Leading 21st Century Manufacturing

NDEMC℠

The National Digital Engineering and Manufacturing Consortium

Compete.

Council on Competitiveness

CASE STUDY

NDEMC Helps Jeco to Exceed Growth and Financial Expectations

The Council on Competitiveness is a nonprofit, 501 (c) (3) organization as recognized by the U.S. Internal Revenue Service. The Council's activities are funded by contributions from its members, foundations, and project contributions. To learn more about the Council on Competitiveness, visit our home page at www.compete.org.

Printed in the United States of America.

NDEMC Helps Jeco to Exceed Growth and Financial Expectations

Overview

Jeco Plastic Products, LLC is a small custom-mold manufacturer of large, complex, high-tolerance products with a plant in the Indianapolis area. Two processes are used in the manufacturing facility–rotational molding and twin-sheet pressure forming. Materials used range from commodity thermoplastic resins, such as polyethylene (PE), to extraordinarily difficult resins, such as polyetherketoneketone (PEKK) with continuous unidirectional carbon fibers. Jeco's customer base includes large U.S. and international original equipment manufacturers (OEMs) in the automotive, aerospace, printing and defense industries. For more information, visit the company's web site at jecoplastics.com.

STAKEHOLDERS

NDEMC Partners
Purdue University
Ohio Supercomputer Center (OSC)
Council on Competitiveness

MEP
NIST-funded, Purdue University-led Indiana Manufacturing Extension Project

Pilot Partners
Purdue University
Ohio Supercomputer Center

TOP KEY STRATEGIC INSIGHTS

Main Outcomes

- NDEMC provided access to OSC and Purdue's expert staff to enable Jeco engineers to promptly analyze and address a potential customer's last-minute design changes to a Jeco pallet product.
- Without the expertise and high performance computing (HPC) modeling, simulation and analysis (MS&A) resources, Jeco would have lost the opportunity for a multi-million dollar export order to a German OEM.
- NDEMC provided the engineering workforce training on the SIMULIA Abaqus Unfied Finite Element Analyis (FEA) software suite from Dassault Systèmes, used to analyze the pallet design change.
- Jeco's demonstrated capabilities with SIMULIA Abaqus Unified FEA and HPC are helping to pave the way for larger, more lucrative projects with major aerospace, automotive and joint product development projects.

Benefits

- A new opportunity for a multi-year contract with annual orders of $2.5 million during the next five to ten years.
- Fifteen additional jobs and a capital investment of more than $500,000.

Executive Summary

To take advantage of a monumental opportunity to secure a large OEM account, Jeco Plastic Products required high performance computing (HPC) and modeling, simulation and analysis (MS&A) resources to successfully evaluate design scenarios and predict the product performance of a complex custom pallet. In-house finite element analysis (FEA) software and computing resources were inadequate to accomplish this task. Jeco joined the NDEMC program to gain training, experience, access to university expertise, software and hardware to successfully compete against large foreign competitors. By employing HPC simulation, the company was able to simulate and analyze their pallet in a highly predictive and time-efficient manner. Without these HPC resources, they would not have earned a multi-year contract from a large German automotive OEM. *Improvements to Jeco's pallet product have impacted their bottom-line as sales revenue is expected to double, payroll will increase by 35 percent at their plant, and they will be in contention for additional high-margin, domestic and export business projects.*

Overcoming Technical Challenges with High-Impact Computing

Jeco experienced a technical challenge in its simulation of complex, high tolerance designs in inhomogeneous anisotropic materials,[1] which is virtually impossible to produce with the current commercially available software. Tedious trial-and-error physical design and testing was deemed inefficient and would not meet the expectations of their large automotive OEM client. High-ranking executives at the company were cognizant that they needed to upgrade their MS&A capabilities to effectively compete in this high growth niche industry.

