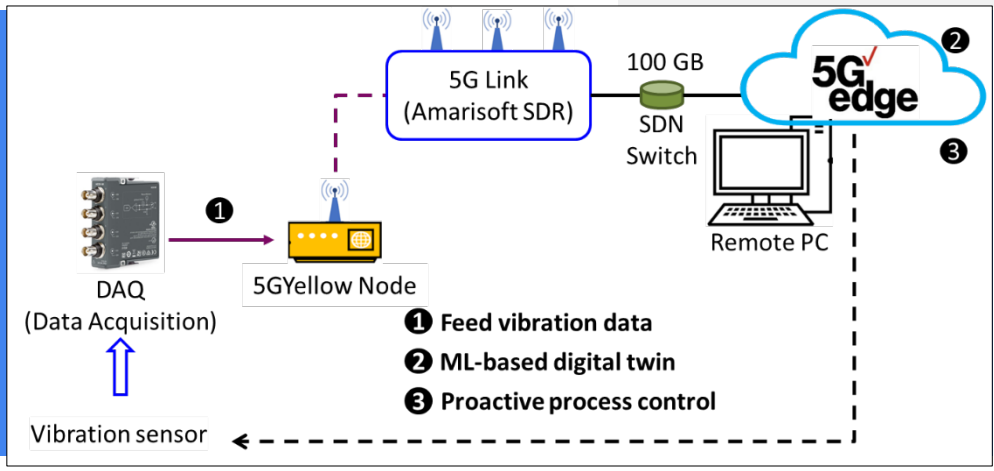
Industry
Aerospace & Defense

Technologies
Connectivity
Sensing
Data Analytics
Advanced Control
Machine Learning

Solutions
Manufacturing Productivity

PROJECT CASE STUDY

5G-Enabled Low-Cost Sensing and Connectivity for Legacy Machinery



PROJECT LEAD

Rutgers University

PROJECT TEAM

N/A

PROJECT OBJECTIVE

Project goals: Develop a smart milling testbed by integrating a 5G-enabled accelerometer with a legacy mill; Develop an automatic repairing testbed by integrating a 5G enabled laser scanner and robot with a legacy lathe.

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Rutgers Integrates Wireless Sensors to Legacy Equipment to Create Smart Machines

BENEFITS TO OUR NATION

With advanced automation, real-time data analysis, and predictive maintenance capabilities, smart equipment reduces downtime, improves quality control, and lowers production costs. This leads to faster innovation cycles and more resilient supply chains, helping U.S. manufacturers stay ahead in key industries like automotive, aerospace, and electronics. Additionally, the presence of smart machines within the US manufacturing base supports sustainability efforts by optimizing energy usage, reducing waste, and reducing the carbon footprint of the manufacturing sector overall.

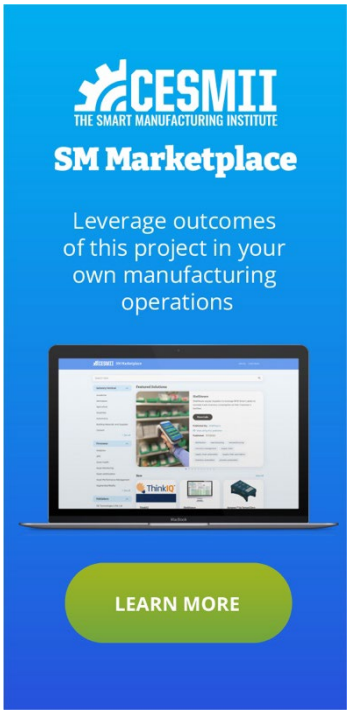
BENEFITS TO INDUSTRY

Smart manufacturing equipment benefits industry by streamlining operations and increasing overall efficiency. Through automation, data-driven decision-making, and real-time monitoring, companies can reduce production errors, minimize downtime, and optimize resource usage. This leads to lower operational costs and faster production cycles, allowing industries to meet market demands more effectively. Smart equipment also improves product quality and consistency, enabling businesses to stay competitive by implementing new technological advancements.

PROJECT DESCRIPTION

TECHNICAL APPROACH

Integrating legacy manufacturing equipment with wireless sensors and edge computing is the most cost-effective way to augment the capabilities of legacy machinery on the shop floor. Two distinct use cases, blade milling and automatic repairing, are proposed to demonstrate the proposed approach. The overall technical approach is to augment a legacy mill and a legacy lathe by integrating wireless sensors (i.e., 5G-enabled accelerometer and 5G-enabled laser scanner, respectively), and streaming process data to the 5G edge for data analytics, machine learning, and edge-based control.



ACCOMPLISHMENTS

- Integrated a 5G-enabled accelerometer to a legacy mill to create a smart milling testbed.
- The smart milling testbed was able to read vibration data and machine operational data to enable the creation of a machine learning-based digital twin that enabled proactive process control.
- Integrated a laser scanner and a robot to a legacy lathe to create a part inspection and repair testbed.
- The part inspection and repair testbed demonstrated the ability to automatically inspect and repair production parts.

DELIVERABLES

- Delivered 5G-enabled Milling and Robotic Testbed Schematics.
- Delivered 5G Accelerometer Retrofit Manual.
- Delivered 5G Robot Control Code.
- Delivered Milling Chatter Machine Learning Code.

REUSABLE OUTCOMES / SM MARKETPLACE

- Robotic Inspection and Repair Testbed
- Smart Milling Testbed

PROJECT DETAIL
Budget Period: BP5
Submission Date: 08/12/2024
Sub-Award (contract) Number:
4550 G LA087
SOPO: 2351

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