Intelligent Factory
智慧工廠

產品及產業化 Product And Industrialization

導磁材料之 AI 智慧磁檢探傷模組

AI Magnetic Particle Inspection Module for Magnetically Conductive Materials

簡介 Introductions

本模組結合傳統機器視覺及深度學習之優勢並整合螢光顯示技術，以期解決現有針對表面裂痕其螢光顯影後磁檢設備商無法智慧檢測問題，透過此導磁材料之 AI 智慧磁檢探傷模組，進行可疑瑕疵檢測複判機制，減少人員複檢負擔並可上傳雲端更新檢測模型，增加螢光磁檢智慧探傷功能、提升國內磁檢設備競爭力。

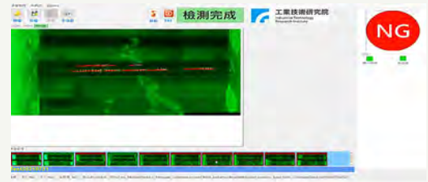
This module combines the advantages of traditional machine vision and deep learning, and integrates fluorescent display technology, to intelligently inspect surface cracks after magnetic testing, a problem that magnetic particle inspection (MPI) equipment manufacturers are unable to do. Through the AI smart magnetic particle inspection module of ferromagnetic materials, a re-judgment mechanism for suspicious defect inspection can be carried out. This reduces the burden of the operator and by uploading updates of the inspection model to the cloud, it increases the intelligent function of magnetic particle inspection; thereby, enhancing competitiveness of domestic MPI equipment.

特色與創新 Features and Innovations

- 藉由 AI 技術導入智慧檢測，克服傳統 AOI 設備，常因螢光磁粉殘留造成誤判率 > 20%，轉換為具有人工智慧檢測能力之螢光磁檢設備，達成自動智慧探傷之目的。
- 透過可疑瑕疵檢測複判機制，減少人員複檢負擔並可上傳雲端更新檢測模型。
- Intelligent inspection through AI technology to overcome issues in traditional AOI equipment, which often has a misjudgment rate >20% due to residual fluorescent magnetic powder. Converts magnetic particle inspection equipment with artificial intelligence inspection capabilities to achieve automatic intelligent MPI.
- Through the suspicious defect re-judgment mechanism, the burden of the operator to re-check can be reduced and the inspection model can be uploaded to the cloud for updating models.

應用與效益 Applications and Benefits

- 可降低 75% 人力需求，將人員素質提升至做更高等級工作，另改為 AI 檢測設備檢測可全天 24 小時生產並檢測，加值設備價值至少提升兩倍以上，大幅增加設備效能與競爭力。
- This module can reduce manpower requirement by 75%, and improve the quality of personnel to do higher-level work. The AI inspection equipment can detect and produce 24 hours a day, which doubles the value of the equipment; thereby, greatly increasing equipment efficiency and competitiveness.



AI 智慧磁檢探傷模組 AI Smart MPI Module

機邊複判與雲端模型主動更新機制 Edge Defect Re-check and Cloud Model Self-Updating Mechanism

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人員作業智慧引導系統

Personnel Operation Intelligent Guidance System

簡介 Introductions

本系統結合傳統機器視覺及 AI 人工智慧技術，可指引告知各產品之標準作業流程 (SOP) 並即時確保作業員是否遵循。減少因為人為疏失所造成的損失與工安意外，並提供作業指引以降低作業門檻，與人員訓練時間，優化作業流程，提昇工作品質。

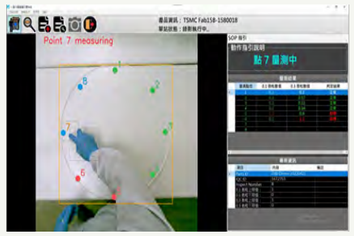
Combining traditional machine vision and AI intelligent technologies, the system gives operators instructions according to standard operation procedure (SOP) of the specific product and immediately ensure them following the SOP. This reduces losses and accidents due to mistakes caused by workers, provides operation guidance then lower work difficulty and the training time, and further optimizes the operation process, and improve the work quality.

特色與創新 Features and Innovations

- 透過 AI 技術的導入與搭配智慧化邏輯行為分析，可即時偵測作業員行為模式，以確保相關作業程序是否遵循標準作業流程之規範。
- 提供多樣化產品之標準作業流程指引，可減少人員訓練時間、降低作業門檻。
- Using AI technology and intelligent rule-based behavior analysis, One can detect real-time operator behaviors to ensure operating procedures following the regulations.
- The system provides the SOP guidelines for each products, which can reduce personnel training time and work difficulty.

