Case 1: AI enabled order forecasting and supply chain planning

Problem addressed

◆ **Forecast fluctuation**

- < 26 weeks forecast visibility
- Weekly rolling updates for after 3 weeks

◆ **Challenges in material readiness for operation**

- 95% offshore materials from 4 import paths
- 25000+ P/N, and 1200+ suppliers

◆ **Multi-SKU**

- Produced 58 SKUs, shipped to 8 countries
- >34 times line change over per week,

Implementation Scheme

Vision

To build an intelligent ecosystem to enhance support supply management from customer PO receiving to shipping of goods

Activity

Demand → Interlock → Procurement → Inbound → Production planning → Production execution → Outbound

Process

Demand analysis (S1-1) → Order prediction (S1-2) → Fulfillment risk identification (S2) → MPS → Material planning (S3) → Logistic (S4) → Custom clearance → Production scheduling (S5) → Production → Vessel booking → Pick up goods

★ SVR algorithm

★ DFS algorithm

SMS | S&OP | SRM | E-logistic | APS | MES | DTMS

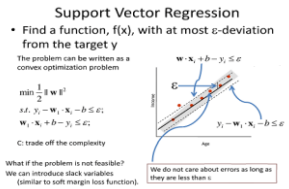
S1 Demand analysis & Order prediction

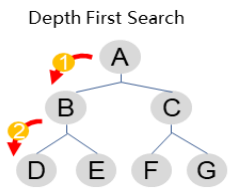
S2 Fulfillment alarm system

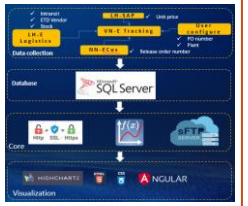
S3 Inventory control system

S4 Systematic inbound process & Logistic tracking

S5 APS system







Impact

Demand analysis

Order prediction

Fulfillment alarm system

Logistic tracking system

APS system

Inventory control system

↑ OTIF 8.3pp (91.2% →99.5%)

↓ DOS 52% (27D →13D)

↓ IDL (PMC) 21% (135P →107P)

Case 2: Flexible and rapid pick & place automation with vision-inertial positioning

Foxconn Industrial Internet

Problem addressed

Low flexibility on production
- Original Line: Designed specifically for a single part and Mechanical positioning
- Models: 1->3
- SKUs: 12->32

Insufficient production speed on single robot basis
- Require higher equipment speed, larger floor space, and increasing investment costs to meet the UPH increase

Insufficient assembly accuracy
- Difficult to meet the assembly accuracy:
- positional: <0.05mm
- angular: <0.3 degree

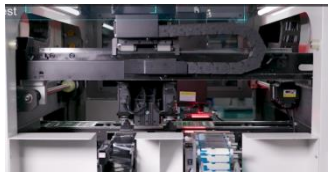
Low efficiency rate of manual visual inspection
- CT=10s/pcs
- 0.5% escape

Implementation Scheme

High speed, high precision, and high flexibility automatic assembly machine

High speed, High Precision

- Dual robot arms are controlled by servo system can operate simultaneously, speed reach up 1500mm/s
- Multiple nozzle for placement
- Support 4 kinds of material part assembly at the same time
- Machine vision enables high speed image acquisition without blur picture issue.
- High performance image processing algorithms as Canny, Shape based matching, achieving 0.02mm assembly accuracy



- Dual 5 MPx cameras with high speed capture
- Coaxial lighting

Image enhancement

Canny Edge detection (50ms.frame)

Halcon-Shape based matching

Coordinate calculation

Intelligent guidance

High accuracy placement

High precision positioning for high accuracy placement

High flexibility

- Conveyor width can automatically adjust by a selected program
- Nozzle and feeder are standardized, easily replace
- Placement program integrating the vision-guide positioning is transited by a simple selection on machine UI

AI-deep learning algorithm enabled the precise visual inspection

Dual 12M pixels camera for TOP/BOT capturing with **flying trigger technology**

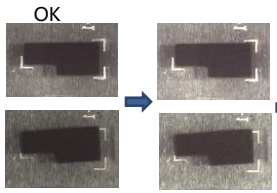
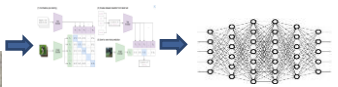
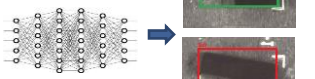


