Request for Information on Pilots to Inform the Creation of Potential New Manufacturing Technology Acceleration Centers (M-TACs)

In response to your RFI, PolymerOhio Inc. offers the following.

The information below includes:

- Narrative on the importance of digital tools—modeling and simulation included—to U.S. SMMs
- Description of a concept to provide a "supply chain" for digital tools
- Description of a "Digital M-TAC" that supports the use of digital tools including simulation software as enabling technologies for SMMs across the nation in all types of manufacturing. This M-TAC will also support all other M-TACs for which the objectives should include developing and helping apply digital tools to improve their competitiveness.
- Summary of responses to questions posed in the RFI that refer back to the Digital M-TAC concept.

Importance of Digital Tools to the Success of SMMs

With the advent of the Digital Age, a broad variety of digital tools are becoming available that enable companies to more quickly develop their innovations and to implement them at lower cost and with a reduced time to market. These tools are powerful in helping companies improve productivity, remain competitive in the global market and increase the bottom line. Tools such as simulation software have been available and used by large companies for decades but their high cost and requirements of skilled engineers to apply them has largely limited SMMs from this beneficial approach.

Manufacturing leaders in foreign countries understand the value of digital tools and are focusing on applying them to try to compete with American manufacturers. The governments of China, Korea and India have already implemented programs that specifically attempt to help their manufacturers apply digital tools, particularly simulation software, to improve productivity.

To meet this challenge to our manufacturing leadership, it is important that the use of simulation software and other digital tools become "best practice" in the U.S. It is important to our global competitiveness and continuing growth that US manufacturers reach this point as early as possible.

U.S. small- and mid-sized manufacturers (SMMs) play a significant role in technology innovation in product and process technologies. At the same time, the dramatic gap between resources,

both capital and human, of large companies versus those of SMMs, particular those with less than 200 employees, has also resulted in a large gap in the capability of SMMs to develop and introduce these new technologies, products and processes. The application of digital tools can enable innovation and speed new products to market for companies of all sizes.

An Enabling Technology to Support SMMs

The Digital Age is bringing the development and availability of new tools, for example, simulation software, that a) help companies carry out projects faster and at lower cost than can be achieved with the present methodologies, b) offer new insights into existing processes, and c) enable innovation by providing speedier and more realistic analyses of models and tests than were previously possible and by inducing thought processes and analytical thinking.

Digital tools are becoming increasingly a part of "best practice". Many engineers are seeking any help they can get to lower cost and reduce time to market. But for many SMMs, the high cost of licenses of useful software and of hardware as well as the need for trained engineers to effectively use the tools is prohibitive.

The proposed M-TACs will be tasked to provide to SMMs a "broad spectrum of services to enable their process improvement and product development." Digital tools must be an integral part of these services.

The RFI states that "M-TACs can serve as a coordination point within key supply chains". The term supply chain is generally used to indicate the movement of raw materials, products, etc. However, in the Digital Age, digital tools will be such an important part of both manufacturing and R&D that there must also be a supply chain through which companies obtain digital tools and services. A company must be able to identify tools that will be effective for it. Often companies do not know about simulation software that could save them time and money in product and process development.

Accessibility of Digital Tools through the Manufacturing Portal

As an affordable means for companies to identify and use high-end digital tools, particularly simulation software, PolymerOhio has developed the Manufacturing and Polymer Portal under a grant from the NIST Manufacturing Extension Partnership (MEP). The Portal is accessed through a website at www.manufacturingportal.org, which takes you transparently to a catalog of digital tools housed at the Ohio Supercomputer Center, the partner that made this Portal possible. PolymerOhio has been licensed by the providers of these tools to provide access and training at reduced cost, usually on a pay-per-use basis. For example, Moldex3D, an injection mold-filling simulation tool, is offered for $200/day and $800/week versus a full license cost of

about $50,000. With Moldex3D, the user will recover their costs on the first use. Almost all software on the Portal will yield a payback within months with very little risk of resources.

The Portal now has ten tools available including simulation software for plastics processing and welding as well as tools for supply chain management, production scheduling and strategic planning. Software and digital tools will be added as often as useful tools can be identified.

The Portal is a nationwide resource and its services will be provided to MEP Centers through revenue-sharing agreements. Its benefits will be marketed nationwide through a combination of company visits, conference presentations, webinars and internet marketing.