A last minute requirement for a multi-year project with a major German OEM required Jeco to take immediate action to upgrade. The critical situation prompted the company to contact Purdue University for assistance through their Manufacturing Extension Partnership (MEP) program, which led to becoming part of the NDEMC Midwest Project. Jeco understood that the relatively small cosmetic alteration required by their client could potentially affect critical specifications for deflection, and they needed outside assistance. To facilitate this change and receive the initial order, they had to rapidly analyze a very complex design before making the expensive, irreversible tool changes. Access to HPC

1 An anisotropic material is one with properties, such as strength, that are different in different directions.

Top: *Aerial view of the Jeco facility in Plainfield, IN.*

Center: *The controlled relative humidity chamber used to maintain a specific moisture content in hygroscopic plastic sheet stock to be thermoformed.*

Bottom: *This custom twin-sheet thermoforming machine is unique in North America.*

and the Purdue support staff were invaluable resources in enabling the company to make quick and accurate evaluations for the final step in the design process.

Jeco CEO Craig Carson learned that the NDEMC public-private partnership would be instrumental in accessing the training, hardware and software necessary for MS&A. Based on their limited resources, Jeco's participation in the NDEMC project became imperative to meet their strategic organizational, product and financial objectives.

NDEMC Facilitates Jeco's Bright Future

NDEMC's Midwest Project offered Jeco access to Purdue's faculty and staff. Jeco's leadership valued the university's strong collaboration, unwavering support and intellectual insight to assist them in bringing technological improvement to their pallet product. The program also introduced the company to superior test facilities for a wide range of applications. This included utilizing HPC simulation paired with laboratory materials test equipment at Purdue to validate their models.

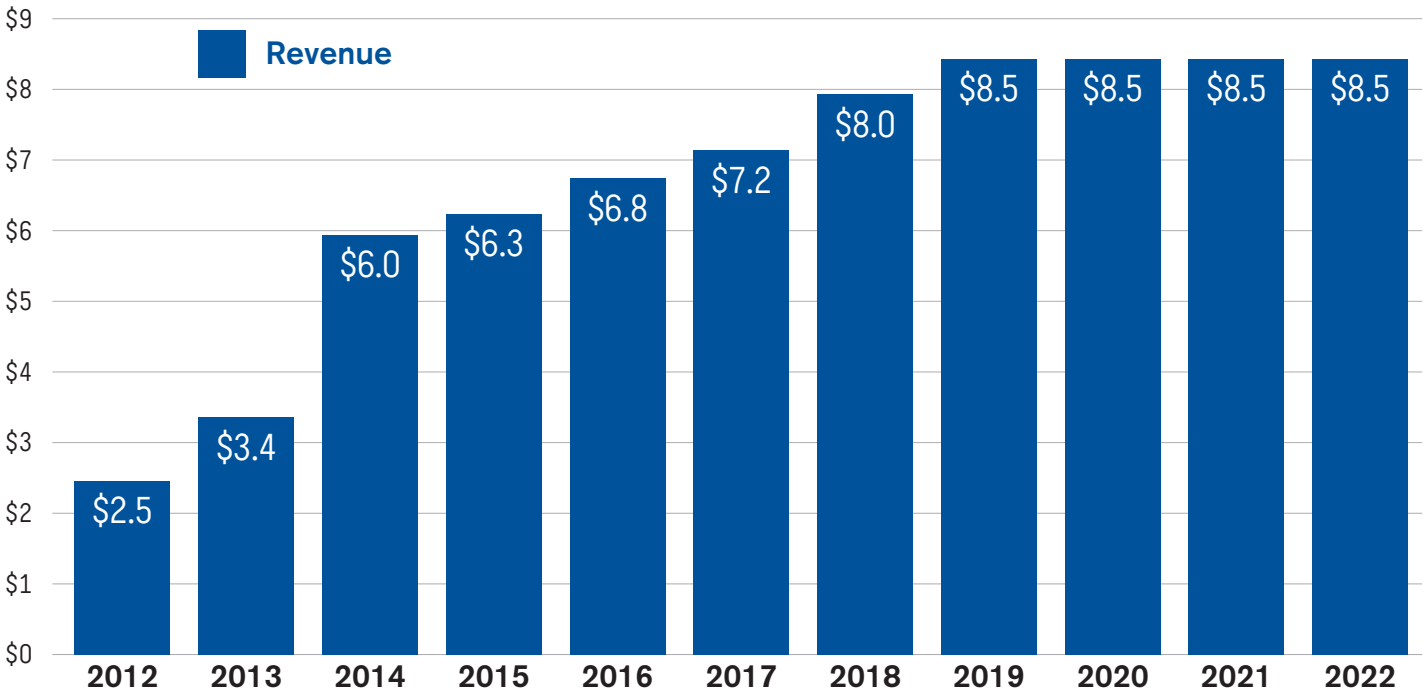
From an MS&A perspective, NDEMC facilitated Jeco's access to SIMULIA Abaqus Unified FEA,[2] which ordinarily would have been beyond the realm of possibility due to budgetary constraints. By gaining access to MS&A and technical expertise, Jeco had the ability to develop creative technological solutions in the final, time-critical phase of the product innovation process.