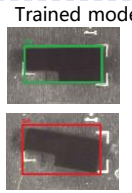
Image Enhancement



Pre-training by CLIP for auto labeling



Training

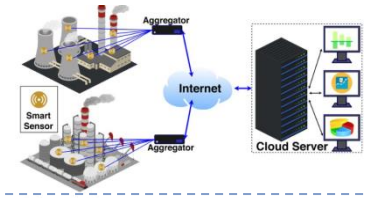


- Inspection time: 8s/200 parts
- Accuracy: no escape, 0.1% NTF

Object detection by Yolo v8 for defect detection

Machine ANDON based on IOT

- 182 machines interconnected through network chain
- Automatic collection of crucial, effective IoT data
- Big data analysis, data modeling, and machine learning technique



Impact

Fungible automatic assembly line

Machine status real time monitor

Machine KPIs monitor

AVI monitor system

↑ UPH 113% (498-> 1063 pcs)

↓ Defect rate 75% (0.2->0.05 %)

↓ Change over time 88% (4->0.5 h)

Case 3: Real-time shop floor compliance management with panoramic AI vision

Foxconn Industrial Internet

Problem addressed

Increase efforts dedicated to routine safety surveillance inspections.

- 2 guards patrol 5+ ares with 10+ safety check items
- Safety risks were not detected and alerted to the management team in real-time.

Complex and cumbersome security loading to meet IP protection request

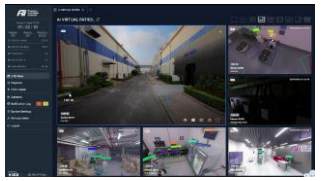
- Personal & material control
- Abnormal cases unable to report in real-time and lack tracability.

Manual manipulation lacks stability, leading to quality risks.

- Subjective judgments and visual fatigue
- OBA rejection rate = 0.5%

Implementation Scheme

Smart Patrol



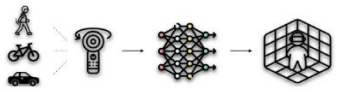
- Virtual Reality Onsite Roaming
- AI Abnormality Detection and Alerting
- Dashboard Integration

Smart Security

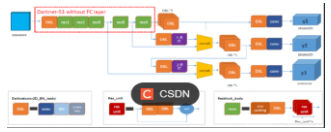
- Abnormal Behavior Detection
- Virtual Security Guards
- Abnormality Tracing and Analysis

Behavior Auditing

- Personal Behavior Analysis
- Intelligent Decision Making: Go/No-Go
- Automated Abnormality Reporting



LIVE 3D Quick Scanning



Edge AI Algorithm

Networking | Data Centre | Security | Combined Cloud platform

Cloud/Local Storage

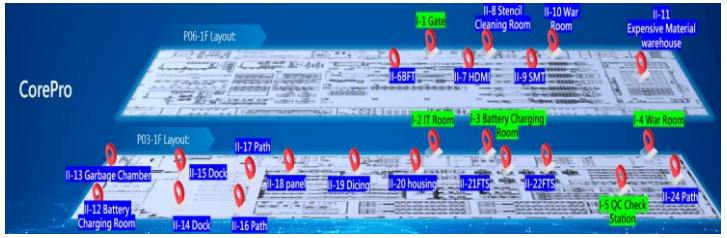
18*360° IP CAM

Server

AI Computing platform

Edge Server

Data Collection



4K HD Live 360° camera

- Highly Concerned Area
  - ① IT Room
  - ② Battery Charging Room
  - ③ Receiving & Shipping Dock
  - ④ High valued material warehouse
  - ⑤ Fire Exits
- Production Shop Floor

Impact

Global Safety Monitoring and Management System

- Develop standardized safety requirements for all facilities across different regions.

↓ IDL (Compliance Auditing) 67% (12->4 /Shop Floor)

↓ MMAR (Million Man-hours Accident Rate) 83% (2->0.35)

↓ OBA Rejection Rate 100% (0.5%->0%)

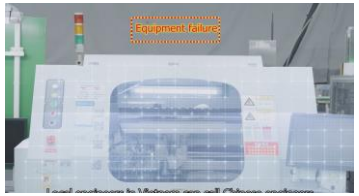
↓ Customer Complaints 100% (Workmanship Issues, 3/year->0)

Case 4: AR enabled remote guidance and personnel training

Problem addressed

Engineering technology transfer and inheritance are slow

- Due to the language barrier, the improvement of local engineers' technical skills is slow
- Insufficient experience and engineering capabilities, long cycle time of equipment troubleshooting



Working skills training requires long cycle

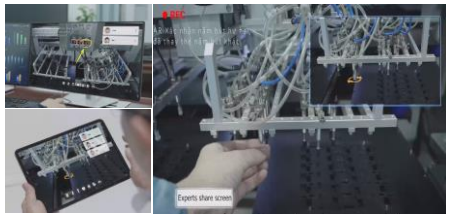
- Language barrier leads to long training cycle
- Training and examination lack of systematic traceability

