Global Top 5 EMS Company Improves Productivity through AI Vision

> **In the past, we had to manually collect production line data, which often resulted in limited insights due to insufficient data. With PowerArena, we now have real-time data that effectively improves our production lines.**
>
> **—Industrial Engineer**

Background

As one of the global top three electronics manufacturers, this U.S.-based company operates around a hundred manufacturing facilities worldwide. They produce a diverse range of electronic components for numerous prestigious brands. As an industry leader, the company is committed to continuously enhancing production line efficiency. One of their Southeast Asian factories specializes in manufacturing hybrid inverter for solar panels. In this labor-intensive environment, they are dedicated to finding solutions that **eliminate waste** and achieve **lean production**.

Challenges and bottlenecks

48 hours of time study for each product through manual inspection

Currently, most data collection on production line is still done manually. Industrial engineers uses stopwatches next to workstations to time operations and record data using pen and paper. This method is inefficient and prone to subjective biases due to human nature. Conducting a time study for a single product takes industrial engineers about 24-48 hours, yet only yields about 15 minutes of usable data per month. This limited information makes it extremely challenging to identify bottlenecks.

"We know there are factors on the production line slowing down efficiency, but **we don't have the time** to collect all the necessary data."

Industrial engineers shared their challenges, often constrained by other more pressing duties. The time-consuming data collection and labor-intensive research and analysis frequently became major pain points in their work.

Insufficient information on the production line led to a lack of real-time analysis

Traditional methods of production line management **lack timeliness**, often leading to reactive measures or attempts to identify the root cause of issues only after anomalies occur. Additionally, due to incomplete production records, managers relied solely on past experiences and speculation for adjustments, resulting in an inability to address issues effectively.

"...Root cause analysis has always been both troublesome and challenging…"

The time spent from error occurrence, problem discovery, root cause analysis to attempting improvements were undermining production efficiency, resulting in a lack of agility in operations. This impeded the ability to increase output or improve the quality of renewable energy power equipment.

The lack of continuous production line monitoring made it difficult to reduce Non Value-Added Activities and achieve Line Balancing

The factory recognized that production efficiency tended to drop during specific periods, and they noticed that operators occasionally leave their workstations for various tasks. However, due to the lack of long-term production line data, they were unable to fully evaluate the efficiency and capacity of each production process. As a result, they could not effectively improve manpower and resource allocation.

The greatest challenge in optimizing production lines lies in the countless variables affecting performance. Many non-value-added operations are easily overlooked, with excess waiting times, unnecessary movements, and flawed workflow persisting on the production line. These factors not only slow down production but also lead to waste.

For the labor-intensive assembly line in the Southeast Asian factory, numerous operators represents additional unpredictable human variables. To achieve line balancing optimization, having comprehensive data is essential. This includes understanding operations at each workstation, identifying the sources of low capacity, and enabling smooth production.

From Passive Remedy to Proactive Prevention: Real-time Data Analysis for Line Balancing Optimization

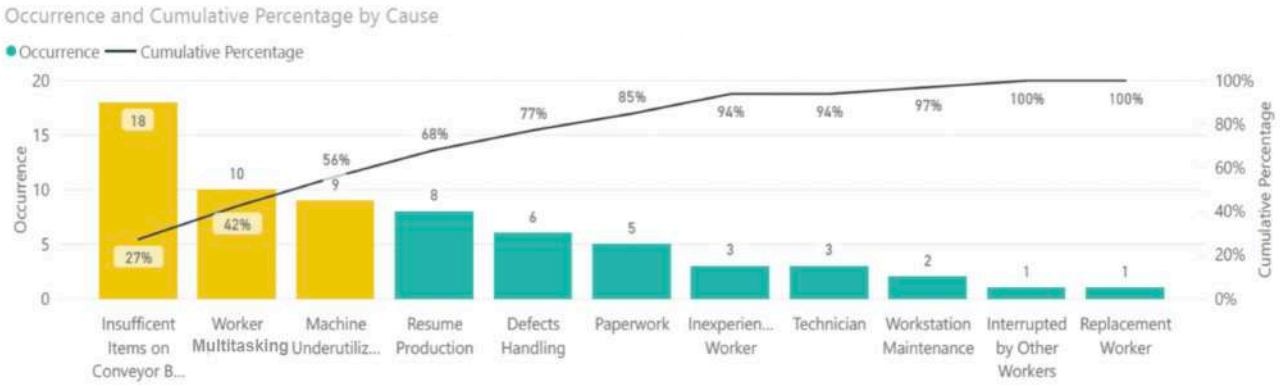
With continuous real-time data from the production line, AI vision has unveiled the following issues in the factory:

