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VMS-ML

Periodic Manufacturing Equipment

Predictive Monitor and Maintenance Solution

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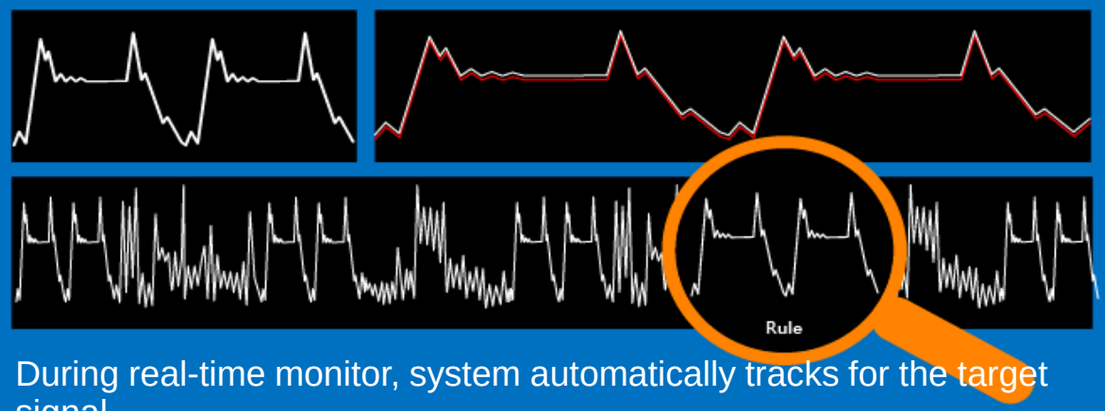
The purpose of Intelligent Manufacturing Monitor

- Avoid unplanned machine shutdown and the yield losses followed.
- Precision Maintenance, visible and quickest ROI.
- Keep high product quality.

VMS-ML machine learning monitor system

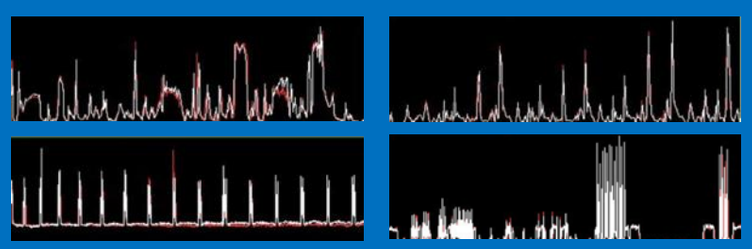
System-leveled Smart Sensor

- **One-shot learning** (Quickly learn the assigned pattern)
- **Auto tracking** (Instant identification for the target pattern)
- **Pre-modeling** (Analysis of machine characteristics)



During real-time monitor, system automatically tracks for the target signal.

Every unique simple or complex process can be automatically identified.



Application

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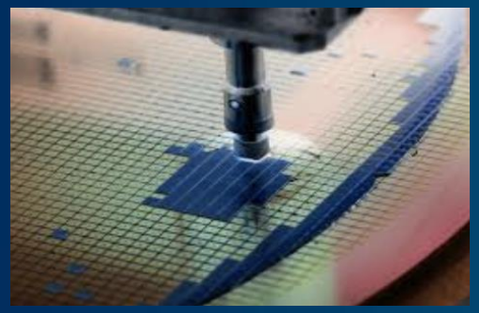
Periodic Manufacturing Equipment

Semiconductor, Panel



Packaging、PCB

Car making

Metal processing

Robotic arm

- Forging and Stamping industry
- Machine tool
- Cutting process
- Auto welding
- Injection forming

Challenges in Periodic Manufacturing Equipment Monitor

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Common non-effectiveness: collect data without classification of different manufacturing cycle. ➔ **Divergent AI model**

- Complex structure of multiple mechanicals & motors enhances the monitor difficulties
- One equipment is for various manufacturing missions.
- Massive and repetitive periodic production process

Anatomy of the structure of periodic manufacturing equipment

Key part：Grinding wheel, knife shaft, glue nozzle, nozzle machine, laser, AOI camera

Moving part：Screws, slides, sliders, bearings, horseshoe magnets...

Drive part：Servomotors, drivers, encoders, optical scales...

Parameter：Timing, moving speed, torque, step number...

Human factor：mechanical interference, collision, cart, overacting

Monitoring focus:

- Monitor only the manufacturing process.
- Differentiate monitor models for different products.
- Differentiate crucial sensors for different processes.

Advantage of VMS-ML

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1. Instant transformation from human manufacturing experiences to monitor standards.

   Built-in monitor model: amplitude, frequency, phase, wavelet, skewness, stability, etc. algorithm.

2. Auto-tracking of target processing signals and display of real-time results.

   No need for equipment shake hands. Execute the monitor task once installed.

3. The enrichment of characteristics is ready for the anomaly.

   Once the processing behavior and manufacturing cycle are classified and cleansed, data can be added to the matter-training base.

