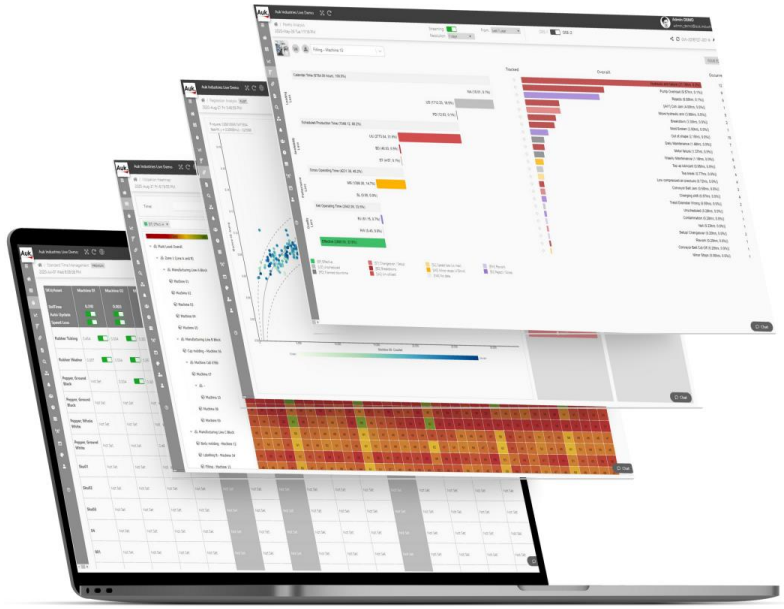
Auk.Industries

Deep data. *Feather-light IoT.*



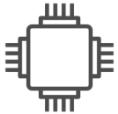
Winning in Ops digital transformation with agile IoT

Brief overview and case studies

INTRODUCTION - *We are* Auk.*Industries*

- Founded by experts in **ops management, data science,** process specialist, hardware & software engineers to serve the global industrial market
- Aim to eliminate the complexity and cost associated with I4.0/IIoT adoption by developing a **scalable, 'plug-and-play' and *agile*** system with deep ops analytics capabilities
- **5-10x more cost effective** and >5x shorter project cycle so clients can roll-out successful deployments *bigger*, *better*, *faster*.

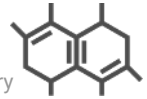
Food production
(basic ingredient, meat produce, powder)



Electronics Manufacturing
(solder & flux product for iPhone 8)

Precision Engineering
(aerospace superalloy/steel, CNC mill, lathe, metal processing)

Oil/Fuel Processing
(blending, primary & secondary packaging)



Polymer Molding
(injection/blow mold, containers, packaging, components)

Machine OEM
(food processing equipment, packaging eqpmt)

Utilities
(Uninterrupted power system, gas network)

9 countries

Auk's end-to-end system is deployed across 9 countries globally

>5000 machines

~5000 machines connected and on track to hit >6000 in year 2023

6+ industry sectors

Horizontal technology applicable across sectors

>120 sites

System is used in >120 manufacturing sites

SOLUTION SCALABLE ACROSS **SMALLEST** TO **FORTUNE 500 CLIENTS**

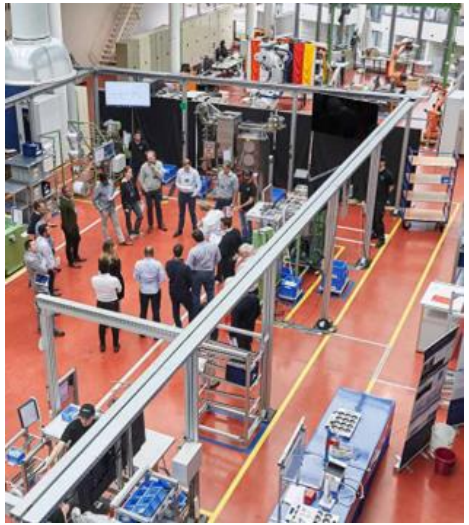
*Note: Illustrative clients at varying stage of sales pipeline/deployment

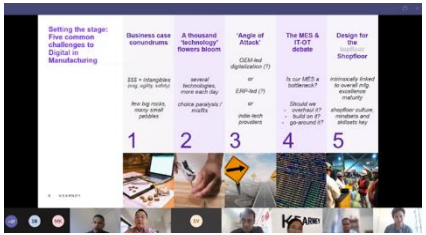
WE ARE A **GLOBAL COMPANY** WITH AMBITIOUS EXPANSION PLAN

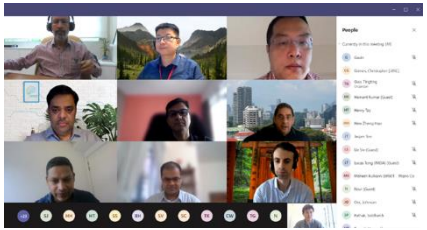
Focused on countries with high industrial output

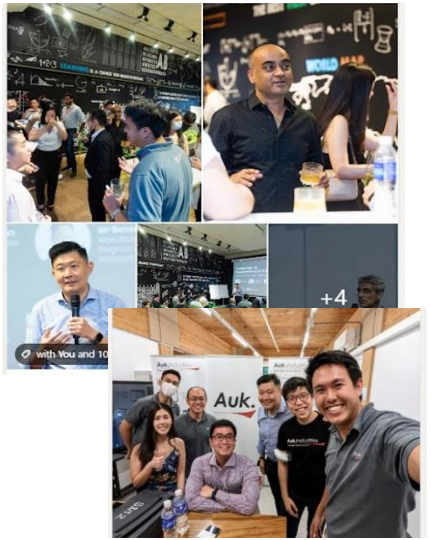
TRUSTED BY WORLD'S LEADING CONSULTANTS & COMPANIES

SHOWCASED IN MODEL FACTORIES GLOBALLY









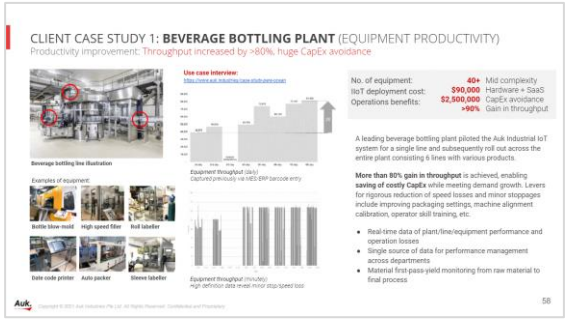
McKinsey &Company Europe, MEA & Singapore

