WELDING SIMULATION

AWESIM

ENGINEERING FIRM CONVERTS WELDING SIMULATOR TO MANUFACTURING APP

Virtual design in the fabrication of large structures has enjoyed significant success in the heavy materials industry for almost two decades. Industries that have used virtual design and analysis tools have reduced material parts size, developed environmentally friendly fabrication processes, improved product quality and performance and reduced manufacturing costs. However, small- and medium-sized manufacturing firms (SMMs) haven't had the resources to leverage weld modeling software in order to make better performing products cheaper.

That's why the Engineering Mechanics Corporation of Columbus (Emc²) and its partners developed a cloud-based tool called Virtual Fabrication Technology (VFT) that simulates welding processes employed in the manufacture of metallic products. The weld design software package is an accessible, open-source "manufacturing app" through AweSim. VFT is a mathematics-based computational tool that allows manufacturing designers to better control distortion, minimize residual stresses, and pre-determine welding parameters, using various inputs, such as material properties and consumable properties.

"Small- and medium-sized manufacturing firms (SMMs) need improved weld-fabrication processes to ensure improved quality at lower costs to remain globally competitive. We are developing a sophisticated high performance computing based tool and making it accessible to SMM firms from a supercomputer center to easily permit use of these tools at affordable prices."

— *Frederick "Bud" Brust, Ph.D., senior research leader at Emc²*

VIRTUAL DESIGNS. REAL BENEFITS.

ADVANCED MANUFACTURING

ADVANCED MANUFACTURING

Emc²

2014

THE CHALLENGE

VFT is a computational weld modeling software tool that significantly improves processes to fabricate metallic products that employ welding to achieve final product configuration. Simulation-driven design traditionally requires high-end investment in complex hardware, sophisticated software and extensive training, making it cost-prohibitive for SMMs. Not being able to leverage this valuable high performance computing resource means fabricators at SMMs to fall further behind larger companies.

THE APPROACH

VFT has been in existence for a long time, however it was previously much less convenient and more complex. In 2014, Emc² secured a $1 million grant from the U.S. Department of Energy to develop VFT as a cloud-based tool that will simulate welding processes employed in the manufacture of metallic products. Since then, Emc² has made numerous improvements to VFT over the years to help SMMs take greater advantage of the benefits of high performance computing.

THE SOLUTION

Emc² and AweSim have worked to develop a VFT app that uses simpler point-and-click methodology. This allows non-specialists to access and use the app, which could significantly reduce or eliminate undesirable outcomes prior to fabrication and avoid costly design changes after fabrication. Also, Emc² and Ohio Supercomputer Center/AweSim have teamed up to do workshops that help fabricators learn how to use the app.