The Learning Factory Digital Twin

A proof-of-concept to apply digital twinning to the manufacturing process of aerospace components.

Project Overview

Even the latest advancements in manufacturing processes and intelligent materials still rely on a form of trial and error: parts are produced and tested, and then refined and redeveloped in a costly, iterative process. The Learning Factory Digital Twin project will integrate advanced materials research with emerging manufacturing technologies to make products lighter, stronger, smarter, more durable and energy efficient, while minimizing production costs.

The simulation of traditional factory processes in a virtual environment will create, in essence, a digital twin of a physical production facility. Sensors will be deployed to collect real-time data that will be used in combination with physics-based simulations of the production line to detect problems faster, predict results more accurately, and ultimately lead to the manufacturing of better products.
The Learning Factory Digital Twin project will position British Columbia as a global leader in digitally enhanced advanced manufacturing, leveraging the Province’s growing technology sector and existing relationships within the Cascadia corridor. British Columbia already plays a key role in the Canadian manufacturing industry with over 7,200 manufacturing establishments contributing $14.7 billion to the BC economy (nearly seven percent of GDP) and nearly $9B in exports in 2014, according to the Chartered Professional Accountants British Columbia Industry Update report on BC’s Manufacturing Sector (Winter 2016).

Avcorp Industries Inc. will lead the project in partnership with Convergent Manufacturing Technologies Inc., AMPD, Boeing Research & Technology, LlamaZOO Interactive, and the University of British Columbia. Together, the project team will digitize segments of two existing industrial production lines for complex Boeing aircraft parts, bridging the knowledge and talent gaps between research, education and full-scale industrial production to create new, digitally driven industrial tools. These tools will have a dramatic impact on spatial planning, asset tracking, asset state determination, data collection, aggregation, physics-based simulation, digital architecture and process automation, benefiting diverse customer bases and industries.

The project will also demonstrate the mutual benefits of data-driven collaboration, enabling advanced computational and modelling approaches and commercial technology development opportunities. The project will inform, develop and evolve Technology Readiness Levels and Commercial Readiness Levels related to the project’s key industrial digital technologies.

Lessons learned in this project will inform future work and create a new paradigm in advanced aerospace manufacturing. Hands-on learning and research will take place in parallel with a virtual environment enabling a cycle of innovation and continuous improvement through predictive maintenance, real-time monitoring and quality control.

Longer-term potential exists to construct a new Digital Learning Factory at the University of British Columbia’s Okanagan campus in Kelowna, B.C., which would expand upon the learnings and new technologies developed during The Learning Factory Digital Twin project.