Quarterly Tech Talk

## Leading FEA Solutions

August 31, 2018

Our Focus

AlphaSTAR Corporation is a leading engineering services and software company that provides innovative physics-based simulation technologies for additive manufacturing, structural modeling and analysis of advanced composite structures in the aerospace, automotive, defense, and energy industries worldwide. As a solution provider, AlphaSTAR proudly partners with DS SIMULIA, LSTC, ANSYS, MSC, ALTAIR and SIEMENS PLM. AlphaSTAR is headquartered in Long Beach, California and is the recipient of esteemed industry and technology awards for R&D and software development.

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What's New with ASC Products?

GENOA 3DP SIMULATION

Now Fully Integrated with Ansys Workbench
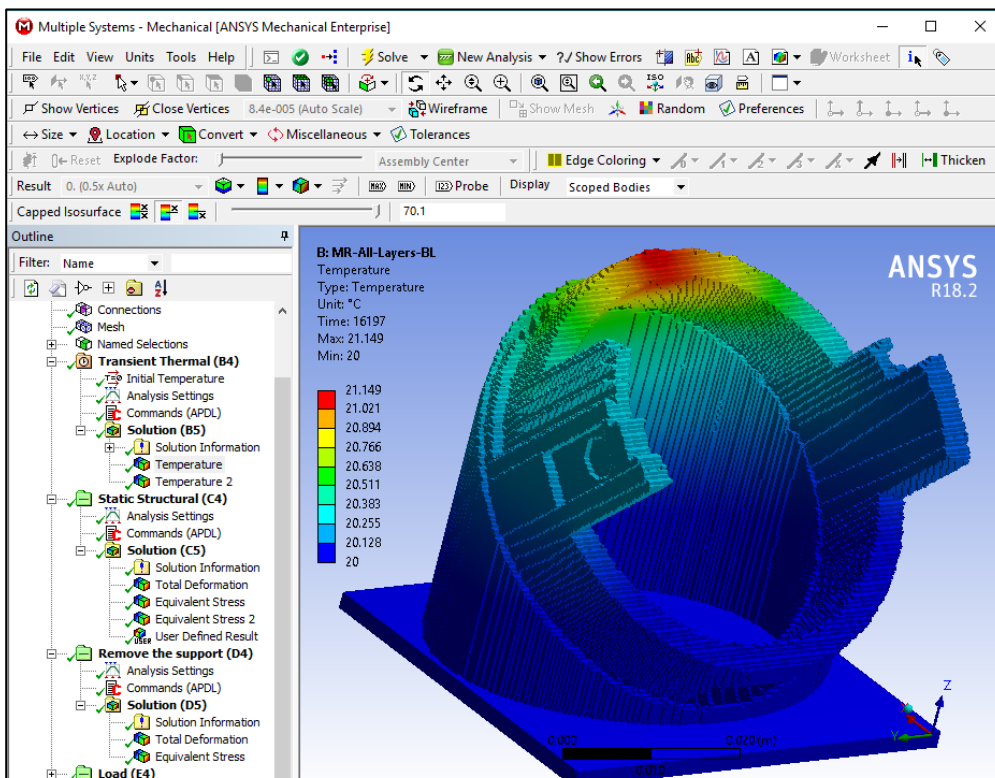
"*With MCQ and GENOA, users have the freedom to use a reverse engineering approach to make material modeling decisions based on application usage and without anticipating the need to have raw data from material suppliers. The simplicity in calibration and ability to predict test results accurately without having to rely on part testing has never been so easy.*"
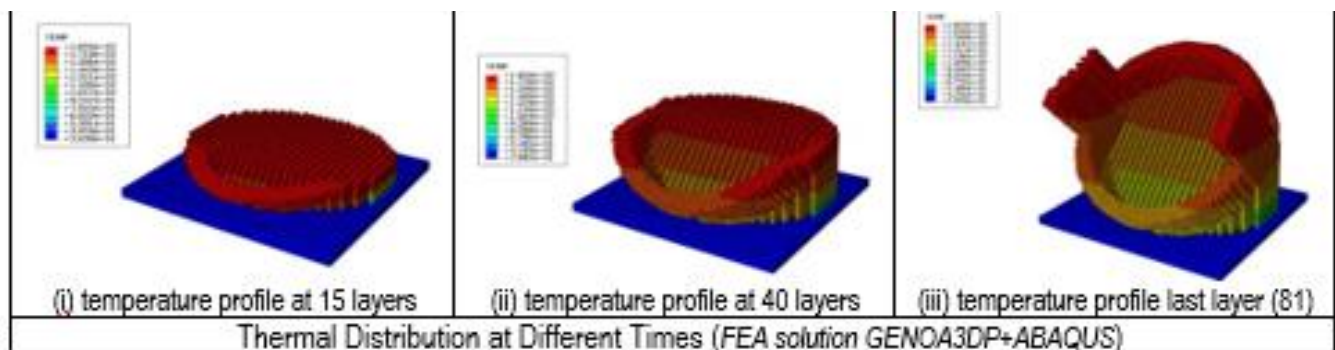
-Bob Jovas
Senior CAE Analyst
Solvay Compsite Materials