KEARNEY ASEAN

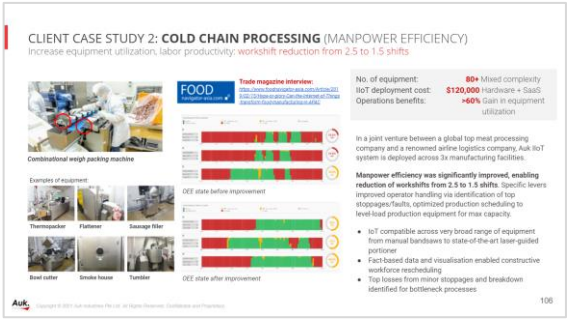
SAP Singapore

Microsoft

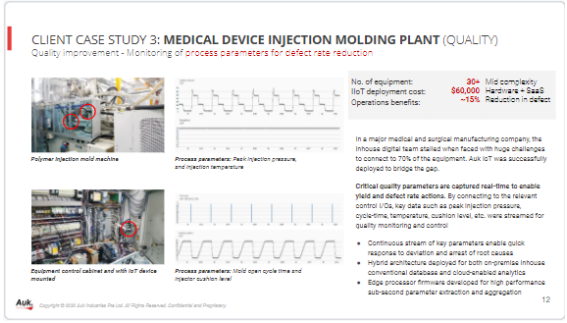
WIDE RANGE OF **APPLICATIONS** & IMPACT



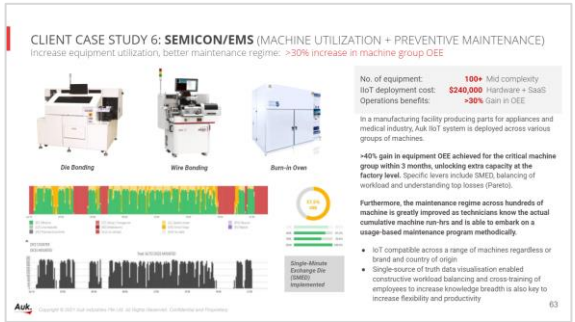
CAPACITY / LEAD TIME
>90% gain in OEE and production output within weeks
ROI of >60x achieved



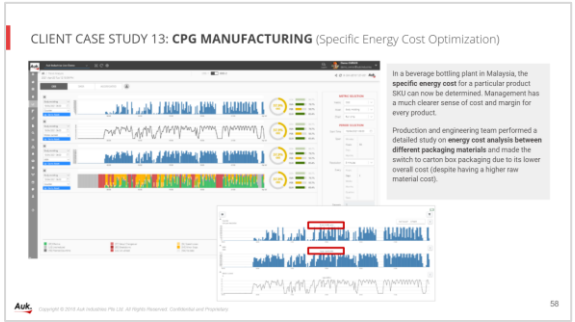
COST-SAVING (MAN-HOUR AND SHIFT REDUCTION)
>40% man-hour savings realised within months
2.5 shifts to 1.5 shifts



QUALITY
>15% reduction in product defects
ROI of >45x achieved



CAPACITY / LEAD TIME + MAINTENANCE
>30% increased in equipment utilization
Proactive usage+condition-based maintenance achieved



COST-SAVING (ENERGY COST OPTIMIZATION)
>25% monthly energy cost savings realised
Hundreds of thousands saved/month

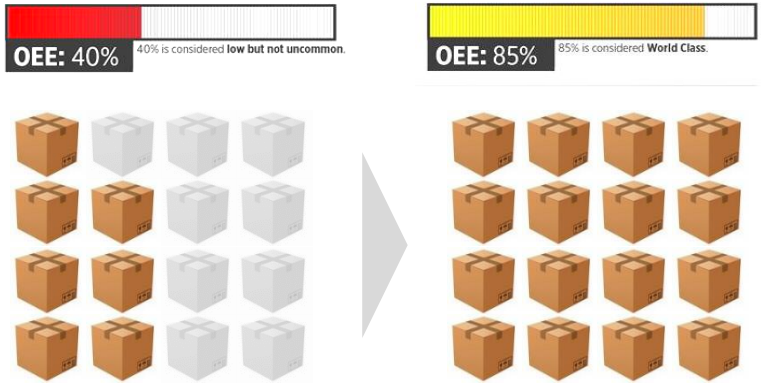
QUALITY + CAPACITY (CCP OPTIMIZATION)
>20% increase in line output due to CCP optimization
ROI of >35x achieved

HUGE OPPORTUNITIES TO DIGITALIZE OPS UNCAPTURED DUE TO COMPLEXITY/COST

Problem Statement

Huge value remains uncaptured in industrial operations. One of the most critical KPI of an industrial ops is **Overall Equipment Effectiveness (OEE)** which measures the actual output vs. theoretical capacity. As a benchmark, 40% is low but not uncommon, 60% is typical, while 85% is world-class.

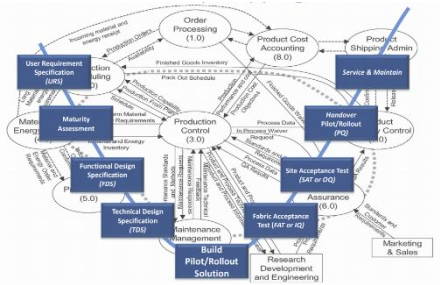
To it put in perspective, OEE gain can have huge impact
OEE 60% > 85%: ***10 factories*** can now produce ***14 factories*** equivalent
OEE 40% > 85%: ***10 factories*** can now produce ***21 factories*** equivalent



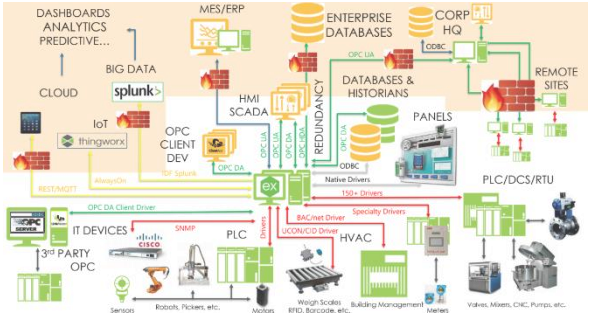
Yet conventional solutions are often bulky, rigid, anti-agile.

Top barriers to digitalization:

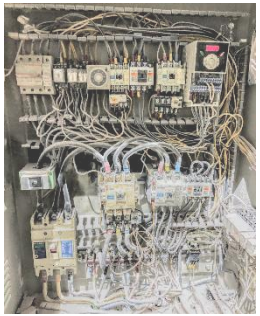
- ***High complexity****/over-engineered*
- ***Highly specialized*** *expertise required*
- ***Heavy infrastructure*** *change needed*
- ***High cost*** *of implementation*
- ***Mix of equipment*** *types/legacy/model*
- ***Lack of agility****/flexibility*
- ***Lock-in*** *inflexible and not future-proof*



IoT Solution - Implementation process mapping
Source: PUMAS Automation & Robotics



Complex architecture requiring high integration/maintenance efforts
Source: Kepware IoT Platform