Long-term Economic and Financial Prospects for Jeco Plastic Products

Based on current projections, Jeco management is expecting a reasonably steady increase in incremental, cumulative sales revenue for rotational molding between 2013 and 2022, totaling nearly $23 million during the period. Figure 1 indicates a solid forecast of expected annual revenue growth during the next ten years.[3] These projections are based on a full-scale release of a new product for their German OEM customer and additional projects in the twin-sheet thermoforming market.

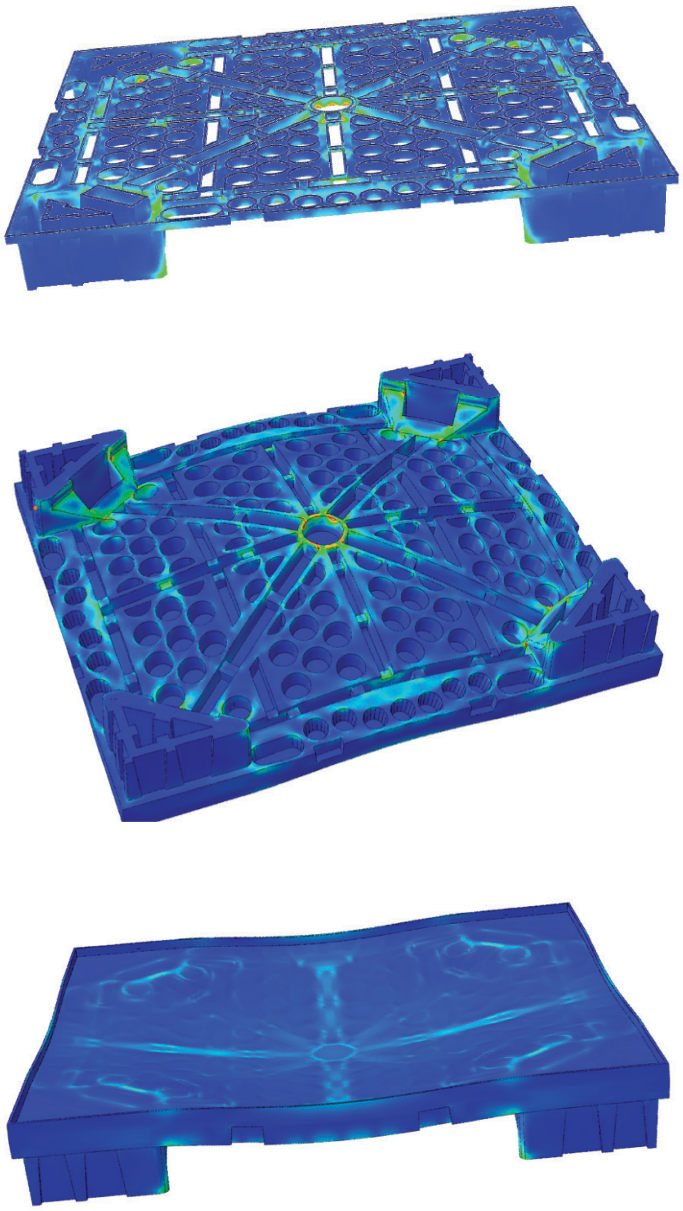
Due to increased production demand from their large clients, Jeco is expected to increase payroll and hire 15 advanced manufacturing workers within the next few years.

