Case Study: Packaging Line Predictive Maintenance (Europe)
GIBES INOV – Industrial Automation, IoT & Smart Manufacturing

Industry Overview

The European food and beverage packaging industry is highly automated and operates on tight production windows, where a single hour of downtime can result in massive financial losses. According to EU manufacturing reports, high-speed packaging lines experience an average of 300–500 hours of unplanned downtime annually when operating with reactive maintenance models. Machine failures in conveyors, servo motors, and fillers are responsible for more than 40% of production interruptions.

Client Background

A large European food-packaging plant operating 6 parallel high-speed lines (conveyors, servo fillers, shrink tunnels) experienced recurring, catastrophic motor and bearing failures. Each failure resulted in:

- Production loss of $6,000 per hour.

- Frequent emergency shutdowns with zero warning.

- Maintenance and spare parts procurement delays.

The client sought a predictive maintenance system capable of forecasting failures with enough lead time to schedule repairs without halting production.

Key Metrics

Metric	Before GIBES INOV	After GIBES INOV	Result (K
Unplanned Downtime (Annual)	420 Hours	21 Hours	95% Reduc
Revenue Loss from Downtime	$2.52 Million	$126,000	$2.39M Annual
Maintenance Lead Time	0 Days (Reactive)	45 Days (Scheduled)	Predictive R

Challenges & Operational Constraints

Before GIBES INOV intervention, the packaging line operated under:

- Purely reactive maintenance — failures occurred without early indicators.

- No vibration or thermal trend analysis.

- Motors frequently running to failure due to bearing degradation and misalignment.

- High cost of spare part inventory due to unpredictable breakdowns.

Emergency repair operations created severe production bottlenecks and financial losses.

GIBES INOV Predictive Maintenance Solution

Hardware Deployment

- Wireless Industrial IoT vibration sensors (triaxial accelerometers) placed on 32 critical motors.

- High-temperature sensors for filler stations.

- IP67-rated battery-powered sensor modules suitable for food-industry washdown environments.

Edge Intelligence & Control Logic

An IIoT edge gateway running Python and TensorFlow Lite was installed to:

- Continuously analyze vibration signatures (FFT, harmonics, RMS).

- Detect early indicators of:

  - Bearing wear
  - Shaft misalignment
  - Unbalanced load
  - Motor thermal stress

- Predict failure events up to **6 weeks in advance**.

The machine learning model was trained on:

- 3 months of baseline vibration patterns

- Known failure signatures from historical data

- Real-time anomaly detection (threshold + ML hybrid)

Cloud Dashboard & UI Layer

GIBES INOV developed a cloud-based dashboard with:

- Real-time motor health scoring (green/yellow/red).

- Predictive failure timeline.

- Automated email/SMS alerts to maintenance supervisors.

- Daily operational insights exported to CSV/PDF.

Deliverables

- Full IIoT sensor installation and commissioning.

- Customized machine-learning model deployed on edge hardware.

- Predictive maintenance cloud dashboard with multi-line analytics.

- Staff training on interpreting vibration analytics and planned maintenance scheduling.

Implementation Timeline

- **Week 1–3:** Line survey, sensor placement plan, gateway installation.

- **Week 4–7:** Data collection and machine-learning model training.

- **Week 8–10:** Deployment of predictive algorithms, dashboard integration, operator training.

Results & Business Impact

The GIBES INOV predictive maintenance system delivered the following measurable improvements:

- 95% reduction in unplanned stoppages.

- $2.39 million annual savings from avoided downtime incidents.

- 45-day predictive maintenance window greatly reduced emergency repairs.

- Improved overall equipment effectiveness (OEE) by 13%.

The plant now operates with a proactive maintenance strategy, dramatically increasing uptime and ensuring consistent product throughput.

About GIBES INOV

GIBES INOV delivers advanced automation, IoT, and smart manufacturing solutions across Europe and Pakistan. Our predictive maintenance frameworks empower industries with data-driven insights, reducing costs and improving reliability.