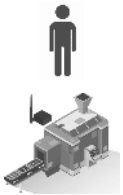


Challenging hardware in field
Source: Client equipment

WE ARE **FITBIT**-FOR-MACHINE x LEAN **OPS-ANALYTICS**

DATA → INFORMATION → **PERFORMANCE & INTELLIGENCE**

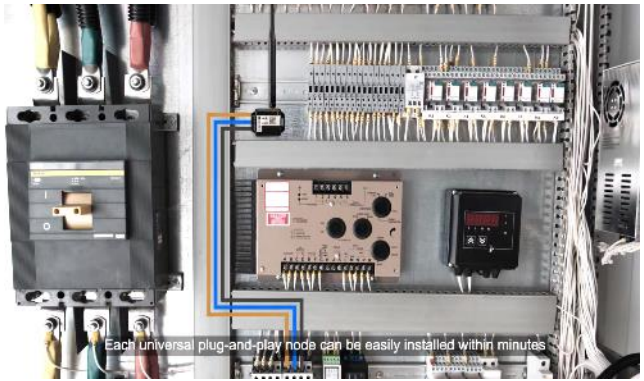
*We have created a powerful suite of **'Lego blocks'** which can be **assembled into basic solutions** for small applications, or **constructed into sophisticated systems** which can autonomously model and analyze large scale operations.*



Steps
Cycle/Std-time
Output/Input
Yield

Heart-rate
Current/load
Temperature
Pressure

Sleep pattern
Active/Idle
Breakdown
Shutdown



OPC UA

Modbus

*Our global customers receive **Auk Industrial IoT kits** which are **ready to self-deploy** onto existing industrial machines. Machine data & OEE analytics can begin streaming onto cloud and visualized on dashboards within 2 hours.*

Reduce CapEx & Save Cost

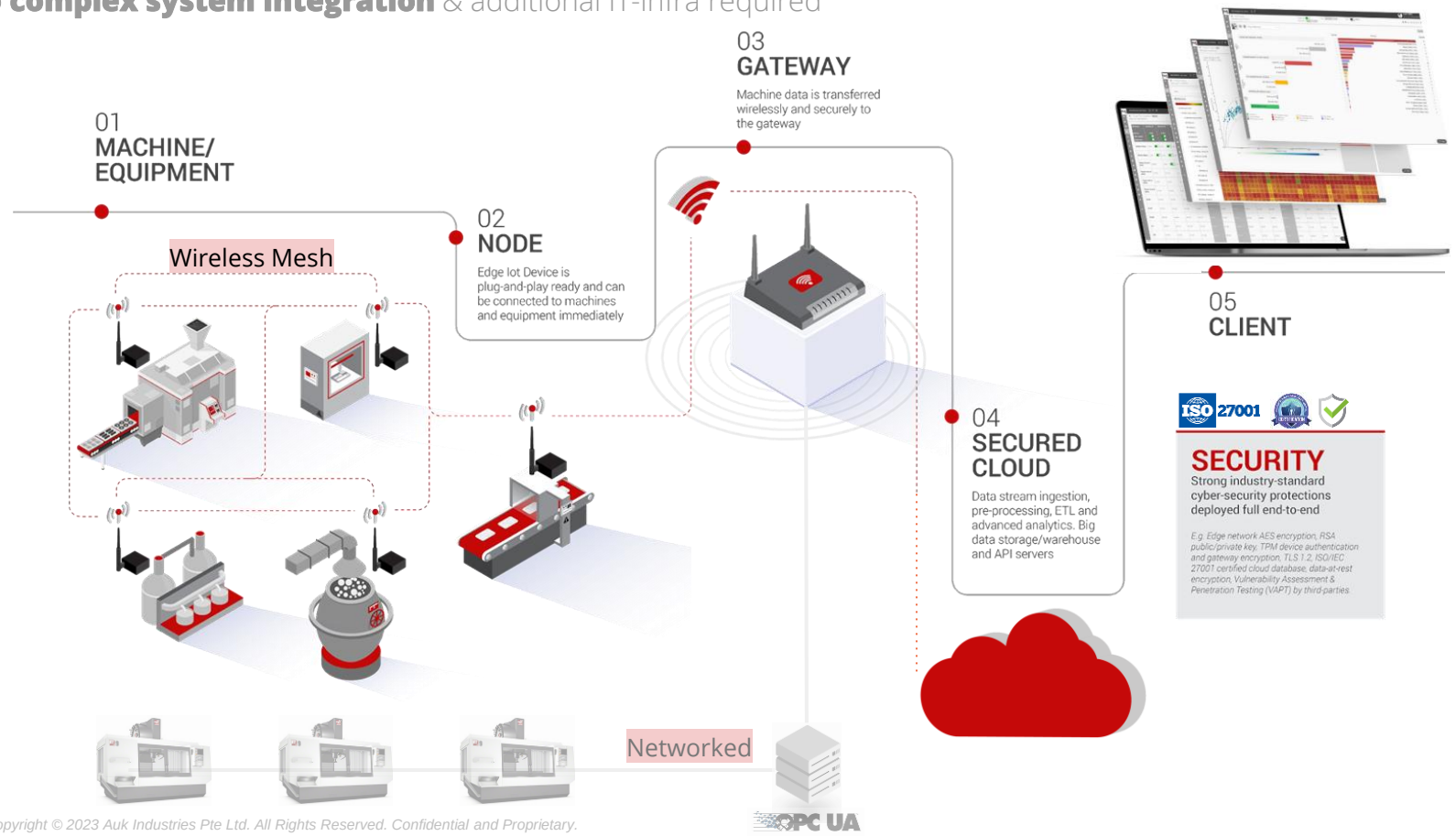
Increase Capacity & Throughput

Improve Productivity & Efficiency

Enhance Quality & Yield

PLUG-AND-PLAY ARCHITECTURE. **SUPER FAST ROI**

No complex system integration & additional IT-infra required

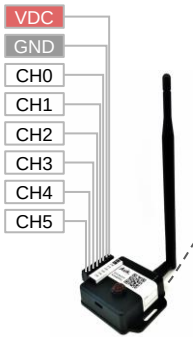


ZERO BARRIER APPROACH TO DIGITAL TRANSFORMATION

For legacy and new equipment, serial and I/O hybrid approach

CONNECT VIA MACHINE INPUT/OUTPUT (I/O)

Connecting to the machine at the sensors or actuators layer. Inputs and outputs are basic building blocks regardless of machine complexity or size. Hence, I/O level signal are typically universal and applicable across machine, brand, model.



CONNECT VIA CONTROLLER (SERIAL/IP)

Using serial communication protocols, subject to availability of serial communications access given by OEM, suitability of built-in aggregation method, and mapping of data variable tags.