- Operators frequently leave their workstations to replenish materials or remove defective products, causing production interruptions.
- Variations in the condition of products from previous stations sometimes require extra adjustment time at the current station before normal operations can begin.
- Some operators leave their positions 15-20 minutes before scheduled break times, resulting in decreased efficiency as the break time approaches.
- Frequent malfunctions of the screw-locking tool force operators to repeat locking actions or pause assembly to call technicians for repairs, increasing the cycle time of operations.

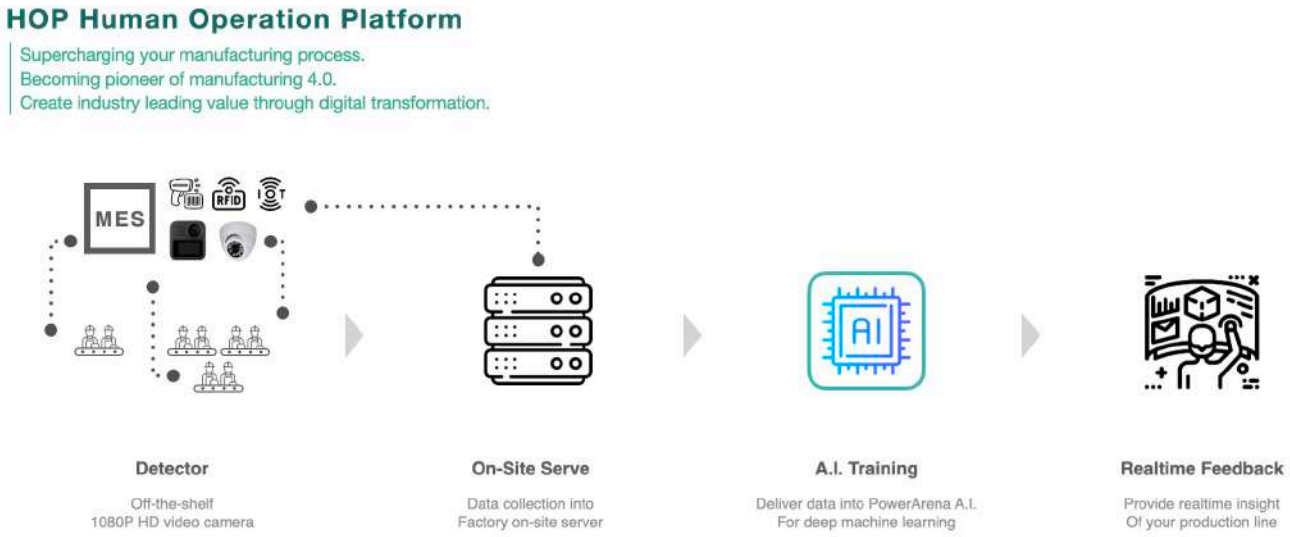
AI vision rapidly identifies abnormal periods, and with **video tracking**, managers can reconstruct workstation conditions at the time of the anomaly. This facilitates root cause analysis and directly exposes inefficiencies. By prioritizing issues based on their impact, managers can focus on addressing the most significant problems first.