4. Automation equipment can learn how to optimize the application models. Machine future condition is within your control.

   The operator can set the criteria through machine learning behavior. Tag for the abnormal characteristics, which allows the trackability for production optimization.

Human experiences transformation→Real-time monitor→ Trend management→Data cleanses→AI processing

Application video

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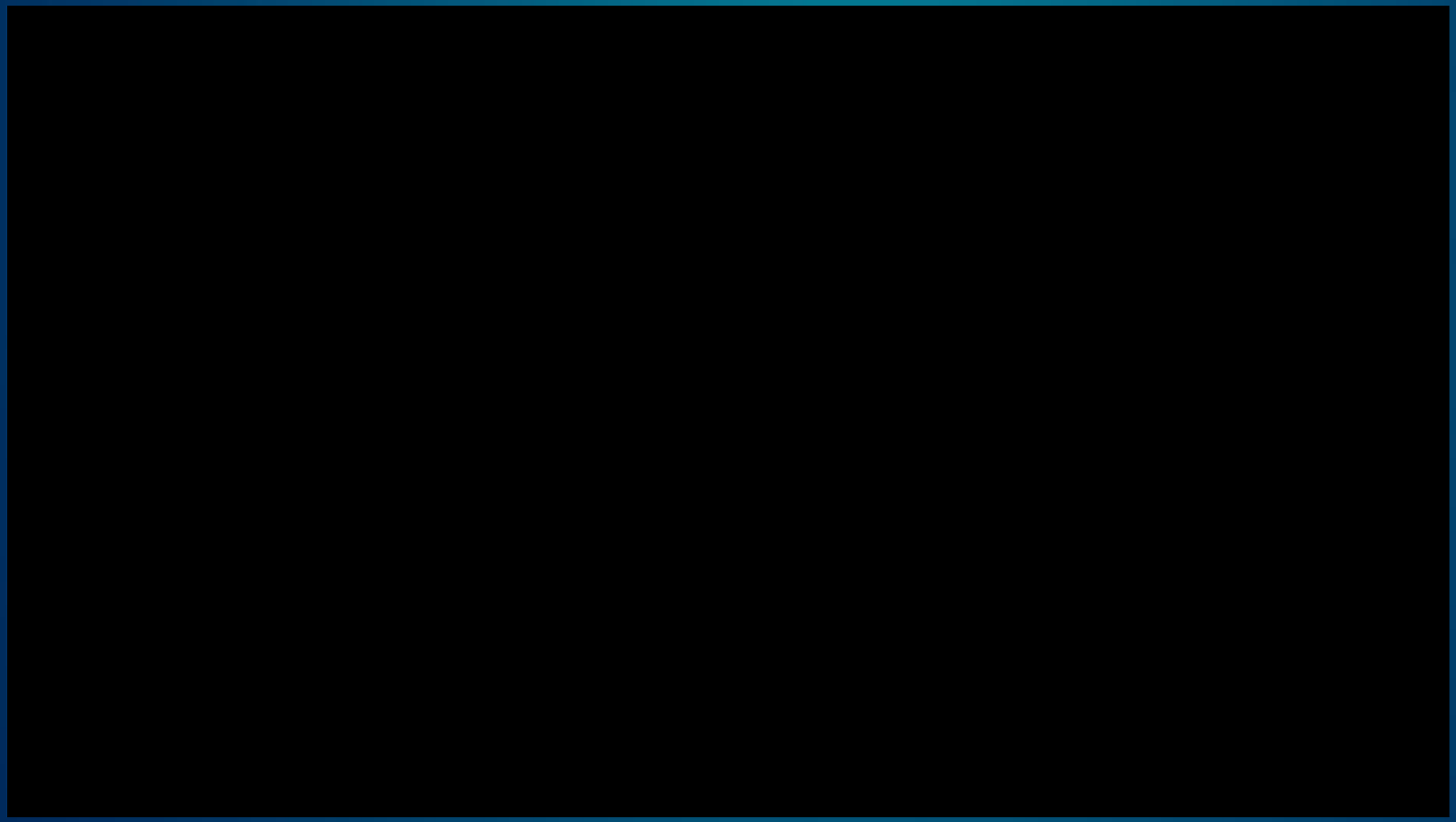

Optional Edge situation room

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Quickly connect to Central Manage Platform（ MES、FDC... ）