OPC UA PROFINET RS 485 RS 232 Modbus

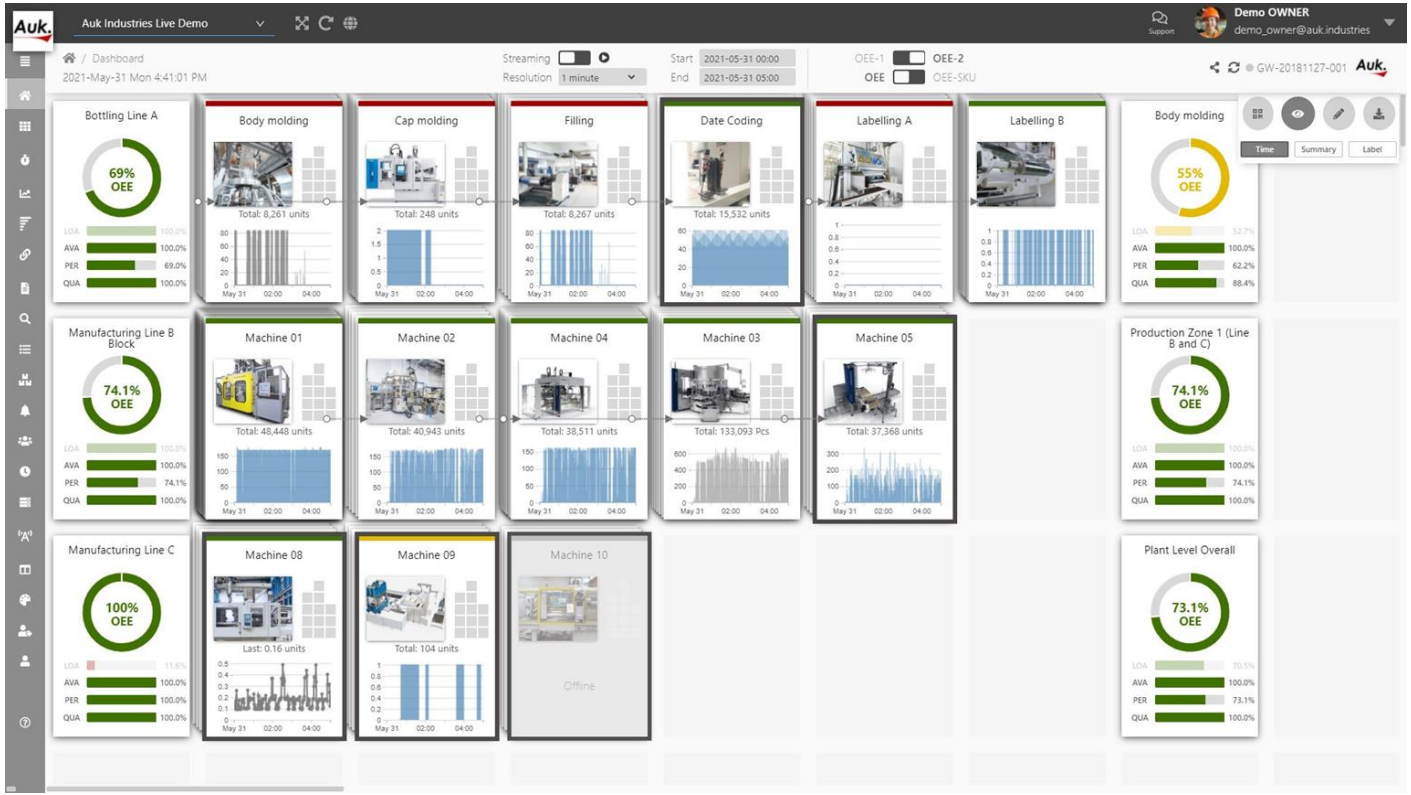
PLC Serial Comms

Energy meter

CLIENT SELF-DEPLOY OFF-THE-SHELF

Our highly productized opware enables clients to deploy through internal crew. The no-code setup go-live in 5 minutes, a game-changer in slower industrial world. *We are world's few I4.0 technologies to ship/pilot remotely even in post-covid new norm.*

ABSOLUTE VISIBILITY WITH REAL-TIME DASHBOARD

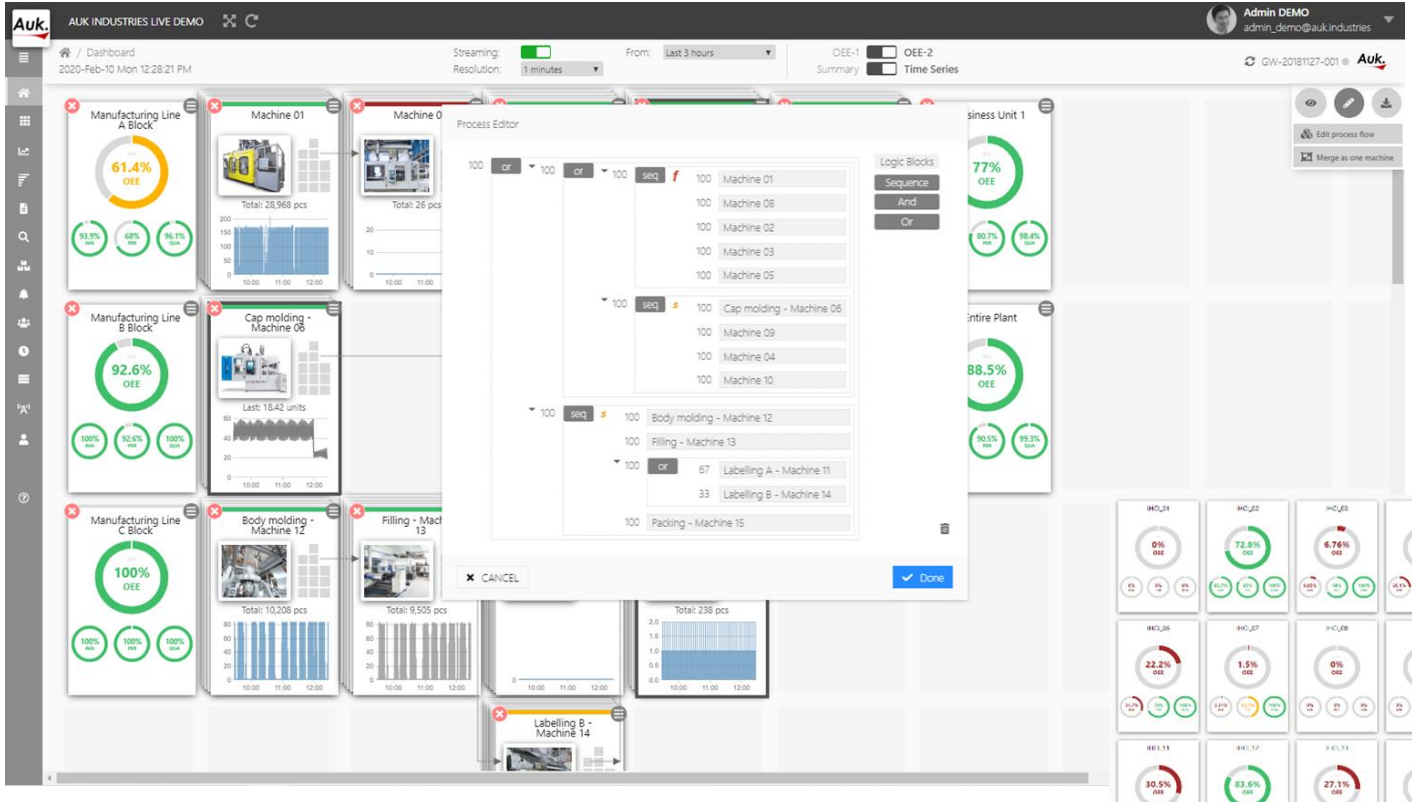


Machine nodes with QR code scan activation.