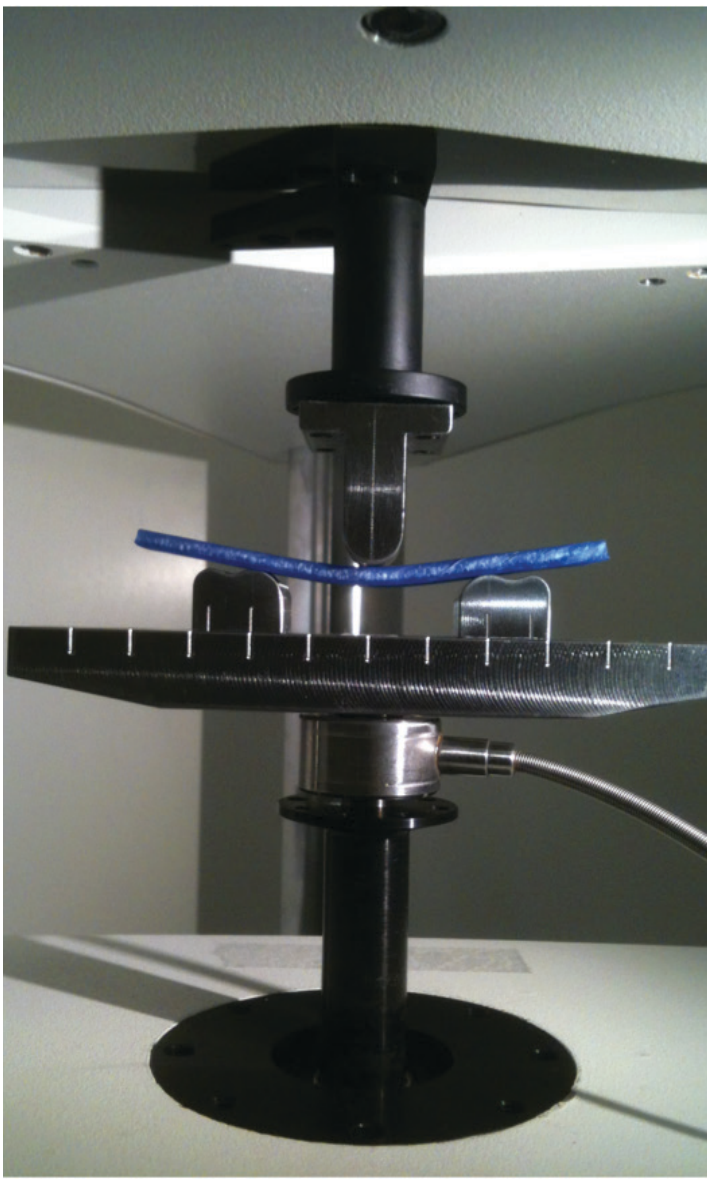
Figure 1. Projected Annual Revenue (Millions)



2 This is a suite of software applications for finite element analysis and computer-aided engineering.

3 The annual revenue figures include potential incremental rotation molding sales for the German OEM client totaling $2.5 million.





Left Side: *Stress and deformation simulations of Jeco's pallet–at top, inner pallet construction; center, pallet deformation bottom view; and bottom, pallet deformation top view. Based on the output from ABAQUS software, these views of the pallet deformation illustrate the level of stress in the material. Blue areas show the least amount of stress, while red indicates the highest level of stress.*

Right Side: *Laboratory testing equipment that measures the deformation characteristics of the material.*

