimensional (3D) models and are applicable to the three most common types of welding processes: arc welding, laser welding, and hybrid laser arc welding. Standard weld joints, butt joint, T-joint, and lap joint, were included in the software tool. Open source finite element codes were used as a solver and as pre- and post-processing tools.

A new web application front end was developed that allows interactive rotation and zoom controls by a user. A python script was developed for automatic mesh generation of the three welded joints using an open-source program, SALOME, based on user input parameters. A material property database containing data for commonly used steels, aluminum alloys, and titanium alloys as well as corresponding filler wires was established. Weld modules for arc welding, laser beam welding, and hybrid laser arc welding were developed which can work with an open-source solver, CalculiX, to simulate welding processes to predict temperature, stress, and distortion. An open-source software, ParaView, has been identified for post processing of CalculiX results. A simulation flow and script has been developed for automatic analyses of welding processes. The development has reached the point where the developed pieces are ready to integrate into one software and install the package in digital manufacturing commons (DMC), OSC, and Parallel Works.

Unfortunately, this project was terminated before its official completion date. The following tasks remain outstanding as of the notice of termination:

- DMC software integration
- Software testing and validations
- Technology transfer, workforce development, and education