Drag and drop interface to model system dynamics, zero-minimal training required.

System level analysis based on block diagram representation

ANALYZE PERFORMANCE AT THE **SYSTEM LEVEL**

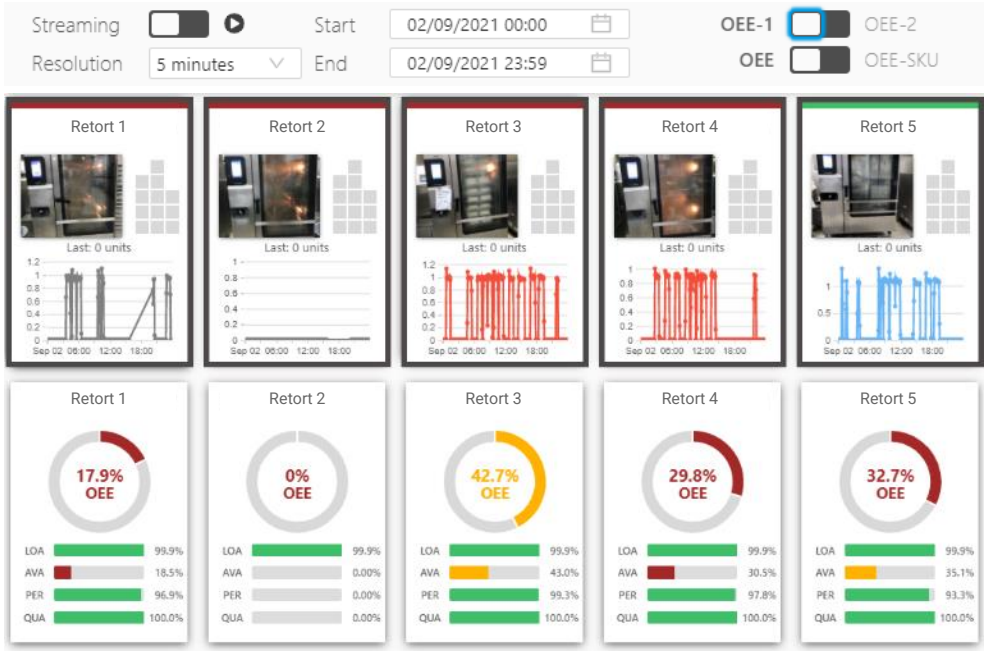


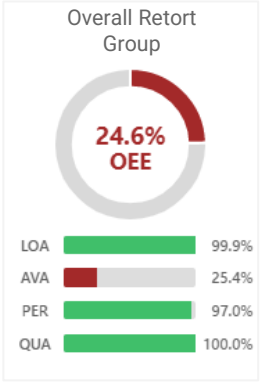
Production line, factory performance can be analysed as a system to gain greater visibility on overall performance.

Identify potential bottlenecks automatically , essentially focusing your attention to solve the most critical points.

IMPROVE PERFORMANCE FOR THE **ENTIRE GROUP LEVEL**

Retort machine group level OEE/utilization analysis





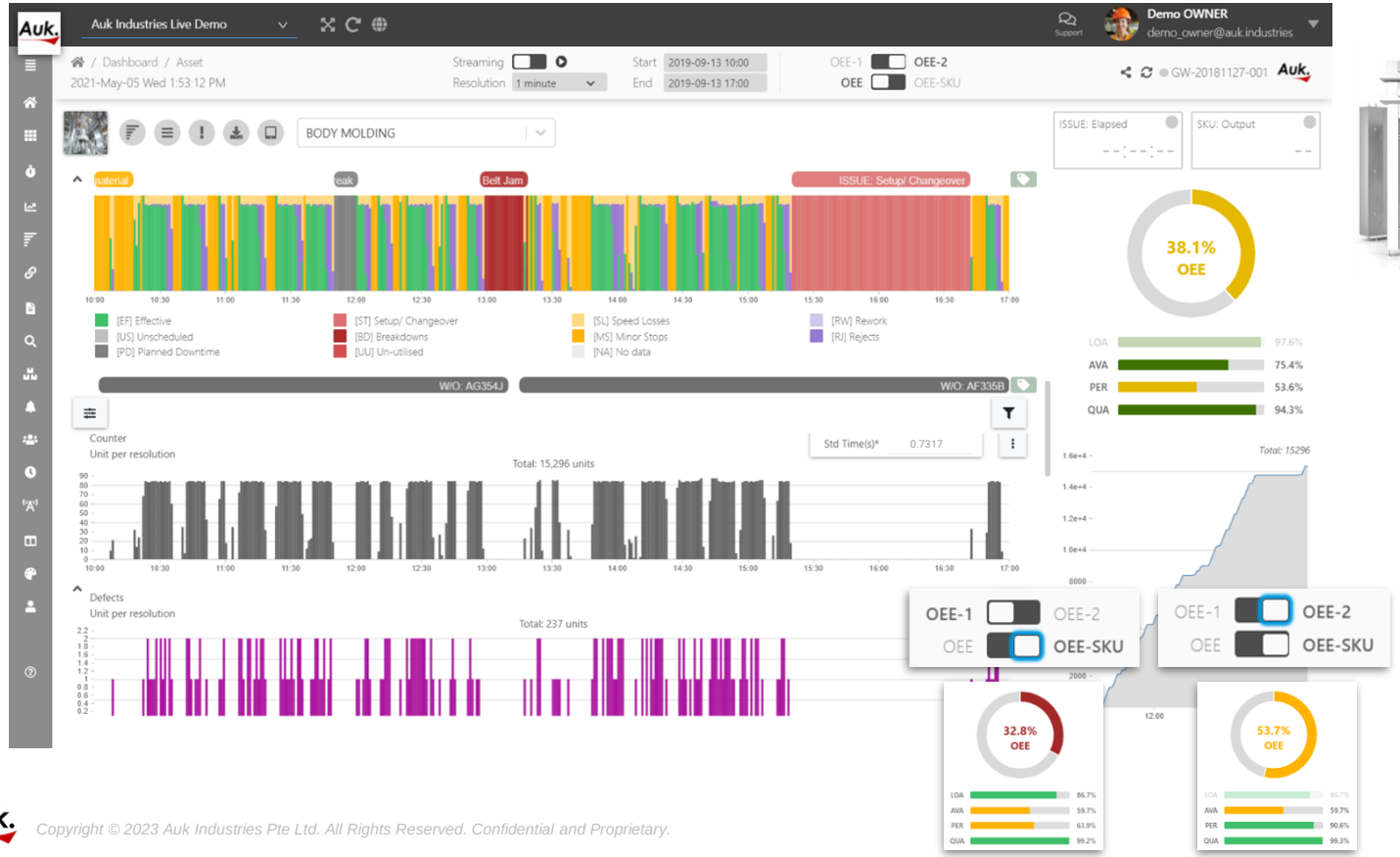
Group Level Utilization

- The individual utilization of each retort can be studied
- The overall retort group performance can also be analysed

