



End-to-End Operational Excellence at the TOGG Gemlik Technology Campus

Optimizing the Just-in-Sequence Manufacturing Andon System with AI & Wearable Technology

2025 | Success Story

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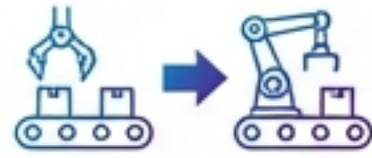
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The Scale of
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Mobility



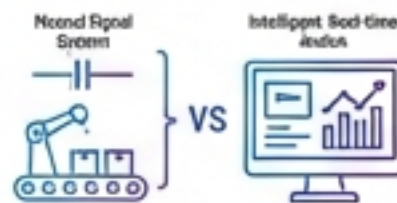
02 Hidden Costs

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The Scale of USE-CASE Mobility



Facility Footprint

1.2 Million sqm

17 distinct campus buildings

Workforce & Automation

4,300 Employees

Operating alongside 250 highly autonomous robots

Annual Capacity

175,000 Smart Devices

Produced at peak annual capacity

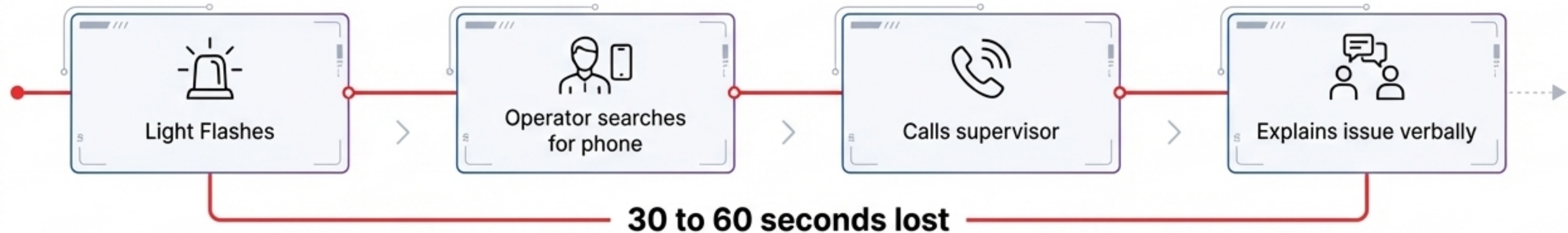
Just-In-Sequence Manufacturing: A zero-tolerance environment where a single unsynchronized second halts the entire value chain.

The \$600-Per-Second Bottleneck

Estimated Hourly Cost of Unplanned Downtime by Industry








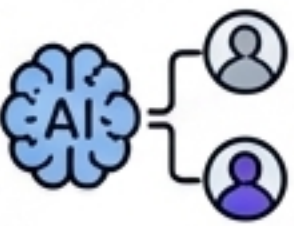


The Operational Bottleneck (Traditional Andon)



A highly automated factory relied on an archaic communication loop. In a facility where downtime costs \$600 per second, verbal reporting is an unacceptable liability.



Upgrading the Andon Architecture

| Traditional Andon Workflow | | TIM Smart Andon Ecosystem | |
|----------------------------|--|---|--|
| Alert Mechanism |  Visual line-of-sight (lights) |  Multi-sensory (Haptic, Optic, Acoustic) on the wrist. | |
| Data Structure |  Unstructured, subjective verbal descriptions |  Structured, high-res photographic evidence with digital logs. | |
| Routing Logic |  General broadcast (causes alarm fatigue) |  AI-filtered, 1-to-1 routing to the exact localized supervisor. | |
| Latency |  Minutes |  Milliseconds. | |

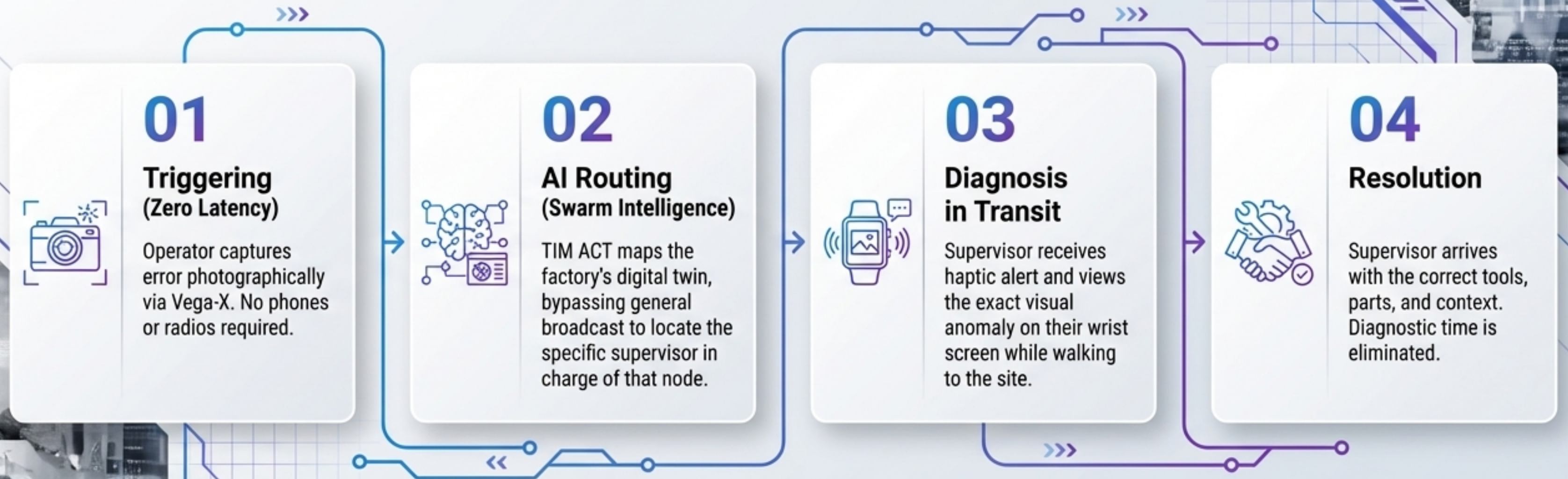
04 Intelligent Automation: Hardware

Vega-X: The Cyber-Physical Interface



Replacing handheld scanners with a wearable ecosystem frees operators to maintain continuous ergonomic throughput.

