

Technology Asset Grant Program Letter of Intent

Lead Applicant: Ohio State University College of Engineering

Address: 2070 Neil Avenue, Columbus, OH 43210

Estimated State Funds to be Requested: \$4.9M

Estimated Projects Total Cash Costs: \$15M

Project title: The Ohio State University Design and Manufacturing Excellence

Collaborators: The Center for Design and Manufacturing Excellence (CDME) will have several industrial partners from the Midwest region and will spark manufacturing-based economic development in the region. Those that will strongly impact Ohio job creation include:

Honda
General Electric Aircraft Engines
Columbus State Community College

Intended use: The Ohio Third Frontier Technology Asset Grant funds (OTF-TAG) will be used to acquire capital equipment, and build or renovate spaces to house this equipment that will support the design, manufacturing and testing of advanced structural assemblies. These facilities are a crucial part of a unified strategy to make Ohio a destination for manufacturing innovation focused on lightweight structural and propulsion systems. Design and manufacturing innovation will be focused at a state-of-the-art Manufacturing Innovation Learning Laboratory (the MILL) that will be a hub for collaboration and innovation in advanced manufacturing. Testing of assemblies is also essential to industry, as such part of this grant will one of the world's largest and most advanced turbofan propulsion system testing facilities.

Overview

The Center for Design and Manufacturing Excellence (CDME) at The Ohio State University was created specifically to attack the design and manufacturing technology issue head on and allow regional manufacturers to reduce the risk inherent in investing in state-of-the-art testing and manufacturing facilities by evaluating concepts in an open (but secure), staffed and equipped environment. CDME is structured to provide industry with the benefit of cutting edge research from leading universities, shared knowledge and best practices from industry, collaboration with technology transfer experts like those at EWI and access to shared tools, assets and capabilities centered in a newly renovated CDME facility in the Columbus' Technology Corridor. This unique mix provides industry with usable access to technologies and equipment that span the technical readiness spectrum enabling companies to them to shorten their product design cycles, become more agile in terms of product innovation and expand productivity of their internal R&D operations and personnel.

Problem Statement:

The process of moving technological innovations from the laboratory to the factory floor is costly and sometimes haphazard, and is a barrier to Ohio manufacturers who wish to remain competitive on the global market. It is well-recognized that the major weakness in this process is an effective means of scaling early-stage technical innovations to the scale and quality levels needed for insertion into a production manufacturing process. Effective, repeatable processes for traversing this mid-TRL (Technical Readiness Level) region are needed to maintain global competitiveness. The increasing number of material choices and material forming and joining processes make this problem even more difficult, to the point where even major manufacturing companies struggle to cost-effectively maintain the in-house technical leadership needed to develop effective manufacturing innovations. To address this challenge, The Ohio State University, in partnership with EWI, Inc., has established the CDME.

The CDME is a multidisciplinary, multi-industry organization focused narrowly on design, manufacturing and testing of advanced structural assemblies. The participation of manufacturing companies from multiple industries, technology transfer organizations like EWI and community colleges, technology creation institutions such as The Ohio State University, and next generation design and manufacturing equipment from commercial vendors make the CDME a one-of-a-kind center that will dramatically alter the way industry locates, develops, deploys and evaluates new manufacturing technology.

A key component of the CDME model is the development of at scale facilities in the heart of Ohio's manufacturing network purpose built to design, manufacture and test structural systems/components in an impartial and open environment where the participating companies own any developed intellectual property outright. The MILL is being developed as a professionally-run, shared access experimental facility to meet these needs. The Gas Turbine Laboratory at Ohio State is and continues to be a key bridge between research and production through its testing of full scale prototypes. The OTF-TAG funds will allow more rapid cycles from concept to product thus allowing Ohio manufacturers to garner its benefits in a shorter timeframe and invest in often risky new technology. Further allowing commercial companies to make capital investments, add jobs and increase the global competitiveness of Ohio's manufacturing network.

Project Goals and Objectives:

CDME will focus on the design, manufacturing and testing of advanced propulsion and vehicular assemblies, and grow into other markets. Access to the center will allow Ohio and other Midwestern manufacturing companies to outpace the global status quo in deployment of new design and manufacturing practices. At a tactical level, the CDME needs to make investments in capital equipment that are targeted at the multi-disciplined, mid-TRL applications. Many advanced manufacturing technologies have been developed in the Midwest, but ultimately find their first deployment in other global markets, sometimes by the direct competitors of those responsible for the technologies development. Key reasons for this are that the US does not have a strong infrastructure for technology development and assessment at intermediate Manufacturing Readiness Levels (MRL's). CDME will address these needs by

- 1) Investing in new design, manufacturing and testing technology
- 2) Placing this technology in modern laboratories suitable for prototype scale equipment with production representative equipment that is operated by CDME staff with hands-on commercial manufacturing experience
- 3) Freely offering the IP to the corporate investors in CDME.