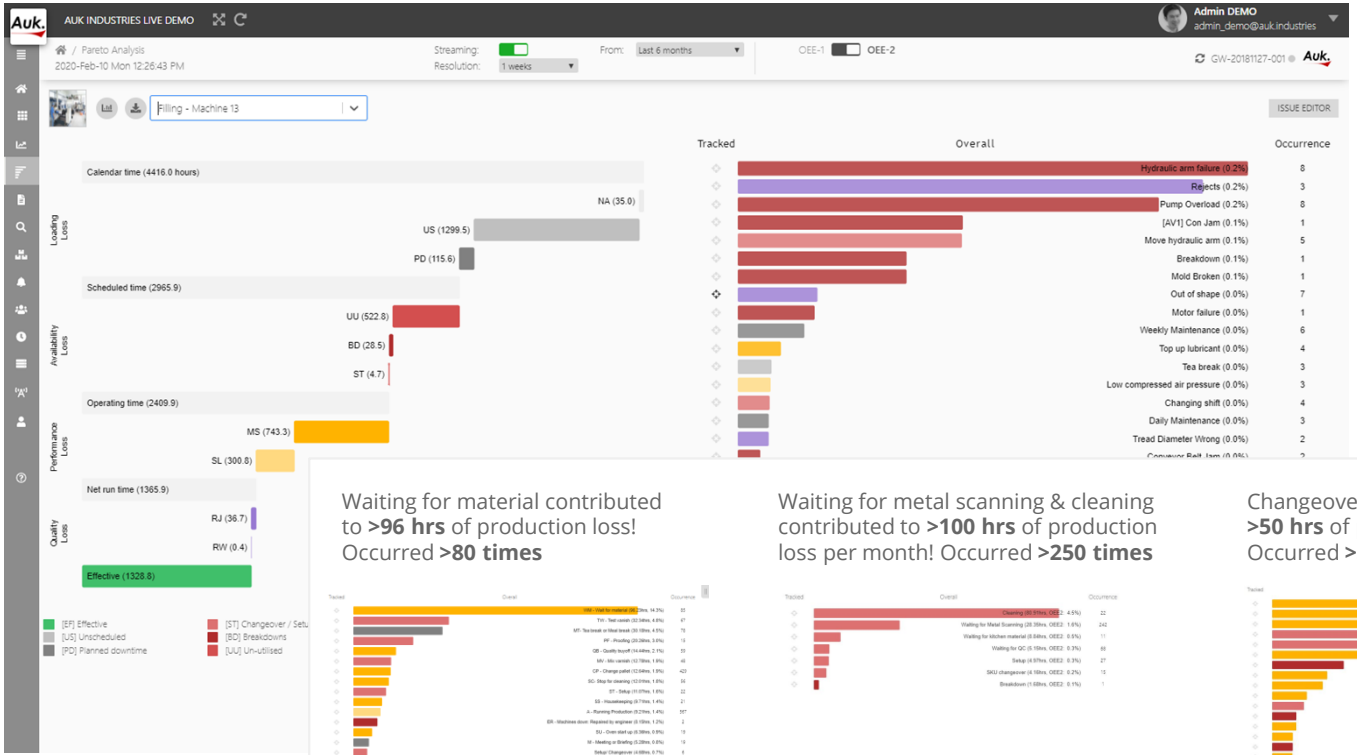
Cycle, Changeover Time, batches

- Batch cycle time can be accurately defined and captured
- No. of batches can also be inferred easily
- Average idling or changeover time in between batches can also be determined

HIGH-RES, RELIABLE DATA KEY TO IMPROVE EFFICIENCY



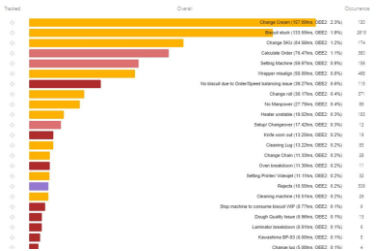
SOLVE THE **RIGHT PROBLEM, MOVE THE NEEDLE**



Waiting for material contributed to **>96 hrs** of production loss! Occurred **>80 times**

Waiting for metal scanning & cleaning contributed to **>100 hrs** of production loss per month! Occurred **>250 times**

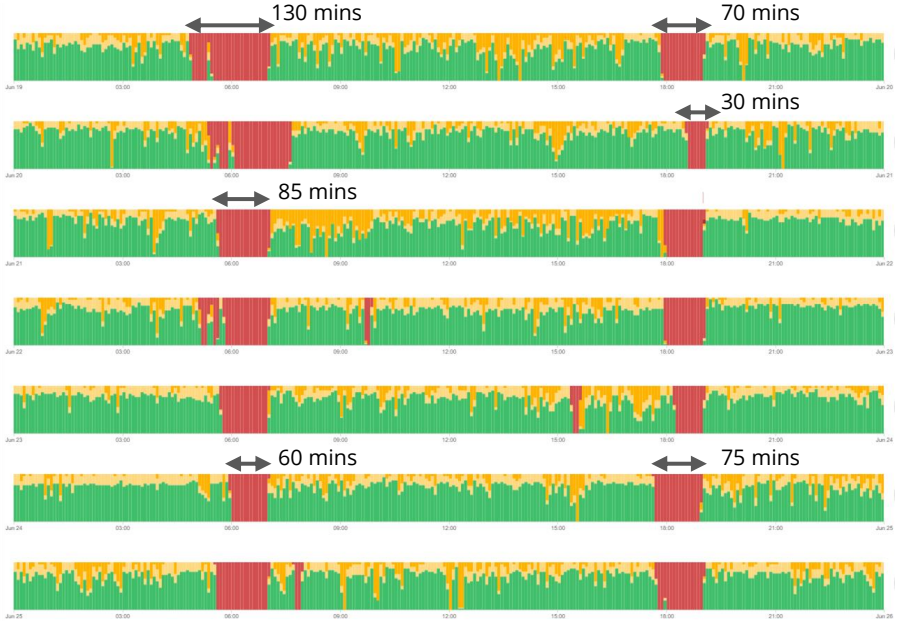
Changeover & product stuck caused **>50 hrs** of production loss per month! Occurred **>300 times**



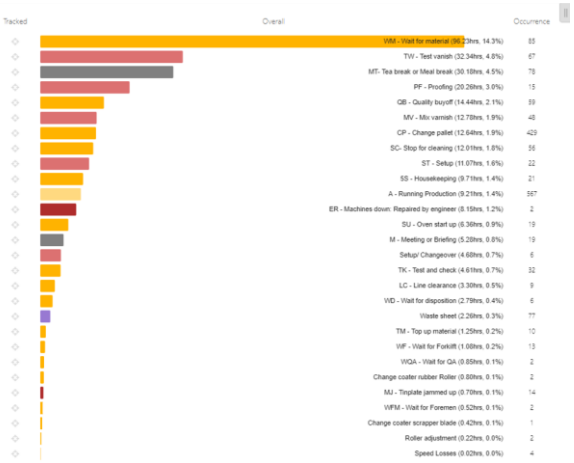
Deep dive into the top 20% reasons that cause 80% of operational losses

