

TECH OFFER

Feedback Driven Manufacturing & Factory Visibilities



KEY INFORMATION

TECHNOLOGY CATEGORY:

Manufacturing - Assembly, Automation & Robotics

Logistics - Planning & Order Processing

Infocomm - Data Processing

TECHNOLOGY READINESS LEVEL (TRL): **TRL6**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO175409**

OVERVIEW

Feedback Driven Manufacturing (FDM) is a methodology that integrates real-time data collection, analysis, and automated feedback loops directly into the manufacturing process, making it a practical pathway toward data-driven smart manufacturing.

Traditional factories often struggle with fragmented data, delayed quality checks, and reliance on human intervention, leading to inefficiencies, scrap, and rework. This technology addresses these pain points by continuously monitoring work-in-progress through sensors, RFID, and machine connectivity, and feeding insights back into operations at the point of production.

This innovation is particularly valuable for aerospace, oil & gas, medical devices, and other precision-driven sectors that require stringent tolerances and rapid response to deviations. Adopters of this technology are manufacturers seeking to transition toward Industry 4.0 and digital transformation without the cost and complexity of traditional MES/ERP systems. By embedding

intelligence and visibility into the factory floor, FDM bridges the gap between raw data and actionable decision-making, creating a scalable, sustainable foundation for smart manufacturing and supporting a smooth shift toward data-driven smart manufacturing.

TECHNOLOGY FEATURES & SPECIFICATIONS

The system is modular and can be scaled by either adding shelves, sensors, or connectivity nodes, making it suitable for both SMEs and large enterprises. Key features include:

- **RFID Smart Shelves:** Real-time WIP, tool, raw material tracking.
- **Process Monitoring:** Live quality deviation against control limits and with real time alerts for corrective action.
- **Monitoring of operational efficiency:** Collection of machine usage data, operator actions and material inventory.
- **Real Time Data:** Inspection results will be presented on visual dashboards and alerted through mobile app based notifications.

POTENTIAL APPLICATIONS

This technology serves as a lightweight alternative to conventional MES. Its adaptability allows manufacturers to adopt the system in stages, starting from shopfloor visibility and scaling toward full autonomous process feedback. It can be deployed across multiple industries where precision, traceability, and productivity are critical. This helps to reduce reliance on manpower for manual decision-making. It also reduces scrap and rework through early detection of deviations, saving material and labour costs, improving workforce efficiency and consistency.

- **Aerospace and Defense:** Supports compliance with stringent quality standards by ensuring process stability and early detection of deviations.
- **Oil & Gas and Energy Equipment Manufacturing:** Minimizes downtime and rework caused by tool or material inconsistencies.
- **Manufacturing of Medical Devices:** Ensures tight tolerance control and reduces the risk of defective products reaching the market.
- **Other High-Mix, Low-Volume Environments:** High-precision industries, electronics, automotive, and contract manufacturing.

MARKET TRENDS & OPPORTUNITIES

Global smart manufacturing and Industry 4.0 markets are projected to exceed USD 500 billion within the next decade, with growing emphasis on real-time monitoring, predictive quality, and data-driven decision-making. Current solutions often focus on either hardware tracking or software analytics, but few integrate both into a seamless feedback loop. This technology's uniqueness lies in its ability to convert fragmented factory-floor data into real-time process intelligence without requiring complex ERP/MES integrations.

Opportunities exist in markets where governments are funding digital transformation, such as Southeast Asia, China, and Europe. Companies face increasing pressure to reduce waste, improve sustainability, and meet compliance requirements — making feedback-driven systems particularly attractive. By bridging the gap between IoT hardware and process-level optimization, this technology positions itself as a differentiated offering compared to conventional MES platforms and standalone IoT solutions.

UNIQUE VALUE PROPOSITION

- **Lightweight solution:** Customers gain the ability to adjust production quickly in high-mix, low-volume scenarios without incurring significant setup costs. Unlike large MES or ERP systems, this solution is modular and cost-effective, enabling SMEs to adopt Industry 4.0 capabilities with lower upfront investment.
- **Quick deployment:** Sensors and system can potentially be deployed within a day.
- **Customisable implementation:** RFID tracking solution can be scaled up or down specific to use cases. Modules can be selected and plugged together specific to use cases and needs.
- **Process to quality linkage:** System enhances compliance and traceability by creating a continuous digital record of production events.