Success Story:
GENOA 3DP Used to Simulate Raytheon AM Build

Additive Manufacturing has changed the paradigm of product fabrication. Traditional methods of subtraction, welding and fastening have required engineers to design parts that can be built. AM has the potential to allow engineers to build parts that can be designed. Recognizing this potential, the US Missile Defense Agency challenged the American manufacturing community to leverage advancements in AM technologies to reduce cost and shorten delivery lead times of non-critical parts for missile defense. These advancements included GENOA 3DP, an AM simulation toolset that addresses both material and process modeling and, with the help of sensitivity analysis, can identify an optimum build solution.

In response to this challenge, AlphaSTAR, in cooperation with the University of Dayton Research Institute (UDRI) and Raytheon Corporation, undertook a study that investigated the Laser Powder Bed Fusion additive manufacture of a "non-critical" camera mount ring used on target vehicles and sacrificed during missile tests. The mounting ring had design characteristics that made it hard to manufacture with traditional methods and, therefore, ideal for additive manufacturing.

Once a part was identified, a corresponding material was selected for the study. Material pillars and coupons were printed and tested to provide a detailed material model. The non-critical component was virtually 3D printed using GENOA 3DP which predicted the thermal distribution on the component and residual stresses. Analysis identified peak load and showed damage initiation and progression. Residual stresses showed to be high in the region with noted distortion. Information collected was used to drive processes and parameters associated with the actual AM build. The path to printing good parts was verified through testing and AM simulation. Coupled with a building block approach, the GENOA 3DP process methodology lead to cost effective AM parts that were qualified for flight with minimal trial and error.

(i) temperature profile at 15 layers | (ii) temperature profile at 40 layers | (iii) temperature profile last layer (81)
Thermal Distribution at Different Times (FEA solution GENOA3DP+ABAQUS)

Upcoming Workshops:

Channel Partner Training	August 27th -31st Long Beach, CA
Optimizing Additive Manufacturing Parts	September 27th – 31st Stuttgart & Munich, Germany
Role of Simulation in Additive Manufacturing	October 8th NIAR - Wichita, KS

New Channel Partner in India:
Qantur Technologies

Taken from the meaning, "Con-tornare" which means "Together- To Turn" Qantur Technologies was founded by a team of experienced engineering professionals who are passionate about contributing towards the needs of the engineering community by providing world class and innovative solutions. Its interest is to work closely with simulation end users across industry sectors who are engaged with aspects of single domain, multi-physics, and multi-scale simulations. The sectors supported include simulation technology providers, researchers, and academia that are engaged in the area for development, manufacturing, lifecycle support and management of systems and subsystems.

"Qantur Technologies is delighted to announce its partnership with AlphaSTAR" says Irfan Ashai, Managing Director. "Partnering with AlphaSTAR will help us to diversify our simulation portfolio and address the significant need for customers who want to go beyond their core FEA solver results."

Qantur Technologies joined ASC as a channel partner in Q1 of 2018.
Visit them @ **www.qantur.com**

Woman Owned Corporation

Serving as President and Chief Operating Officer since 1990, Ms. Kay Matin, proudly brings the designation of "Woman Owned Corporation" to AlphaSTAR. During her tenure, the company has evolved from an advanced R&D firm to a leading provider of software and engineering solutions globally. Hardly a shrinking violet, Ms. Matin deftly maneuvered AlphaSTAR within the all-boys world of CAE to thrive among the industrial giants and be recognized by Industry as a technological leader in analysis and prediction.

President, Kay Matin

As technology evolved in the periphery over the last two decades, Ms. Matin recognized the significance of simulation as an accelerator of product development and fabrication, especially in Additive Manufacturing. Particulary when AlphaSTAR was approached by Oak Ridge National Lab to help address major printing flaws associated with the fabrication of the world's first 3D printed car, which is how the validated AM simulation toolset, GENOA 3DP, was born.

Fast forward to 2018, Ms. Matin has embarked on an aggressive R&D agenda, which propelled AlphaSTAR to the forefront AM Simulation, Real-time In-Situ Visualization and Part Qualification.

