
ADI Successfully Completes Industrial Internet-of-Things Computing Demonstrator Project for Process Manufacturing, in Partnership with The Dow Chemical Company and Barton Research Group

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Applied Dynamics International (ADI), a global leader in industrial computing and connectivity, today announced the successful completion of a collaborative innovation demonstrator project to deliver an “Open Architecture Testbed Framework”, with support for Digital Twin functions, to enable digital transformation for the Process Manufacturing industry.

As part of its partnership with MxD, the nation’s digital manufacturing institute, ADI embarked on a research and development project with The Dow Chemical Company and the University of Michigan’s Barton Research Group to demonstrate advanced manufacturing concepts in an industrial open automation computing framework. This project is now featured on MxD’s future factory floor in Chicago, IL.

“ADI is very grateful to have had the opportunity to work with the Dow, MxD, and Michigan teams on a very fast-paced and ambitious industrial computing innovation project. Each of these team members brought a tremendous amount of technology, methodology, and knowledge to the table, on day one.” Said Scott James, ADI’s President & CEO. “ADI had the good fortune to have the right technology, at the right time and place, to help MxD remove a barrier by filling a well-defined, key technology gap, for process manufacturing.”

The project started when MxD and its members proposed addressing the challenges of “plug and play” connectivity and interoperability between different vendors. According to Rene Reinbigler, an enterprise architect at Merck, at a BioPhorum workshop, “communication between equipment from different suppliers will no longer be a nice to have, it will become mandatory in the industry.” MxD was searching for a computing architecture that allows swapping of different technologies with minimal levels of reconfiguration required and relying heavily on the use of standards, the Open Process Automation Standard (O-PAS), developed by the Open Process Automation Forum, a member of the Open Group, was of most interest to the project.

The project involved the development and implementation of a framework for gathering and analyzing all the data from a process manufacturing line necessary to improve visibility and control. This framework is a key first step in being able to implement proof-of-concepts for ‘mobile worker’, cybersecurity, predictive maintenance, and other digital twin use cases. This well-defined vision has the factory connected to: on-premises computing at the edge; cloud computing; and, the enterprise. This project looked to demonstrate key enabling technologies to achieve that digital manufacturing vision.

ADI believed the project scope was a great fit for the ADEPT software platform and believed the development of a demonstrator industrial computing rig, for this project called an Integration Test Environment (ITE) rig, would allow the concepts to be rapidly developed and clearly demonstrated.

ADI's partnership with the Barton Research Group in open automation connectivity and Digital Twin technology is part of how ADI became aware of the MxD project opportunity. The scope of this project made it a natural fit for the Barton Group to partner with ADI for the purposes of rapid prototyping and demonstrating their best-in-industry Digital Twin architecture and technology platform.

The Dow Chemical Company joined the team as the project's "Pilot Manufacturer" and voice of the customer, and provided a key input to the project with the Dow Statement-of-Work (SOW) document. The Dow SOW document provides a detailed "customer discovery" report including solution objectives, key use cases, target demographic, solution architecture, ranked must-haves, and ranked nice-to-haves.

The Process Manufacturing Digital Twin – Open Architecture Testbed Framework consists of a digital twin and open automation sandbox with a self-contained Integration Test Environment (ITE) platform. This system demonstrates and evaluates digital twin and open automation technologies with cross-vendor systems. It also allows for manufacturers to develop, test, and evaluate new technologies without interrupting production operations and without costly R&D investments.

The project team designed, implemented, and delivered an industrial open automation framework, based on ADI's ADEPT software platform, that included multiple digital twin and open automation apps, running in real-time, on the purpose-designed and built ITE rig. ADI's systems engineering team performed an agile design engagement with the Dow/MxD team, designed, and built the ITE as an industrial-packaged computing rig based on Commercial Off-the-Shelf (COTS) industrial computing equipment including Dell® edge server, NVIDIA® machine learning server, Cisco® industrial network gear, Eaton® smart power distribution equipment, and Texas Instruments® industrial communication prototyping equipment.

This project demonstrated how an OPA Plug-and-Play Computing Framework may be used to deploy a wide range of cost-saving open automation and Digital Twin functions. The project also demonstrated how Digital Twin Apps may be used to deploy cost-saving functions, including equipment and process health monitoring, predictive maintenance, and Control Loop Performance Monitoring (CLPM).

Efforts are well underway to define a follow-on innovation demonstrator project to extend the scope of connectivity and OPA app hosting: Connected to best-in-class industrial controls platforms; hosting OPS apps in the cloud; and, connecting the entire capability to the Enterprise.

To learn more about this exciting computing innovation demonstrator project go here: adi.com/mxd

Open Process Automation

Traditional automation technologies have been developed and controlled by a single (or small group) of companies that require their version of hardware and software to be used. While this enables those companies to control quality, it creates single-source lock-in, which limits users' options for integrating new technologies, thus reducing competition and motivation for new entrants to address cutting edge challenges. Open Process Automation (OPA) technologies allow products from multiple vendors to interoperate as a single, cohesive system, thus enabling increased options and competition for delivering future innovation.