Online real-time anomaly alert

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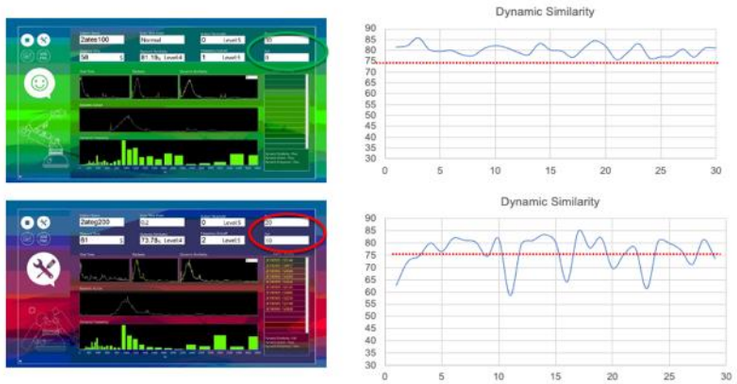
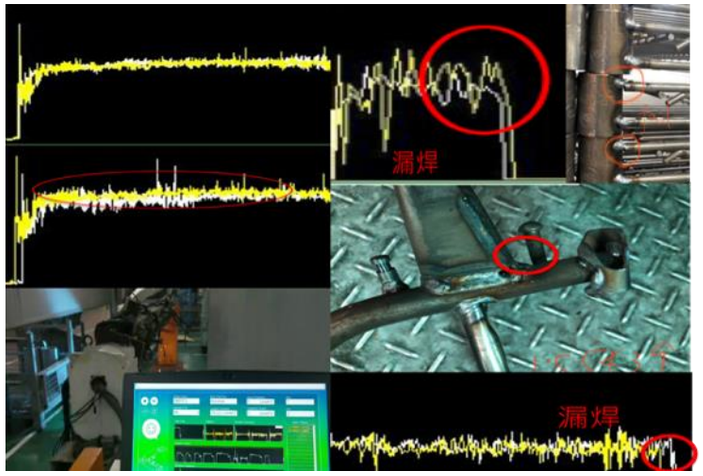
Robotic arm fault alert

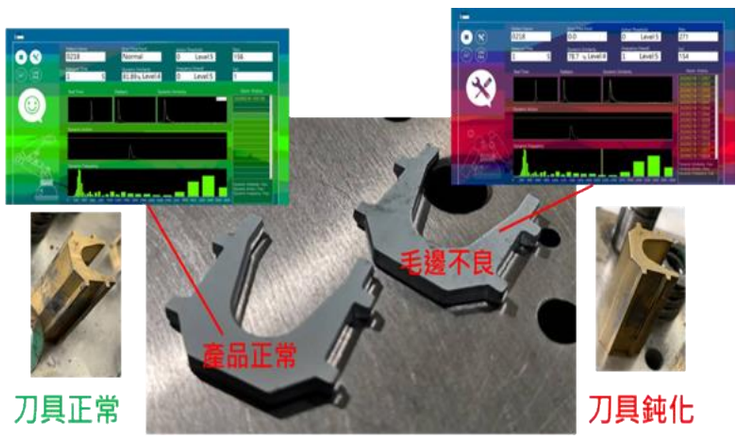


Auto welding fault alert

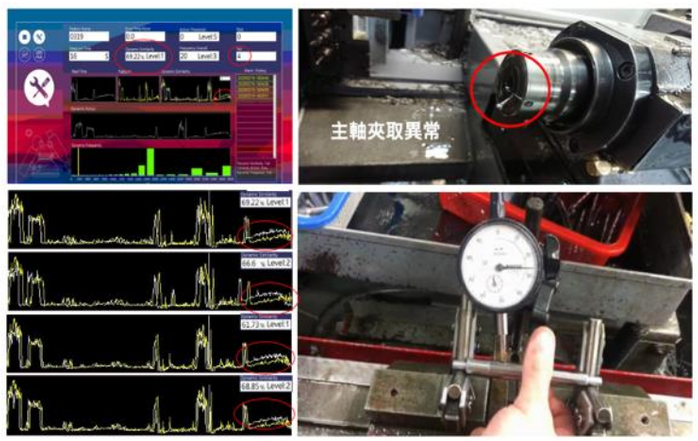


Forging mold fault alert

Punch fault alert



Metal processing fault alert



Driller tool fault alert

Our knowledge of monitored factors for every sophisticated producing process

- Accelerometer: mechanical relative(robotic arm, stamping and forging mold, machine tool)
- Current sensor: producing process directly relates to current(auto welding)
- Pressure sensor: producing process directly relates to pressure(auto gluing, injection molding)

Intelligent Monitor, AI process

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Common program

- Massive data acquisition ➔Data processing, characterize ➔ Labeling ➔ Training ➔Predictive model

Before visible ROI, you've invested great amount of money, time and yet not sure about the training result.

VMS-ML, your optimal program

- Plug & Play instant monitor ➔ Pre-modeling of characteristics data ➔ Labeling ➔ Training ➔ A more precise predictive application model

Execute the task once installed. The quickest ROI monitor solution in the market.

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Conclusion

PHM and PDM mainly talk about preventive maintenance. In industrial production, product quality is the core and the most important competitive factor. Therefore, it’ s crucial to well control the manufacturing process.

AOI+AI is a well-known product quality control program, which aims to prevent defective products from being shipped. The ultimate goal of production line monitoring should be set forward to proactively avoid defective products being manufactured!

These two types of solutions “in production” and “after production” should marry smoothly and complementally. Hence, zero false in production line can be expected!