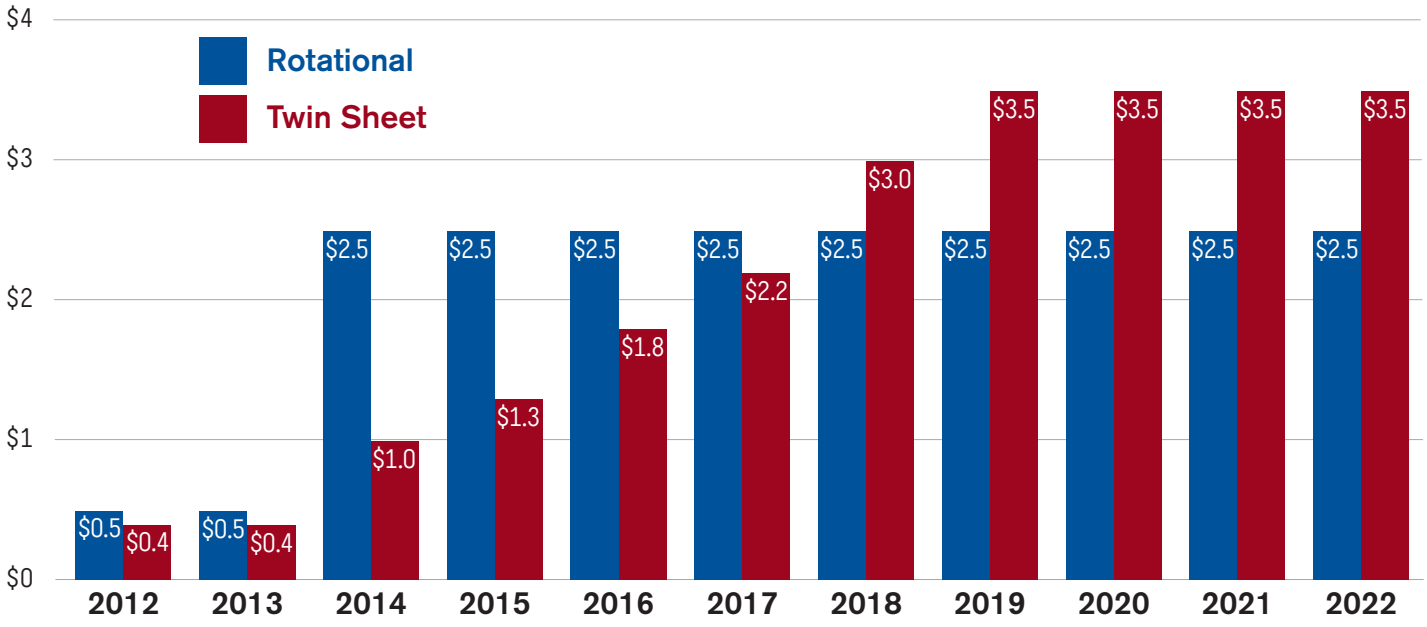
HPC Helps Deliver New Business Opportunities For Jeco

Carson and his company plan to utilize their new core competency to address emerging markets in the aerospace and automotive industry. The company has received a lucrative order from NASA for a major component for the International Space Station, based upon their new ability to design and manufacture products in layered anisotropic materials with continuous internal fiber reinforcement. HPC has become a vital resource in Jeco's product development process for various industrial applications. Most importantly, Jeco's demonstrated experience with MS&A during the Midwest Project was instrumental in helping them secure additional projects with other major aerospace and automotive clientele. Management reported that they are very pleased with the results of NDEMC's Midwest Project.

Additional Financial Projections

Carson insists the sales volume forecast for the next few years is very achievable, and the company will have working capital to fund growth by the 2015 fiscal year. Figure 2 illustrates revenue growth and sales projections for both rotational molding and twin-sheet forming processes. The total revenue for their twin-sheet work during the next ten years is expected to climb to nearly $24 million.

Figure 2. Sales Revenue for Twin Sheet Forming and Rotation Molding (Millions)



For more information about NDEMC, please contact:

Dr. Cynthia R. McIntyre
Senior Vice President
Council on Competitiveness
cmcintyre@compete.org

Mr. Aaron Malofsky
NDEMC Marketing & Communications
Council on Competitiveness
amalofsky@compete.org

Visit ndemc.org for more information.

Council on Competitiveness
1500 K Street, NW, Suite 850, Washington, D.C. 20005 T 202 682 4292
Compete.org

Compete.

Council on Competitiveness