This will enhance the regional economy by

- 1) Providing access to advanced design and manufacturing technology without the high upfront investment and risk of failure for commercial companies
- 2) Developing collaborative experimental facilities that spurs process innovation between industry and academia
- 3) Developing new jobs, both through the growth of the CDME and its member companies.
- 4) Training next-generation advanced design and manufacturing professionals both at Ohio State and through collaboration with Ohio's community colleges
- 5) Developing an enterprise that can pursue large programs that would be unavailable to a single organization independently
- 6) Increasing manufacturing competitiveness for companies supporting the CDME
- 7) Encouraging Ohio and Midwestern companies to locate operations in central Ohio, keeping the brain trust of the Ohio State University engaged and relevant in the global commercial manufacturing environment

Technical and Commercial Aspects and Workplan:

The CDME model is ironically both commonsensical and completely unique. The key features of the CDME architecture are that it is University center led by an experienced industry manufacturing executive who is supported by a management team consisting of a mix of both industry professionals and university faculty. The CDME is directionally oriented by an industry based Executive Committee. The Executive Committee and CDME management use performance matrices that emulate commercial environments more so than academic laboratories (project ROI, on time delivery, etc.). This is done through disciplined project management and utilization of the best resources for the application such as access to multidisciplinary faculty from multiple departments and colleges within OSU like the College of Engineering and Fisher College of Business, implementation support from non-university organizations like EWI and workforce development through community college engagement. Lastly, the CDME manages the Manufacturing Innovation Learning Laboratory (MILL); for project execution, for industry led technology vetting and to provide hands-on design and manufacturing experience for OSU students.

CDME's foundational facilities investment complements existing experimental facilities at Ohio State and EWI, and builds upon it by providing equipment and facilities that can test manufacturing processes at near-production scales of size and automation. Our initial investment is strongly informed by CDME's industrial members and supporters, including such companies as GE, Honda, Johnson Controls, and Whirlpool. This equipment will be housed in two locations: the newly renovated 20,000 square foot facility on OSU's west campus known as the MILL, and at OSU's Aerospace Research Center located at the OSU Airport. An anticipated vision of how the requested OTF-TAG funds would be deployed is shown below in multiples of thousands.

Design Equipment

Design Studio \$100

Manufacturing Equipment

Press Upgrades \$255
Solid State Welding Systems \$340
Advanced Automation Tools \$240
Polymer Extruder \$165

Testing Equipment

High Temperature Test Chamber \$200
Corrosion Chamber \$65
Thermal Cycle Test Chamber \$260
Drop Tower \$250
TurboFan Test Facility \$3,000

This equipment builds on existing university intellectual and physical assets as well as addressing near-term needs of Midwestern manufacturers. The equipment will be used for CDME projects, manufactured equipment qualification, for undergraduate, graduate and faculty directed research and will be made available for projects and training from Columbus State and other workforce partners. Being that this equipment is more indicative of commercial testing and manufacturing equipment than research/laboratory equipment all projects conducted will have a shorter path to impact. The more technologies and capabilities that we can add to the Ohio State University's design and manufacturing excellence portfolio, the more rapidly CDME members and Ohio companies can implement them on the shop floor.

Commercial Maturity of the Technology and Market Acceptance

The CDME was born out of a direct request from Ohio's design and manufacturing companies to OSU. This is an American response to the request that we (the university network, State of Ohio and industry) develop a new model for transitioning of technology from the scientific, fundamental research level to deployment on the manufacturing floor. The turbofan test facility and the MILL are being furnished with equipment and staffed with manufacturing expertise based on hours of interactions with companies in Ohio and surrounding communities. The unique feature of the CDME is its symbiotic connection to OSU faculty, Fortune 500 commercial manufacturers, the staff and equipment housed in the MILL, and high TRL manufacturing technology organizations like EWI.

Projected Impacts:

These will mirror the goals and objectives, and bring new technologies that are a mix of those now commercial and process innovation and a ready workforce. The design, manufacturing and testing capabilities created by the OTF-TAG funded will create a minimum of 130 new Jobs in Ohio, will help stabilize current Ohio facilities, and will further define central Ohio as the technology epicenter of the Midwest. Additionally, the work completed at the CDME will support funded graduate programs like Honda and GE-ACE, which has created over 230 MS and PhD level engineers from OSU alone in the last decade.

Sustainability:

The CDME is a highly sustainable model, because it is underpinned by the well-articulated needs of industry and it is based on the best attributes of globally successful centers and institutes, and the vast majority of the funding is from annual research commitments. So far, Honda, GE Aviation and Johnson Controls, Inc. (JCI) have all pledged at least \$1M/year to this enterprise. JCI is not featured in this proposal as their job growth may not be focused in Ohio. But their membership is further evidence that the concept will attract additional companies. The model being implemented for the CDME is a coalescence of the best parts of the 10 leading public-private technology centers around the globe, the successful university centers like the OSU Center for Automotive Research, and the guidance from committed commercial companies that are providing a large component of the CDME startup costs.