Equipment and safety inspection rely on manual recording

- The abnormalities recorded manually, which is error-prone and inefficient.
- The reports are not generated & uploaded to the BBS system automatically

Implementation Scheme

AR remote collaboration – Equipment troubleshooting



- Real time communication
- Document sharing
- Real time Interaction
- Language translation simultaneously
- 4x digital zoom

AR skill training and examination (SMT-AOI/SMD/VI)

- Rapid courseware creation
- Auto score for test results
- Data-driven training guidance reinforcement

AR Equipment and safety inspection(Printer/Routing/ Safety Facilities)

- Equipment Inspection Guide (Automatic Identification & Display)
- Inspection reports are generated & uploaded automatically
- Inspection abnormal record are automatically pushed to the responsible person

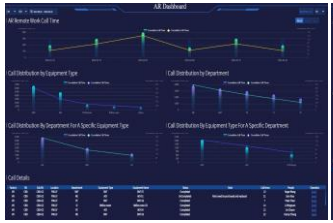
Developed by Fii RD independently

AR Headset	
Display	1920x1080, Si-OLED + Freeform Light Guide
Optics	34° FOV; 6x5mm Eye Box@20mm Eye Relief
Camera	2MP RGB Camera
Audio	Mic x 2, Speaker x 2
I/O	USB 3.1 Type C with DP Sink
Sensor	6-axis IMU (Accelerometer, Gyro), Magnetometer, ALS
Dimensions	208.9 x 83.9 x 38.2 mm
Weight	248g

Impact

AR working guidance

Remote collaboration



Training and examination

Equipment maintenance and safety inspection

- ↓ MTTR 80% (2→0.4 hours)
- ↓ IDL (maintenance) 50% (40→20 persons)
- ↓ Training Cycle Time 67% (3→1 Day)
- ↓ Equipment Inspection Time 50% (2→1 Day)

Case 5: LLM enabled failure log analysis and anomaly handling

Problem addressed

Local engineers lack of maintenance experience lead to long handling time and capacity loss.

Increasing volume of automation equipment(100,000 logs/yr from 182 machines) results in rising of maintenance engineering cost.

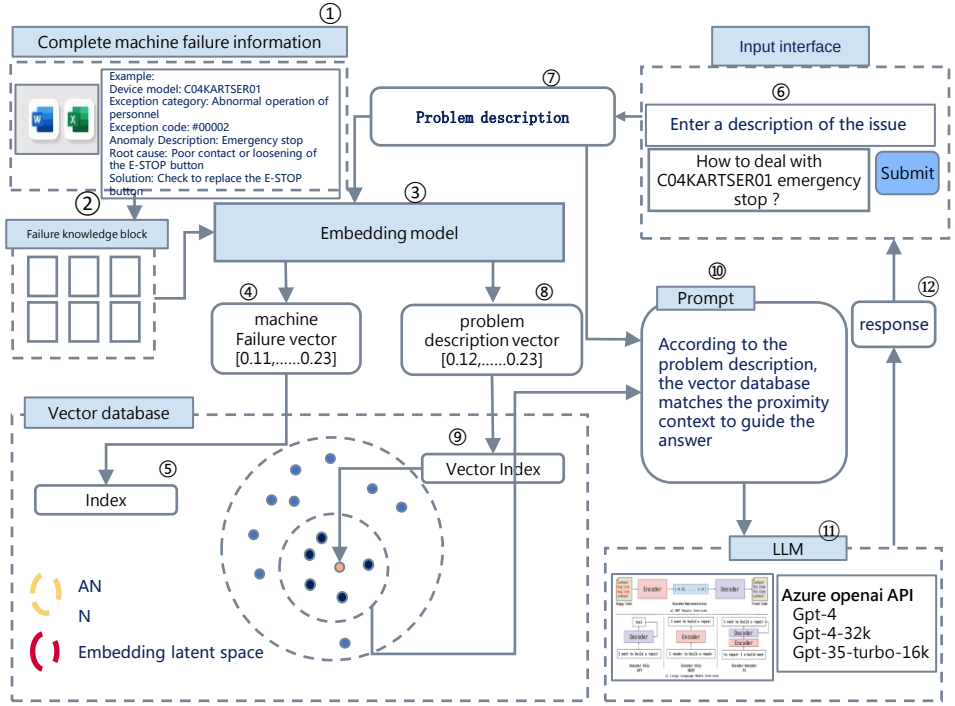
Precious experience among experienced engineers not easy to consolidate and pass down to new coming workers.

More machines
How to maintain the machine more accurately, more simply and faster?