應用與效益 Applications and Benefits

- 降低作業門檻與人員訓練時間。
- 24 小時即時監測，減少工安意外與疏失損失。
- Reduce work difficulty and personnel training time.
- 24-hour real-time monitoring to reduce accidents and losses due to negligence during working.



人員作業智慧引導系統
Personnel Operation Intelligent Guidance System HMI

人員作業智慧引導系統
Personnel Operation Intelligent Guidance System

人員作業智慧引導系統應用
Application of Personnel Operation Intelligent Guidance System

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金屬製品外觀品質 AI 鑑別與回饋模組

AI Identification and Feedback Module for Appearance Quality of Metal Products

簡介 Introductions

本模組結合傳統機器視覺及深度學習之優勢，以期解決現有金屬加工製品表面特性及光源不均造成自動檢測不穩定之問題，後續可搭配雲端通訊進行異常資訊回饋，可提早發現製程異常減少損耗，達到節能及提升產品品質之功效。

This module combines the advantages of traditional machine vision and deep learning. This can solve the problem of unstable automatic inspection caused by uneven surface characteristics and light sources of existing metalworking products. It can also be used with cloud communication for abnormal information feedback, which can detect process abnormalities early and reduce loss to save energy and improve product quality.

特色與創新 Features and Innovations

- 結合傳統機器視覺並輔以深度學習改善曲面之金屬易受表面反光影響而形成紋理變異誤判問題，可達成自動檢測。
- 可於機邊運算獨立進行邊緣運算，也可結合 5G 或雲端通訊達成加速運算與即時製程回饋之價值。
- 國內首創 3D 螺旋切齒齒輪檢測機，可檢測黑皮、撞傷與崩齒等瑕疵。
- Combine traditional machine vision with deep learning to improve the misjudgment of the texture variation of curved metal due to reflective influence. It can achieve automatic inspection.
- Not only can perform edge computing, but also can combine 5G or cloud communication to achieve accelerated computing and real-time process feedback.
- The first 3D spiral gear inspection machine in Taiwan. Can be used to detect defects such as black skin, bumps and gear valanche.

應用與效益 Applications and Benefits

- 金屬加工製品、水五金、齒輪等產業之外觀品質鑑別與回饋系統。
- Exterior quality identification and feedback system for metal processing products, plumbing hardware, gears, and other industries.

金屬製品外觀品質 AI 鑑別與回饋模組
AI Identification and Feedback Module for Appearance Quality of Metal Products

雲端加速運算與回饋示意圖
Schematic Diagram of Cloud Computing and Feedback

品質鑑別與回饋人機介面
Quality Identification and Feedback HMI

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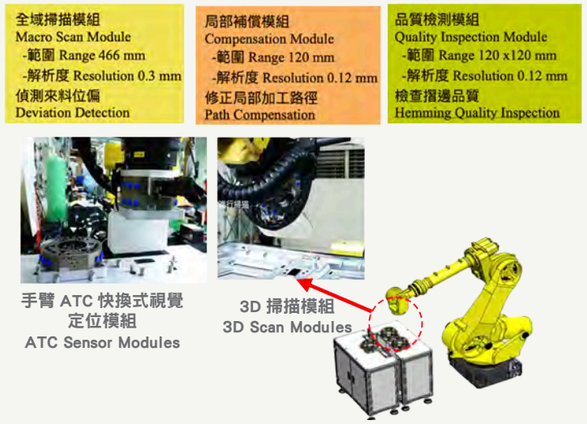
摺邊輪廓路徑動態補償技術

Hemming Path Dynamically Compensation Technology

簡介 Introductions

機械手臂加工常面臨精度不足、對位不易之問題，傳統以人工對位、教點等方式，必須耗費大量人力、時間。輪廓路徑動態補償技術結合 3D 視覺及機械手臂座標補償，具備高靈活度可達成大範圍複雜角度之零件加工位置導引，達成換線靈活度提升之目標。

Mechanical arm processing often faces challenges of insufficient precision and difficult alignment. Traditionally, manual alignment and point teaching methods require manpower and time resources. This path dynamic compensation technology combines 3D vision and robot arm coordinate compensation, with high flexibility to achieve guidance of part processing positions in a wide range of complex angles, achieving the goal of improving flexibility in wire changing.