We envision the Portal as an “access center” or "Digital M-TAC” that will provide important complementary services to those offered by other M-TACs. The access center/Digital M-TAC will have several objectives:

- Identify simulation software and other digital tools that can help manufacturers as well R&D groups to innovate, lower costs, and improve their processes and functions.
- Obtain agreements with providers to offer access to their tools through the Portal at affordable prices, for example pay per use.
- Provide easy access to the tools and to training in their use
- Assist all M-TACs in identifying both existing tools and needed tools and provide capabilities to develop the needed but non-existent tools.
- Provide outreach and marketing for the M-TACs to SMMs.

The last point is important. The “Digital M-TAC” will develop individual marketing plans for each digital tool in order to inform relevant companies of the benefits of using the tools. The plan will include sharing marketing costs and revenues.

It is important that each M-TAC focuses on its specialty. The Digital M-TAC will alleviate the need for all of the M-TACs to have the capability of offering access to the digital tools that they identify or develop as well as the need for an outreach and marketing program to assure that companies know of their availability.

Each M-TAC should be seeking to a) identify needs for digital tools, b) find existing tools, or c) to develop new ones to meet needs. Thus, the other M-TACs will be important sources of existing and newly developed digital tools. We are able to install and offer a new digital tool in a month, usually less than a month, if the tool is ready for public use.

The Manufacturing Portal has just held a National Launch with a press release, webinar and specific outreach to nearly 40 individual membership organizations across the spectrum of

manufacturing. The Portal will continue to proactively carry out nationwide marketing activities.

Access is available, some within minutes, for ten tools including:

- **Virtual Fabrication Technology:** Simulates welding of large structures with multiple welds to minimize effects of residual stresses, saving significant cost of real prototypes and fixtures.
- **Forecasting Solutions**: Manages supply chain to forecast sales and reduce inventories of raw materials, in-process goods, and products.
- **Supply Planning:** Assists companies in replenishing raw materials to maintain an optimal inventory of raw materials based on the company's ordering history.
- **Advanced Planning and Scheduling**: Schedules production equipment and labor resources to optimize production, resource acquisition and allocation.
- **StrategyStreet.com:** Guides leaders through the process of preparing a strategic plan to help companies improve their businesses.
- **AutoHarvest:** Resource for offering new IP for sale, partnering or acquisition; easy searchable for database for patents and for all SBIR Programs.
- **Moldex3D**: Simulates the injection molding process in 3D to assist in designing molds and optimizing processes.
- **Training from Routsis Associates**: Teaches injection molding processes and equipment to operators and design engineers including safety and best practices.
- **Virtual Extrusion Laboratory™**: Assists in designing extrusion dies of all types and in simulating single-screw extrusion.
- **Ludovic**: Simulates co-rotating twin-screw extrusion process to assist in optimizing process parameters and designing screw configuration, reducing cost and improving product quality

The newly designed website provides to visitors the information with which they can decide if the tool is appropriate and how it might be applied productively. The individual page for each tool includes a value proposition, the benefits that may be derived from its use, how to apply it to improve productivity and the fee schedule for using the tool. Supporting videos and linked articles are provided where appropriate.

With the existing relationship with the NIST MEP and the additional interfaces with other M-TACs, the Portal will be able to rapidly identify existing and needed tools and grow its catalog of digital tools beneficial to companies across the spectrum of manufacturing.

The Manufacturing and Polymer Portal is a solid foundation for a "Digital M-TAC". It has developed the technical, organizational, business and marketing mechanisms needed to provide digital tools affordably to SMMs across the nation. Establishing the Portal as a Digital M-TAC will assure that digital tools can be made available to SMMs almost instantaneously.

The pilot project has demonstrated that the Portal can be a self-sustaining provider of digital tools to SMMs and a strong supporter of the technologies developed and disseminated by other M-TACs.

The Digital M-TAC will meet the goals stated for the M-TACs.