Waiting for work-in-progress (WIP) from the preceding station is the primary source of idle time on the production line, accounting for nearly 20% of the standard work duration. With clear operation times and problem tracing, the factory has devised improvement strategies:

- Task Assignment: Assign personnel to support operations such as replenishing supplies and removing defective products.
- Operator Training: Supervise stations prone to errors, retrain on standard operating procedures, educate operators to have replacements when leaving their stations, and issue warnings for early departures.
- Tool Maintenance: Thoroughly inspect screw locking tools to identify and rectify the reasons for frequent malfunctions.



Root cause analysis. Easy to prioritize issues based on their numbers of occurrence.



Results

24/7 Automated Production Line Data Collection. Liberate IE's Valuable Manpower.

AI vision digitizes personnel behavior on the production line, utilizing real-time motion analysis to calculate operation times and generate accurate data reports. These reports are readily available to managers, providing insights into the current production status. In addition to replacing the time-consuming tasks of industrial engineers, this approach eliminates human measurement errors, ensuring more comprehensive and detailed records.

With AI vision, the manufacturer can now accurately monitor cycle time, process time, and idle time at each workstation. Every action or unexpected event on the production line is thoroughly documented, allowing managers to receive immediate alerts through AI in case of anomalies.

With comprehensive 24/7 production line data, managers can effectively assess production performance and identify unusual operations.

Eliminate Management Blind Spots. Enhance UPH by 5.2%.

Even on production lines that follow standardized procedures, unnoticed blind spots can still exist. AI vision intercepts previously overlooked problems, identifies management blind spots, and provides managers with technological insights for continuous improvement, helping eliminate waste on the production line.