手臂 ATC 快換式視覺定位模組
ATC Sensor Modules

3D 掃描模組
3D Scan Modules

特色與創新 Features and Innovations

- 鈑件偏移量偵測與手臂摺邊位置補償，降低單軸誤差至 ≤ 0.1mm。
- 整合感測器快換模組，達成產線上 (in-line) 自動快換。
- Sheet metal offset deviation detection and robot folding position compensation, reducing single-axis error to ≤ 0.1 mm.
- Automatic tool change module enables in-line fast application.

應用與效益 Applications and Benefits

- 主要應用於摺邊路徑導引，同時可衍伸應用於各種需要導引、循邊、或修正手臂路徑之加工製程，如焊接、型狀切割或去除毛邊等應用。
- Hemming path guidance, which can extend to robot arm path correcting processes such as edge-tracing, welding, cutting and grinding.

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製程參數回饋與成型品質監測技術

Process Parameter Feedback and Molding Quality Monitoring Technology

簡介 Introductions

本技術結合製程參數與 AI 深度學習，解決傳統產業的品質分析大多仰賴現場人力檢測與巡檢，導致無法提供穩定生產造成大量不良品生產之問題。透過蒐集產品從設計、製造與品管等製程的大數據，分析後得到有意義的分群視覺呈現，可用於回饋現有製程問題或預測將發生的狀況。

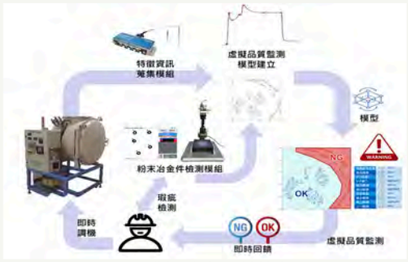
This technology combines process parameters and AI deep learning to solve the problem of relying on manual inspection of quality analysis in traditional industries, which results in unstable production and a large amount of defective products. By collecting big data on product design, manufacturing, and quality control processes, meaningful clustering and visual presentation can be obtained through analysis. This can be used to provide feedback on existing process problems or to predict potential incidents.

特色與創新 Features and Innovations

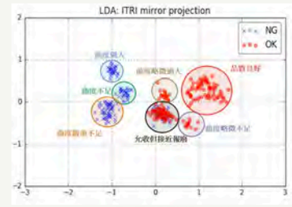
- 透過 AI 的製程參數地圖分析，不須經由人工檢測或者機器視覺等方式就可判別產品之好壞。
- 製程參數地圖結合異常檢測技術、降維技術、機器學習方法、結合現場專家知識，可提供直觀的肇因分析與即時警示工具，避免不良品持續生產所造成的浪費。
- Through AI process parameter mapping analysis, product quality can be determined without the need for manual inspection or machine vision.
- The process parameter map combines on-site expert knowledge, anomaly detection techniques, dimension reduction techniques, and machine learning methods to provide intuitive root cause analysis and real-time alert tools, avoiding waste caused by the continuous production of defective products.

應用與效益 Applications and Benefits

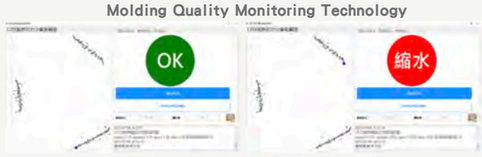
- 可廣泛應用於能取得產品設計、製造與品管等製程參數的產業如射出成型、汽機車零組件、3C/3K 等製造業。
- This can be widely applied to industries that can obtain process parameters in product design, manufacturing, and quality control, such as injection molding, automotive and motorcycle components and 3C/3K manufacturing.



製程參數回饋技術
Process Parameter Feedback Technology



成型品質監測技術
Molding Quality Monitoring Technology



製程參數回饋與成型品質監測技術人機介面
Process Parameter Feedback and Molding Quality Monitoring Technology HMI

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細胞培養自動分裝系統整合

Automated Cell Dispensing System

簡介 Introductions

本系統透過結合精密定量分注、96 管冷凍管同步開 / 關蓋與高速資訊辨識及管理模組，提供細胞凍管分注作業一站化整合機台，解決過往人工作業耗時費神之問題。

The system consists of precise quantitative dispensing module, 96-cryotube lid synchronous opening/closing module and high-speed information identification/management module, providing a one-stop integrated machine for cell cryotube dispensing operations.