- The Digital M-TAC demonstrates a business model that enables SMMs to effectively and efficiently access technology that will enable their innovations in product and process technologies. The Portal has operated for the past two years as a pilot project for Ohio polymer companies. Its scope has been expanded to include manufacturers in any segment of the U.S. manufacturing industry.
- The Portal has already established the relationships and interfaces with digital tool providers to apply a business model that will benefit both the SMMs and the providers. An important part of the relationships and interfaces will come from MEP Centers. Although other providers and organizations have considered offering digital tools for pay-per-use prices, the Portal, its provider partners and the Ohio Supercomputer Center are the first to offer access to a range of tools.
- The Portal's NIST MEP grant was awarded after a solicitation for programs to develop services that will help nationwide MEP Centers better assist their client companies in growing their businesses. We are working directly with the MEP to use the extensive MEP network to both inform SMMs of the benefits of the tools on the Portal and to learn from the SMMs what their needs are in order to identify and develop additional tools to help them improve their businesses.
- The Digital M-TAC will be constantly interacting with other M-TACs, MEP Centers, and individual companies to learn where the technology gaps are, particularly in terms of digital tools that can improve their productivity. Just as important, we will be learning what companies need and will pass that information to appropriate M-TACs.

Summary of Responses to RFI Questions

1. A Digital M-TAC, established with the Manufacturing Portal as its base, will leverage its present relationship with NIST MEP and its nationwide network of Centers, SMMs, other M-TACs, NNMI Centers, OEMs, and with academia to identify needed digital tools and to find or develop tools to fill the gaps. In addition, it is important that the Digital M-TAC develop relationships with the software provider community as a trusted outlet for their digital tools. At the same time, the Digital M-TAC will tap the knowledge in all of these groups to identify digital tools that are needed and will work to make those tools affordably available. These tools are also important additional services that the MEP Centers can offer their clients. The MEP Centers and other M-TACs will share in the revenues.

2. In order to support the establishment of simulation and other digital tools as "best practice" in U.S. manufacturing, the Digital M-TAC will develop a "supply chain" through which SMMs can access the tools at affordable prices as well as training in their use. Including all of the groups listed in the point above, there will be many important links in the digital-tool supply chain that must be cultivated and brought into the supply chain:

    Digital-tool providers (software, for example)
    Academia (model developers)
    OEMs (users and developers)
    SMMs (users)
    Other manufacturers and companies (users)
    Research institutions (users and developers)
    MEP Centers and their partners ("sellers")
    Other M-TACs (users and developers)
    NNMI Centers (users and developers)
    Associations (promoters of the value of M&S and other digital tools)

3. In regards to a specific Digital M-TAC, the present business model for the Manufacturing and Polymer Portal is feasible. It provides benefits for all parts of the chain. For example, with any simulation software, the providers will not generally market to the smaller SMMs—in the range of 20 to 100 employees—because few companies of that size have the resources to purchase a license. By allowing the Portal to offer their software at pay-per-use prices, they reach this market and with the revenue sharing model, they can benefit. In addition, some of these companies will eventually purchase a full license when they find that their use is adequate to rationalize a purchase. Newly developed software can be offered immediately to a broad range of companies and thus can grow sales at a faster rate than is now achieved with the usual approaches.

    Of course, the SMMs will benefit significantly because they do not risk the capital to purchase the software for which the usage may be less than projected. They can expense the pay-per-use access fees which are paid only when the tool is actually used. The decision to apply digital tools, simulation software in particular, is significantly simplified because of the very low cost of training and the first application of the tool.

    Cost share can be accommodated because of the need for the software providers in particular to give cost share for a number of licenses. There will need to be one license for each accessible copy. For example, if the Portal needs to have the capacity of ten simultaneous users, the provider will provide the value of ten copies of the software. Training will also require multiple licenses. Classroom training is the preferred method

for Portal tools and a license will be required for each student using the software through a computer. The Portal presently estimates up to twenty student licenses will be needed for a typical class. If the software is only $50,000 per license, the thirty licenses yields a cost share of $1,500,000.

4. No response

5. A critical issue with reaching SMMs with any type of new technology is the general resistance of such companies to perceived "costly" investments. We believe this will be an issue for any M-TAC in persuading an SMM to evaluate and accept a new technology, approach or tool.

   A company with annual revenues of $5 million to $10 million cannot easily rationalize an investment of $50,000. Many times there are no resources with which to evaluate the potential benefits. If the SMMs existing procedures and technologies are adequate in maintaining its bottom line, the decision makers will often defer even the consideration of the potential benefits of new technology.

   PolymerOhio has for 12 years had as its base objective to assist SMMs in growing their businesses. As a result, it has gathered an understanding of how SMMs make decisions and how to work with these companies. Consequently, the staff assigned to the Manufacturing and Polymer Portal Team also has experience with presenting new technologies to SMMs.

August 5, 2013
R. L. Markham
PolymerOhio, Inc.
614-477-1133
rmarkham@polymerohio.org