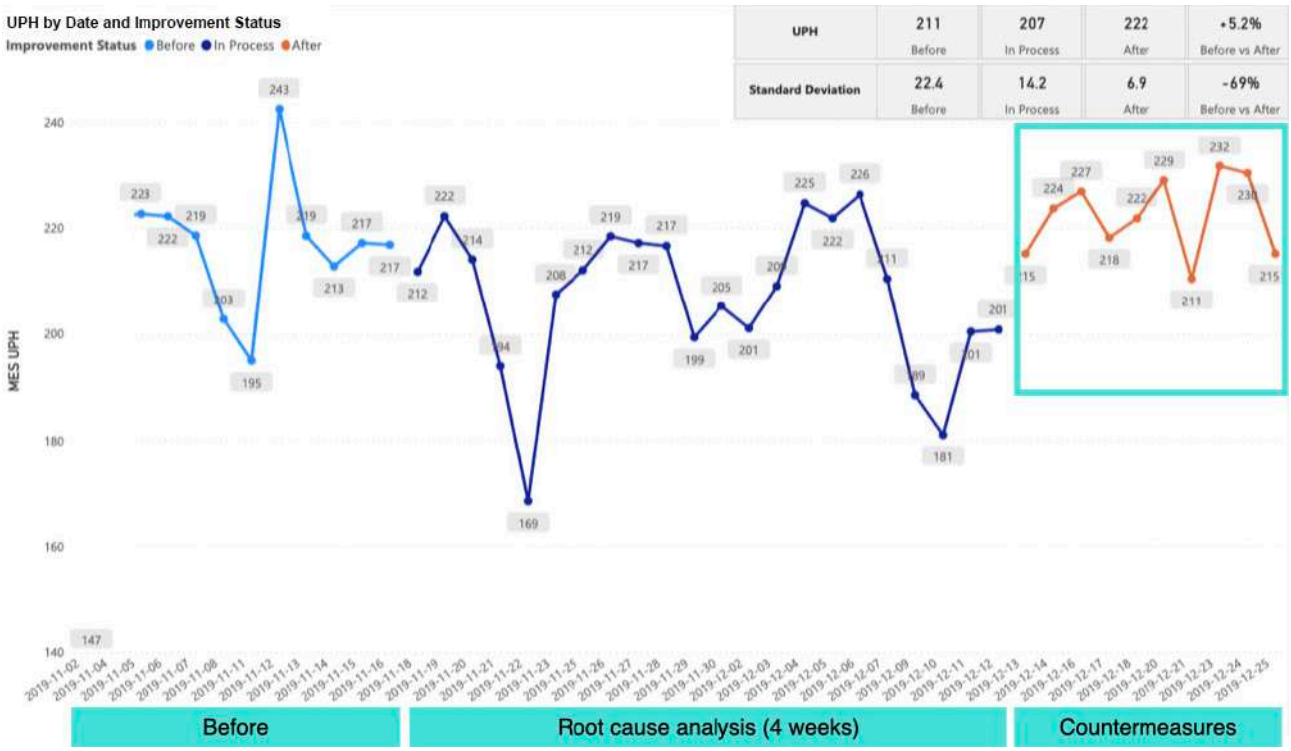
Real Operational Scenario

The factory initially believed that a specific workstation would have the longest cycle time. However, the actual time spent at this station was much shorter than expected, contradicting management's assumptions of prolonged assembly time. With access to real data, managers

can now make adjustments and establish the most suitable process standards. This prevents management errors caused by misconceptions from affecting the entire production line.

Spatial Configuration

Some power supply components are large, and when workstation space is limited, operators must move these components elsewhere, extending the operation cycle. The arrangement of components and tools in the workspace significantly affects production efficiency. The distance and angle an operator reaches, as well as body movement, can involve unnecessary actions, leading to extra time and labor consumption.



To streamline the retrieval and assembly process, the factory repositioned the components at this station according to operating procedures, expediting production time.

By directly addressing root causes through AI video analysis, implementing line balancing improvements, and further eliminating management blind spots, the American manufacturer reduced the factors contributing to suboptimal unit per hour production (UPH) by 70% in just four weeks. This equates to **a 5.2% increase in UPH and an ROI of over 5 times the investment**.

POWER ARENA

HOP vs Traditional Approach

	HOP	Traditional Approach
Observation	AI vision camera	Manual observation
Cycle Time	AI vision collection	Manual calculation
Data Captured	24/7	0.5 hr/ per month
Analysis	Real-time	3-5 days
Data Quality	Comprehensive and precise	Fragmented and biased

And there's more you need to know…

Procedure Refinement. Granular Management.

On production lines where AI vision is deployed, the manual transfer of WIP to the next workstation can lead to idle time more easily compared to conveyor belt systems. This idle time often results in unnecessary movements or waiting, reducing the effective use of working hours. As a result, precise time management is crucial.

Since training AI models requires clear recognition criteria, implementing AI vision pushes the factory **to redefine various work times and break them into finer segments**. This **granular management** allows for a shift toward a ratio of non-value-added to value-added operations of 8:2, aiming to increase value-added tasks.

People-Centric Approach

Implementing AI vision isn't about enforcing rigid changes but rather **adopting a "people-centric" approach to identify common operating habits**. These habits provide guidelines for production execution that align with human behavior and operational comfort. New technologies should help people work more efficiently and comfortably, achieving the optimal balance between human operations and production line efficiency.

This balance is crucial for stable production, enhancing competitiveness, leveraging team values, and maintaining a leading position as one of the world's top five EMS companies.

HOP (Human Operation Platform)

PowerArena's Human Operation Platform (HOP) is an AI vision-driven smart manufacturing solution. HOP visualizes production operations, providing real-time, transparent production information for labor-intensive production lines. Its features include 24/7 video collection, AI vision analysis, and instant playback. HOP offers three levels of applications: Digital workstations, AI line balancing, and AI poka-yoke. HOP continuously provides valuable data to optimize production performance and enhance corporate competitiveness.

About PowerArena

PowerArena's Human Operation Platform (HOP) is a smart manufacturing solution powered by AI vision. In 2022, it was recognized by Frost & Sullivan as Taiwan’s most competitive brand in computer vision for manufacturing.

Founded by ex-Googlers, PowerArena started at Stanford’s StartX program with teams around the world from Taiwan, United States, China, Mexico to Hong Kong. With three out of the global top five EMS enterprises enhancing production efficiency with HOP, PowerArena’s AI Vision solutions are now live in hundreds of factories across major manufacturing countries.

Enhance your human performance today.

Book your demo today.

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