特色與創新 Features and Innovations

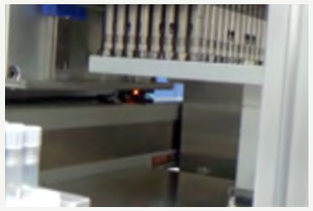
- 精密定量分注裝填細胞。
- 多馬達同步控制技術使 96 管冷凍管同時開 / 關蓋。
- 高速資訊辨識 96 支冷凍管 (≦ 800 ms)。
- 分注校正數據庫與凍管資訊管理系統。
- 可滅菌，適用於標準生物安全櫃。
- Precise and quantitative cell dispensing.
- Multi-motor synchronous control technology enables 96 cryotubes to unscrew/screw lids simultaneously.
- High-speed information identification of 96 cryotubes (≦ 800 ms).
- Dispensing calibration database and information management system.
- Sterilizable, suitable size for standard biological safety cabinets.

應用與效益 Applications and Benefits

- 大量細胞培養分裝、凍管作業自動化。
- Automated cell culture and packaging into freezing tubes of large quantities.

細胞培養自動分裝系統
Automated Cell Dispensing System

精密定量分注模組
Precise Dispensing Module



凍管同步開 / 關蓋模組
Lid Synchronous Opening / closing Module

凍管資訊管理模組
Information Management Module

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零組件配適優化分析模組

Assembly Tolerance Optimization Module

簡介 Introductions

透過組裝公差演算分析優化模型，結合產線檢測作業之尺寸資訊擷取，計算並提供最佳品質組裝指南，解決傳統組裝作業常遭遇組裝尺寸不合，只能換取工件再組裝或現場手工修調之問題。可降低組裝重工時間，同時提升產品組裝品質一致性。

The module provide the assembly guide via capturing the dimensional information from production line and calculating the best assembly quality through optimization algorithm, , and reduces the repair/rework problems encountered at the traditional assembly operation. The module can reduce assembly rework time and improve consistency of assembly quality.

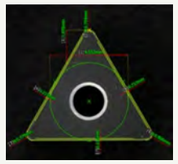
特色與創新 Features and Innovations

- 提供組裝配適建議，降低修配 / 重工機率。
- 提升組裝品質一致性 。
- 提高製造公差外廢品利用率 。
- 支援藍芽 (無線) 量測資訊傳輸，並可整合自動量測模組 (接觸 / 非接觸) 。
- Provide suggestions for assembly and reduce the probability of repair/rework.
- Improve assembly quality and consistency.
- Increase the utilization rate of workpieces beyond manufacturing tolerances.
- Supports Bluetooth measurement data transmission, and can easily integrate automatic contact or non-contact measurement modules.

應用與效益 Applications and Benefits

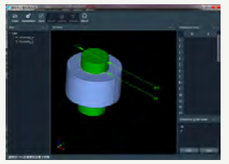
- 產品生產之組裝品質優化。
- Optimization of assembly quality in manufacturing.

人工量測
Manual measurement



自動量測
Automaticmeasurement

尺寸資訊
Measurement Data



零組件配適優化技術
Assembly Tolerance Optimization Module

裝配建議
Assembly Guide

人員 (自動化) 組裝
Assembly

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複材不對稱 3D 編織系統

Non-symmetrical 3D Composite Braiding System

簡介 Introductions

傳統複材疊層於管狀結構、不規則結構件時製作不易，且材料使用率僅為 70-80%，此技術是透過 160 個環型運動之線軸，結合雙手臂同動控制，可直接將複材紗束於 3D 曲面內模上編織成型，提高生產效率與材料利用率至 90% 以上。

It is challenging to layup composite material on tubular structures and irregular structures, as the material usage rate is only 70-80%. This technology combines dual-arm synchronous control and the circular movement of 160 bobbins to directly produce a multi-surface asymmetric structure with carbon composite, thus improving production efficiency and increasing composite usage to more than 90%.

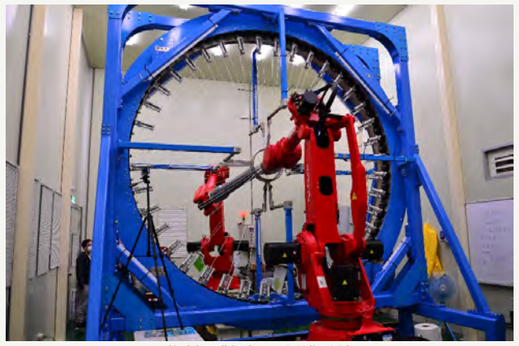
特色與創新 Features and Innovations

- 國內首台徑向複材編織設備。
- 纖維利用率可達 90% 以上。
- 採雙臂支撐穩定度高，編織角度達 ±75°。
- 即時線上品質監控，降低瑕疵減少浪費。
- 編織路徑生成軟體，可針對變截面管材的覆蓋率及編織角度規劃控制。
- First domestic radial composite braiding equipment.
- Fiber utilization rate >90%.
- High stability of process by dual-arms support with braiding angle ±75° .
- Real-time monitoring reduces process defects and fiber waste.
- Braiding path generation software can plan and control coverage and braiding angle of fiber on parts.