As the majority owner of AlphaSTAR, she epitomizes the designation of a "woman-owned' corporation.
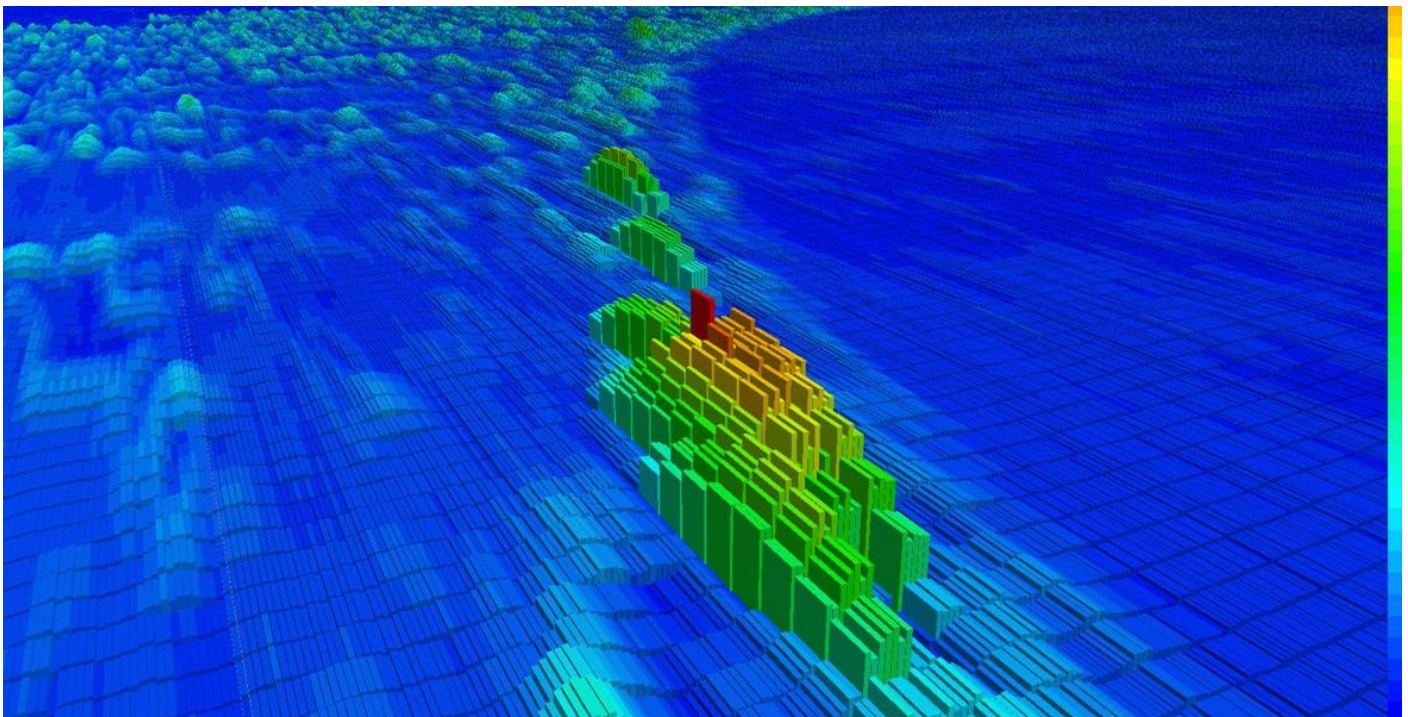
Cutting Edge InSitu Technology: AM SimQ

Quality inspection of Additively Manufactured parts is a critical subject. Engineers are actively pursuing new technologies to build better parts that meet tougher quality standards.

At the same time, AM technology is allowing engineers to print complicated parts with non-traditional geometries. These new features bring additional challenges and make post-built non-destructive-evaluation (NDE) and non-destructive testing (NDT) difficult to realize. Further, quality shortcomings identified after the completion of the AM process may lead to part rejection and, ultimately, the loss of time, labor and materials invested in the original build.

Did You Know?

- AM SimQ is applicable to both metallic and composite complex AM-fabricated parts
- AM SimQ enhances Build Quality while reducing Post-Built Evaluation
- AM SimQ replaces X-Ray and CT Scans integration with a Closed-Loop Control System

AM-SimQ represents a breakthrough technology that addresses many of these concerns, providing reliable in-process sensing and monitoring of the AM build to accurately predict part quality. Working with off-the-shelf profilometers and thermal cameras, AM-SimQ combines high speed monitoring, big data processing, and micro Terrain Mapping to provide real-time visualization of surface roughness and real time calculation of Heat Affected Zone, Meltpool, Solidification, Cooling, and Shrinkage. More significantly, AM-SimQ gives an engineer a layer by layer assessment of quality, which leads to greater control of the build process, reduces post-built evaluation, enhances build quality, eliminates waste, saves money and provides the foundation for closed-loop feedback control to meet a higher standard of acceptance.

Surface Roughness Shown in AM SimQ