TIM ACT: AI-Driven Anomaly Routing



Transforming Micro-Efficiencies into Macro-ROI



Communication Latency

Minimized to near-zero. Eliminated the 60-second manual reporting gap, protecting up to \$36,000 per incident.



MTTR (Mean Time to Repair)

Drastically reduced by overlapping physical transit time with digital diagnostic time.



100% Traceability

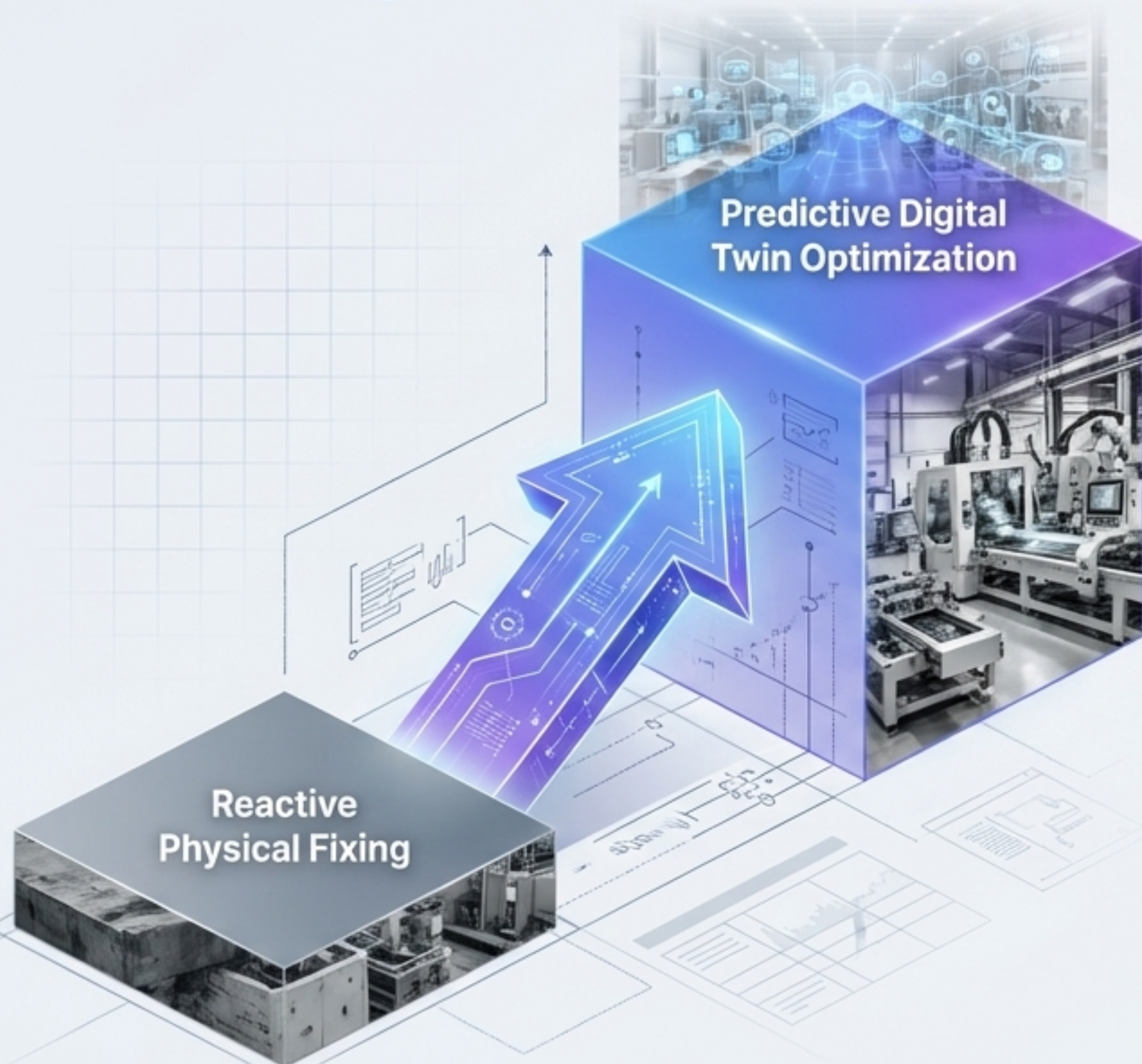
Converted all unstructured verbal reports into a **searchable**, time-stamped **visual data lake** for Root Cause Analysis.



Workforce Autonomy

Reduced cognitive and physical load on operators, boosting **ergonomic compliance** and floor morale.

The Leap to Industry 5.0



The Paradigm

By digitizing the traditional Andon cord, TOGG didn't just solve a communication delay—they transformed human operators into integrated nodes within the facility's digital twin.



Strategic Impact

The TIM ecosystem provides an evidence-based data lake of heat maps, SLA metrics, and exact error locations. This empowers TOGG's leadership to execute continuous Kaizen (improvement) driven by unmanipulated, real-time ground truth.



In a hyper-competitive global landscape, instantaneous, visually-driven digital response is not a luxury—it is the baseline for survival.

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