應用與效益 Applications and Benefits

- 已成立複材零件驗證試產實驗室，可提供廠商打樣試作，與業者合作共同開發輕量化之複材零組件，協助台灣廠商打開國際複材零組件市場。
- Verification and trial production laboratory of composite product has been established to cooperate with industry to develop lightweight composite products and assist Taiwanese manufacturers to expand into international composite components market.

複材編織流程
3D Composite Braiding Process



複材不對稱 3D 編織系統
3D Composite Fabrics braiding system

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半導體真空泵餘命分析模組

Remaining Useful Life Prediction Technique of Semiconductor Dry Pumps

簡介 Introductions

半導體真空泵智慧監診方案，整合泵浦自身運轉狀態以及迴轉件產生的振動訊號，透過一種新穎的設備健康指標 (台灣及美國專利) 進行運轉狀態識別，提升泵浦使用週期且適時地更換泵浦。

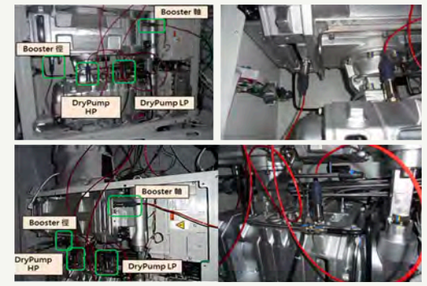
The semiconductor vacuum pump smart monitoring solution integrates the pump's own operating status and the vibration signal generated by the rotating parts, and uses a novel equipment health indicator (Taiwan and US patent) to identify the operating status, improve the pump life cycle and replace the pump in a timely manner.

特色與創新 Features and Innovations

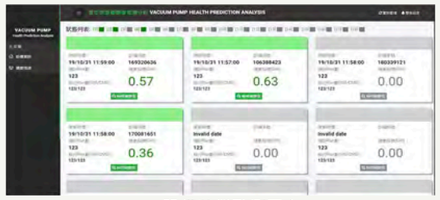
- 自動預估設備使用餘命。
- 避免設備無預警停機。
- 延長平均故障時間。
- 簡單且直觀的指標依據。
- Automatic analysis to indicate remaining life.
- Avoid equipment downtime without warning.
- Extending mean time to failure.
- Based on simple and intuitive indicator.

應用與效益 Applications and Benefits

- 提供可靠且計劃性換機依據。
- 減少製程設備 redundant 50%。
- 減少設備巡檢人力成本 25% 。
- 預防產品報廢損失千萬 / 年等級，並提升製程生產效率。
- Provides basis for reliable and planned machine replacement.
- Reduce process equipment redundancy by 50%.
- Reduce equipment inspection labor costs by 25%.
- Prevents loss of tens of millions per year from product scrapping, and improves production process efficiency.



真空泵訊號量測單元
Vacuum Pump Signal Measurement Unit



設備狀態監測平台
Equipment Status Monitoring Platform

設備餘命分析趨勢
Equipment RUL Trend Line

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設備預兆診斷系統

Prognosis Monitoring System

簡介 Introductions

預兆診斷系統可廣泛應用於迴轉式機械設備，並可自動執行狀態分析及預測，彌補定期維護或巡檢無法即時掌握運轉中異常之不足，發揮預測維護的價值。

The Prognosis Monitoring System can be widely used in rotary machineries to automatically perform health analysis and prediction, so as to make up for the deficiencies of time-based maintenance and field inspections, and play the value of predictive maintenance.