Focus resources to **solve issues that 'moves the needle'!**

UNLOCK DOUBLE-DIGIT **OPPORTUNITIES IN 2-4 MONTHS**

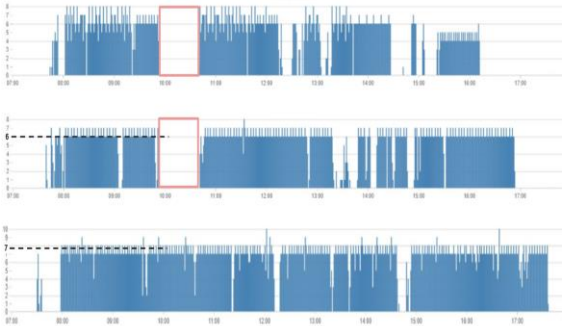


For a snacks manufacturer, changeovers are frequent and duration inconsistent (30 mins - 130 mins).
Standardization of SOP has **improved productivity by >15%** within 2 months, translating to **higher output, without additional machines/manpower/shift**.



For a metal fabrication plant,, **waiting for material** contributed to **>96-hrs of losses** per month/line, or **4.3M pcs** per year.

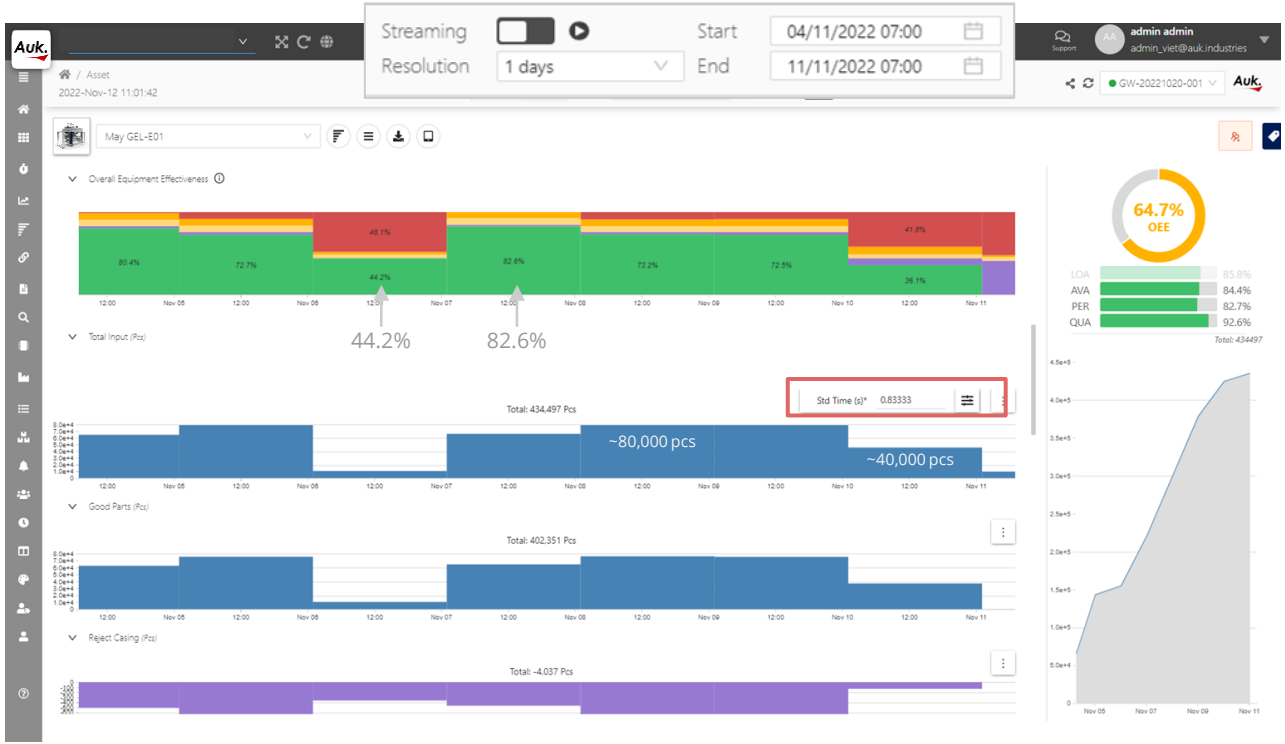
Improved load balancing with dedicated material transfer 'runners' reduced the total time from >96-hrs to 32-hrs



Due to lack of visibility, bottleneck thermoforming stations of a meat processing plant were running at 40%.
Reduction of speed loss and staggering of breaks **improved the output by 75% within 4 months**

IMPROVE CONSISTENCY WITH BETTER CONTROL

Improving consistency *in performance has an upside potential of* ***17.9% OEE*** *or* ***18,558 pcs additional output*** *per machine per day*



Data Observation

- Throughout the week, OEE ranges from **36.1 % to 82.6%** and the **average OEE is 64.7%**.
- The best cycle time determine by our software is **0.83333**, or **72 pcs per minute**

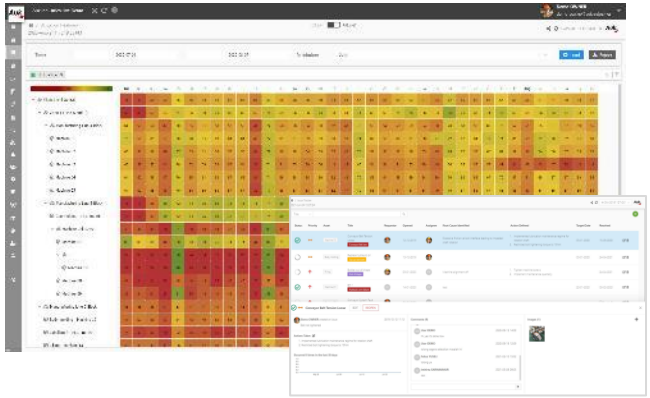
Improvement Potential

- There are fluctuations in the OEE and output on a daily basis, which represents an **upside potential of 17.9%** if consistency is maintained.
- This translates to **additional 18,558 pcs** that can be produced for **1 machine per day**

**17.9% improvement potential = 82.6% (max OEE achieved) - 64.7% (average OEE)*

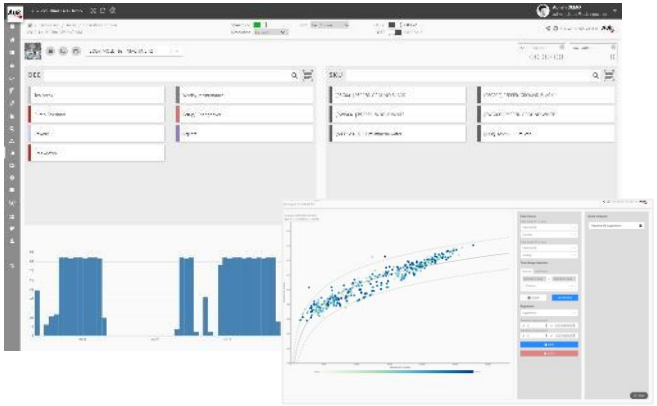
SOFTWARE IS **POWER-PACKED OUT-OF-BOX** WITH ADVANCED ANALYTICS

No-Low setup required. **Ready to use out-of-box**. Go-Live in minutes.