Digital Twin

Digital Twin (DT) technologies are one such cutting-edge technology that promises to greatly reduce waste, increase safety and reliability. A DT is a virtual representation of a physical entity (e.g. component, equipment, manufacturing line, or entire production facility) that can be monitored and compared against the real thing. A DT can be used in real time, collecting data from equipment throughout the manufacturing line, to detect anomalies and predict failures before they occur, and it can also be used at an accelerated pace (and with many copies in parallel) in a completely virtual environment. When a DT is used in a virtual environment, it enables testing “what if” scenarios much more efficiently and safely (without the risk of harm to people or damage to the facility) and can provide insight that greatly improves quality, efficiency and safety. And since a DT is virtual, it can be tuned and improved over time to provide better feedback and more effective predictions.

ADEPT Plug-and-Play Industrial Computing and Connectivity Framework

ADEPT is an industrial computing and connectivity software platform built around the concept of time-deterministic “data frameworks” executing on industrial real-time Linux servers and operating as a single, coherent distributed resource controlled and managed via intuitive, drag-and-drop desktop tools. ADEPT is used in the largest, most demanding industrial computing and connectivity applications across the global aerospace and defense industry, but also scales down to work with low-cost computing hardware and open-source real-time Linux. The open architecture nature of ADEPT allows users to leverage best-in-class COTS and open-source technologies in a common, project-based environment. ADEPT dramatically reduces the cost and time to deploy and operate industrial open process automation capability, providing comprehensive out-of-the-box capability built on a trusted technology platform.

Process Manufacturing

Process manufacturing accounts for a significant portion of overall manufacturing, including the following industries: food and beverages, oil and gas, pharmaceuticals, personal care and cosmetics, plastics and metals. Process manufacturing operations have many different requirements than discrete manufacturing, but one significant difference is the support for continuous processes that require very long uninterrupted runtimes, sometimes up to 10 years or more. Without the luxury of planned downtime for maintenance and improvements, process manufacturing facilities require systems and equipment that can continue to operate throughout maintenance and improvement events. Open process automation and digital twin technologies have the potential to greatly improve the process manufacturing operations, but to do so, they must overcome the unique challenges that process manufacturers face.

About MxD

[MxD](#) is where innovative manufacturers go to forge their futures. In partnership with the U.S. Department of Defense, MxD equips factories with the digital tools and expertise they need to begin building every part better than the last. As a result, our approximately 300 partners increase their productivity and win more business.

About Dow

[Dow](#) (NYSE: DOW) combines global breadth, asset integration and scale, focused innovation and leading business positions to achieve profitable growth. The Company's ambition is to become the most innovative, customer centric, inclusive and sustainable materials science company, with a purpose to deliver a sustainable future for the world through our materials science expertise and collaboration with our partners. Dow's portfolio of plastics, industrial intermediates, coatings and silicones businesses delivers a broad range of differentiated science-based products and solutions for its customers in high-growth market segments, such as packaging, infrastructure, mobility and consumer care. Dow operates 106 manufacturing sites in 31 countries and employs approximately 35,700 people. Dow delivered sales of approximately \$39 billion in 2020. References to Dow or the Company mean Dow Inc. and its subsidiaries.

About the University of Michigan Barton/Tilbury Smart Manufacturing Group

The [University of Michigan Barton/Tilbury Smart Manufacturing Group](#) has been conducting research into many of the facets of smart manufacturing ranging from architectures and solutions for Software Defined Control (SDC), Digital Twin (DT), and analytical solutions for anomaly detection, virtual sensing, and predictive maintenance (PdM). In the SDC area, research has been focused on developing a DT framework that incorporates smart manufacturing capabilities such as PdM, predictive scheduling, and control reconfiguration in an extensible, reusable, and strictly value-add fashion. In the PdM and anomaly detection arena, DT methods have been developed for incorporating data, context, and subject matter expertise into detection and prediction analytics. Using this PdM approach, trace features can be extracted to determine anomalies and trends, and limits for diagnostics and prediction can be adjusted based on an understanding of the context under which the model operates (e.g., product or time since last maintenance event), and the operational state progression. The utility of these methods has been verified in manufacturing scenarios, and research has begun on extending these methods into a more generalized environment.

About Applied Dynamics

[Applied Dynamics](#) is a digital engineering and industrial digital transformation solutions company. We have been pushing the limits of simulation and real-time systems for over 60 years. Applied Dynamics flagship product, the ADEPT Framework, is the most advanced real-time, industrial Internet of Things (IoT) software platform available, providing an agile, open architecture, feature-rich environment for the complete product lifecycle from development through integration, verification, validation, certification, deployment and sustainment. ADEPT embraces an open architecture and allows its users to leverage best-in-class COTS components. The ADEPT user base includes 14 of the global top 35 A&D companies and extends into marine, power systems, oil & gas, and the automotive industry.

To learn more about how ADI can help your team, visit www.adi.com or send an email to adinfo@adi.com.

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