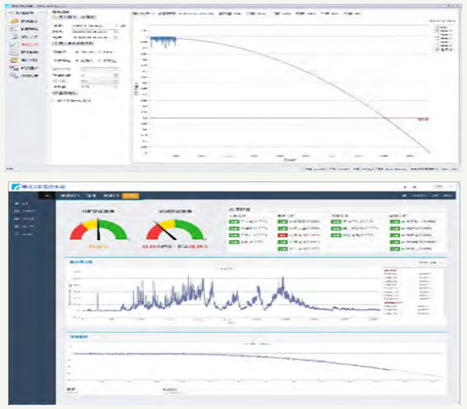
特色與創新 Features and Innovations

- 以三大核心功能達成監測即時化、維護預測化、診斷智能化。
- 健康狀態監測：以基於 ISO 標準或自行建模之健康度指標，即時、快速掌握設備健康狀態。
- 健康趨勢預測：有效預測健康度衰退趨勢，最佳化停機維護排程、保持良好稼動率。
- 故障診斷：準確鑑別零組件故障類型，減少維護作業所需時間、加快回到製程應用。
- Automatic analysis for predictive maintenance.
- Using a health indicator for effective evaluation and real-time monitoring of the machine health status.
- Predicts possible changes of the health indicator so as to prevent unwanted downtime.
- Accurate and automatic diagnosis of damaged parts/components, effectively shortening repair time.

預兆診斷系統應用實績領域
Practical Application Fields of PMS

應用與效益 Applications and Benefits

- 即時監控、有效預測、準確診斷，維護作業事半功倍。
- 可廣泛應用於金屬加工、半導體設備、石化廠務設備、電廠 / 綠能機械等領域之迴轉機械設備。
- Real-time monitoring, effective prediction, and accurate diagnosis which greatly facilitates maintenance operations
- Applicable to the field of rotating mechanical equipment, including metal processing, semiconductor equipment, petrochemical plant equipment and power plant/green energy machinery.



中控版 /Web 版預兆診斷管理介面
Prognosis Monitoring System, PMS

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智能冷卻水塔預診監測系統

Intelligent Cooling Tower Prognosis and Optimization System

簡介 Introductions

智能冷卻水塔預診監測系統由工研院機械所與國內工業大廠共同開發，透過專業經驗、訊號感測、AI 分析、友善化軟體等跨領域技術的整合，協助產業使用者快速落實節水節電效果。

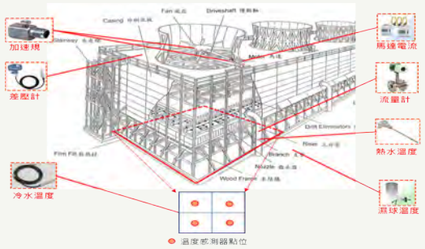
The intelligent cooling tower prognosis and optimization system is jointly developed by MMSL, ITRI and an industry leader in Taiwan. Through the integration of professional experience, signal sensing, AI analysis, friendly software and other cross-field technologies, it helps industrial cooling tower users quickly achieve water and electricity saving.

特色與創新 Features and Innovations

- 透過多種感測資料直接推算目前運作效率。
- 可模擬各種操作參數設定對應之預期冷卻效果。
- 以大量歷史資料建立可給出合理且最佳化的操作參數 AI 建議模型。
- 同步整合風扇馬達傳動鏈預兆診斷功能，確保以正常效率運作。
- Evaluates the current operating efficiency through a variety of sensing data.
- The expected cooling effect corresponding to various operating parameter settings can be simulated.
- Includes an AI suggestion model that can give reasonable and optimized operating parameters.
- The Prognosis Monitoring System is integrated to ensure normal operation of the motor drive chain.

應用與效益 Applications and Benefits

- 實績案例可達節水 6%、節電 7%。
- 可廣泛應用於半導體廠、石化廠等之工業冷卻水塔。
- Practical application cases have resulted in 6% of water and 7% of electricity savings.
- Applications: industrial cooling towers used in semiconductor, petrochemical and other industries.



感測系統架構
System Structure

Web 管理及操作介面
Web User Interface

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線上刀具狀態智慧監測模組

Online Tool Condition Monitoring System

簡介 Introductions

線上刀具狀態監測模組可透過主軸振動判斷刀具即時加工狀態，提供刀具損壞與加工異常之警戒以輔助現場人員進行調整，降低補救施工需求並提升設備稼動率與產品品質。

The Tool Condition Monitoring (TCM) system evaluates the health condition of machining tools based on spindle vibration signal analysis; therefore, unscheduled tool breakage can be prevented and the overall equipment effectiveness can be improved.