Implementation Scheme

Utilizing the LLM model and RAG
(Retrieval-Augmented Generation) technology:

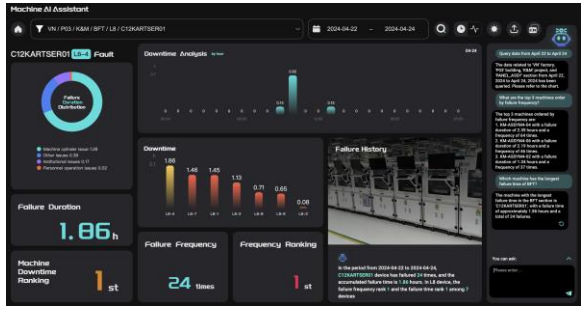
- Able to retrieve historical record from the enormous knowledge base and filter out the most related information.
- Consolidate the related questions and generate the precise and accurate answers, supporting engineers to take real-time actions.
- Based on questions and answers, generate charts for display automatically.



Impact

Comprehensive digital employee assistant for maintenance

Auto-generate data/charts for display



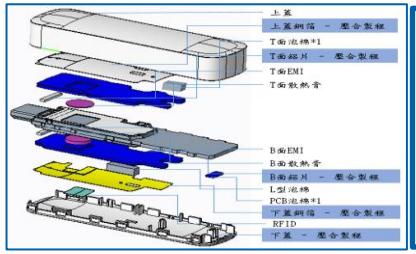
↓ Unplanned downtime 90% (2->0.2 h/day)

↓ IDL (maintenance) 50% (40->20 persons)

Case 6. AI enabled quality improvement

Problem addressed

— **Poor quality control for pressing process;** press force varied among different press machine; no data, no traceability for the abnormal of press force applied to the product



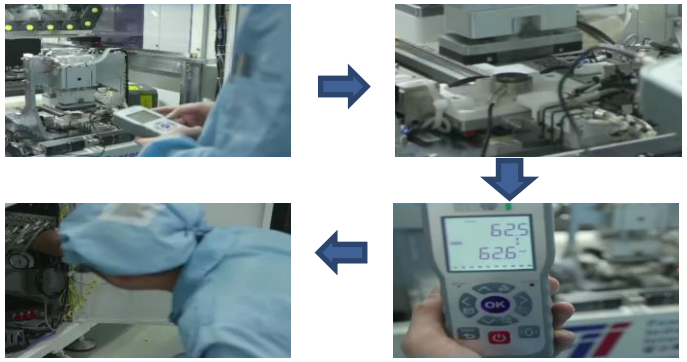
product exploded drawing

5 parts require lamination process

— **Lack of preventive measures:** not able to detect the abnormality of press force in real time;

— **Low yield:** defect rate 0.9%

— **Difficult in machine calibration and parameters adjustment**



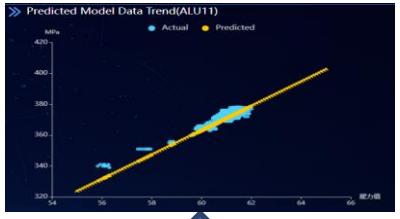
Implementation Scheme

— Developed and deployed SW tools to collect the pressure data in real time by installing pressure sensors & controllable compressed air sensors on more than 20 machines in the automation lines

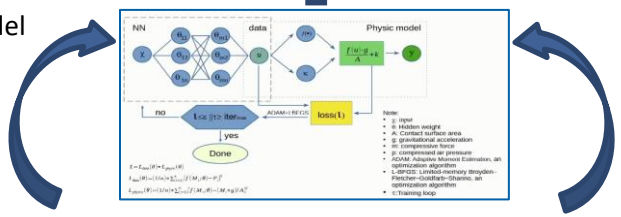
— Utilizing logistic regression AI models to regulate pressing processes, which realize the precise control of the press force for each machine

— Automatic adjustment of input air pressure based on the AI recommendations

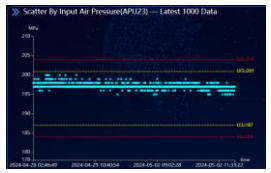
Optimal parameter recommendation



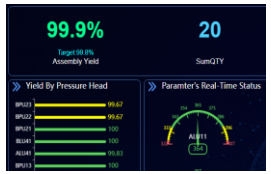
Data analysis & logistic regression +PINN AI model



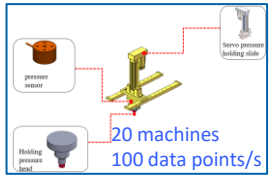
Interact with MES for real time quality control



Quality Data



Sensor Installation & Process Data collection



Process Data

Impact

— Pressure data collecting and monitoring in real time

— Pressure adaptive control by logistic regression AI models

— Innovation of quality control for pressing process

↓ Assembly defect rate 89% (0.9% -> 0.1%)

↓ IDL (Maintenance) 50% (40 -> 20 persons)