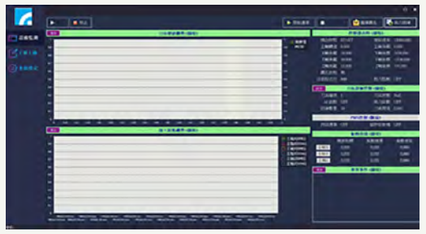
特色與創新 Features and Innovations

- 系統運算快速，達成即時監測之功效。
- 使用半監督式 AI 演算法，解決加工參數與工件材質搭配之複雜工況 。
- 自動提供換刀警示，減少人工誤判與工件損壞可能。
- 可對接不同廠牌控制器 (如發那科 Fanuc、西門子 Siemens) 監控加工狀態與回授控制 。
- 客製化人機介面與閾值相關參數調配 。
- Real-time monitoring of tool condition.
- By applying semi-supervised AI algorithms, the effects of various machining parameters can be ignored.
- Providing tool change notification and anomaly detection.
- Can be connected to controllers of different brands (e.g. Fanuc, Siemens) to monitor the machining status and provide feedback control.
- Customized user interface and threshold setting.

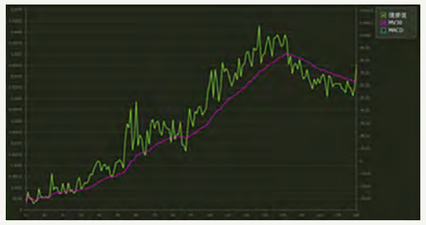
應用與效益 Applications and Benefits

- 可應用於車、銑、鑽等設備或刀具需頻繁替換之場域。
- Equipment or tools such as lathes, milling machines and drills, where frequent replacement is required.

模組架構
System framework



刀具狀態監控介面
TCM User Interface



刀具狀態監測結果
Results of TCM

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資產管理殼共通平台

Asset Administration Shell Common Platform

簡介 Introductions

I4.0 資產管理殼 AAS 共通平台，支援數位雙生的開放標準中繼格式，描述資產如流體機械 (水泵) 及齒輪傳動機構 (減速機) 為載具，建構其資產數位模型，使滿足 I4.0 產品屬性。並於水泵測試平台整合轉子不平衡、葉片損傷、水泵氣蝕異常狀態指標能力，以及於減速機提供嵌入式感測器與分析能力。

The I4.0 Asset Management Shell (AAS) platform supports standard metadata format for digital twins, describing assets such as fluid machinery (water pumps) and gear transmission mechanisms (reducer) as carriers, constructing their digital asset models to meet the attributes of I4.0 products. The platform integrates the capabilities of abnormal state indicators for rotor imbalance, blade damage, and cavitation in water pump testing, as well as providing embedded sensors and analysis capabilities.

特色與創新 Features and Innovations

- 具有水泵智慧化模塊，可透過振動訊號快速判別轉動件異常、葉輪損傷、水泵氣蝕效應等。
- 減速機透過齒輪低背隙優化設計，具備無線傳輸監測，提供單軸振動檢測功能，傳輸振動原始資料 (6 ks/s)。
- 提供 AAS Gateway、Monitor、Data logger 等標準，符合 VDMA/ZEVI 設備資訊模型及 Product Properties 工業 4.0 產品規範。
- Equipped with intelligent module for the water pump, which can quickly detect abnormalities in rotating parts, impeller damage, and cavitation effects through vibration signals.
- Reducer is designed with optimized low-backlash gears and has wireless transmission & monitoring, providing single-axis vibration detection and data (6 ks/s).
- Complies with VDMA/ZEVI information model and Industrial 4.0 Product Properties specifications, provides standard features such as AAS Gateway, Monitor, and Data logger.

應用與效益 Applications and Benefits

- 水泵異常警報準確度達 83%，附加價值提高 50% 以上；減速機可透過振動分析故障樣態預防非預期停機。
- Water pump abnormal alert accuracy reaches 83%, with added value increased by more than 50%; reducer can use vibration analysis to identify fault patterns and prevent unexpected downtime.

資管理殼架構
Asset Administration Shell Common Platform

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PCBECI-OPC UA 設備聯網及通訊伺服模組

PCBECI – OPC UA Device Networking and Communication Servo

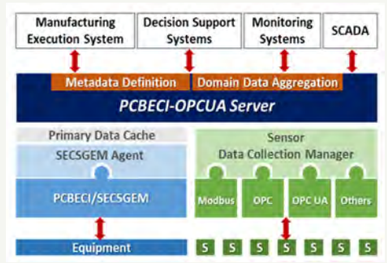
簡介 Introductions

PCBECI - OPC UA 伺服模組可解決電子設備 / 半導體製程冗長複雜，掌握製造進度與生產變異，現今透過專屬通訊和機台溝通，技術門檻高；PCBECI - OPC UA 聯網及通訊伺服模組可輔助業者進行 AI 決策分析，多重感測器佈建，使生產數據與製造資料間之數據整合與時序同步。

The PCBECI - OPC UA servo can solve the complex process of electronic/semiconductor equipment, grasp the manufacturing progress and production variation, and communicate with machines through dedicated protocols with high technology thresholds. The PCBECI - OPC UA module can assist the industry to carry out AI decision-making analysis, deploying multiple sensors, and enabling data integration and timing synchronization between production and manufacturing.

特色與創新 Features and Innovations

- 依據 SEMI 規範，內建資訊模型，符合產業生產特性。
- 整合生產與感測時序資料，滿足關鍵問題分析需求。
- 具備 PCBECI/SECSGEM 標準通訊，提供完整 E5、E30 訊息交握方法，可兼容現場各種通訊能力機台。
- Built-in information model conforms to the characteristics of industrial production according to SEMI standards.
- Integrate the time series data of production and sensing to meet the analysis needs of key issues in real-time.
- Follows PCBECI/ SECSGEM standards, provides complete E5 and E30 message handshake methods, compatible with various communication capabilities on site.



PCBECI - OPC UA 應用軟體架構
PCBECI / OPC UA Application Software Architecture

應用與效益 Applications and Benefits

- 本平台使用無代碼、引導式數位雙生模型流程，並整合 plug-in 通訊 Driver 將設備數據串流整合至數位雙生模型內，快速完成 IT/OT 系統整合。
- Uses code-free, guided digital twin models to establish process, and integrates plug-in communication driver to integrate data stream into digital twin model, quickly completing IT/OT integration.

OPC UA 無代碼數位雙生平台
OPC UA Codeless Digital Twin Platform

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SECS/GEM 電子設備通訊

SECS/GEM Equipment Communication

簡介 Introductions

SECS/GEM 為設備端與 HOST 之間通訊的中介層軟體，提供半導體、PCB 等等產業，於製程設備之狀態資料收集、異常回報、遠端控制命令、事件回報及製程配方管理等生產自動化所必需的通訊技術與功能模組，設定彈性並且建立快速，使設備具備 SECS/GEM 通訊功能。

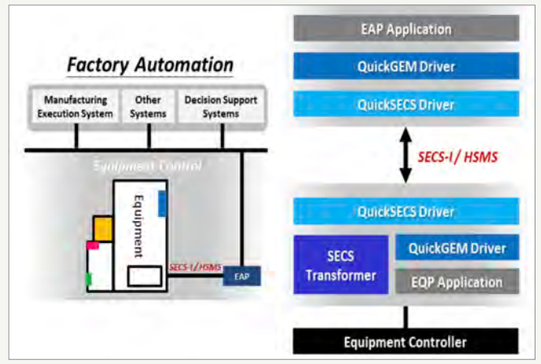
SECS/GEM is a middleware software used for communication between equipment and hosts in the semiconductor, PCB, and other industries. It provides essential communication technologies and functional modules for automation, such as collecting equipment status data, reporting abnormalities, remote control commands, event reporting, and process recipe management. It is designed to be flexible and establish quick communication, enabling equipment to have SECS/GEM communication capabilities.

特色與創新 Features and Innovations

- 符合 SEMI E4,E5,E37 的 SECS 通訊規範。
- 提供每秒 10 次 Transaction 的通訊能力 。
- 快速 Encode 與 Decode Big Message。
- 提供 DLL 及 ActiveX 元件供程式設計者使用，支援 VC++、VB 6.0、VB.NET、C#、LabWindow 等程式語言，提供每種程式語言的 Sample Code 讓程式設計師參考。
- Complies with SEMI E4, E5, E37 SECS communication specifications.
- Provides communication capability of 10 transactions per second.
- Offers fast Encode and Decode Big Messages.
- Provides DLL and ActiveX components for programmers to use, Supports VC++, VB 6.0, VB.NET, C#, LabWindow, and other programming languages, and provides Sample Code for programmer reference.

應用與效益 Applications and Benefits

- 半導體廠不可或缺的通訊功能，本產品系列已超過 3800 套於國內半導體廠廠所使用。國外也有美國 GF、韓國海力士等國際大廠的設備使用，效能和品質雙獲得國際大廠的肯定。
- This is an indispensable communication function for semiconductor fabrication plants, with more than 3800 sets of this product series having been used in domestic semiconductor factories. International manufacturers such as GLOBAL FOUNDRIES in the United States, and Hynix in South Korea are using this product and the quality has been recognized by international manufacturers.



半導體設備聯網架構
Semiconductor Equipment Network Architecture

SECS/GEM 應用軟體架構
SECS/GEM Application Software Architecture

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