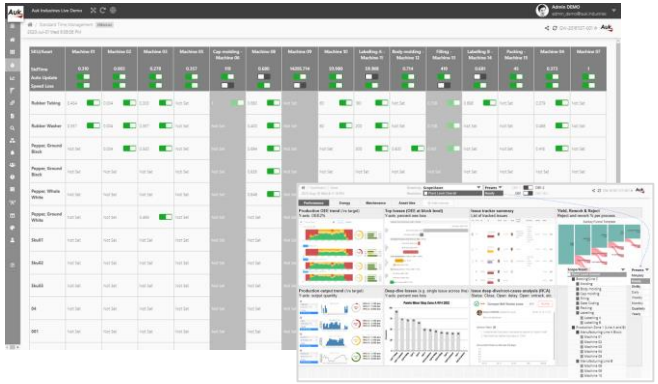
High level glance at monthly plant performance in a single view

RCA can be done and documented systematically.

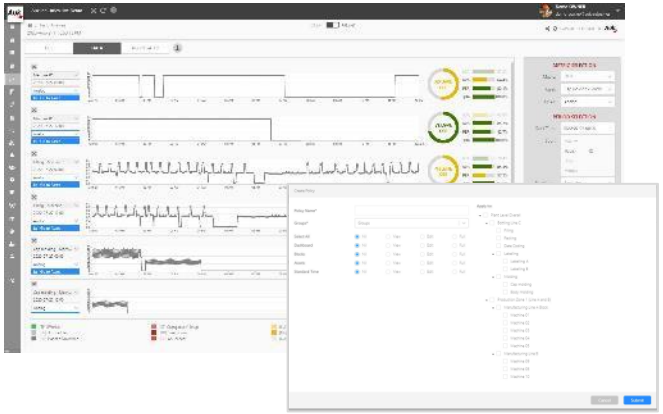


SImplified operator console enables shop-floor information to be updated by operators immediately

Build baseline of normal operating conditions of equipment for optimization and anomaly detection.



A highly refined OEE analysis can be done even with SKUs with different cycle times producing at the same machine.



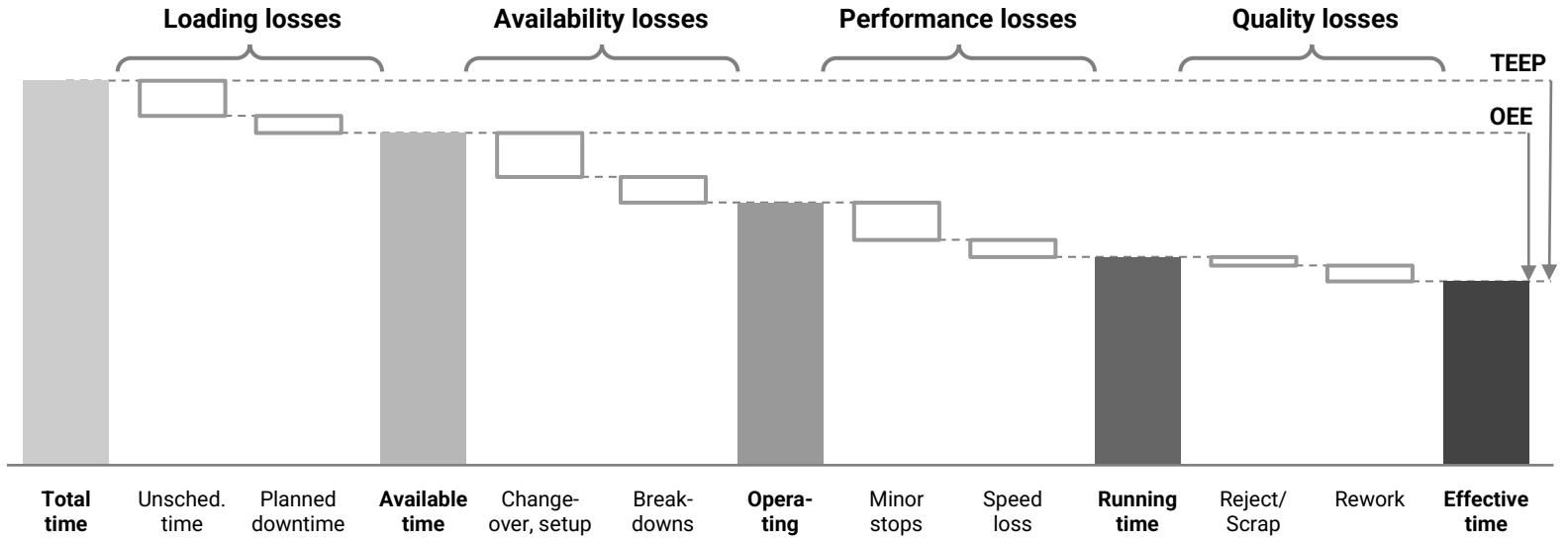
Important production parameters can be compared and correlation can be studied to identify gaps for improvement on performance and QA

Group and manage access level of different personnel across the organization

HIGH GAIN/EFFORT IS FREQUENTLY ACHIEVED THROUGH **IMPROVING MACHINE EFFECTIVENESS**

Significant operational gain can be derived regardless of machine sophistication - *from complex million-dollar automated equipment to simple thousand-dollar human operated packers.*

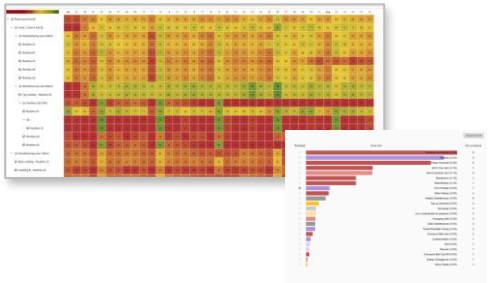
OVERALL EQUIPMENT EFFECTIVENESS (OEE)
Percent %



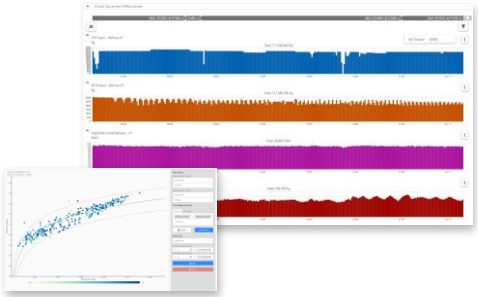
OEE loss-bridge chart
Source: McKinsey & Company

Digital Performance Management

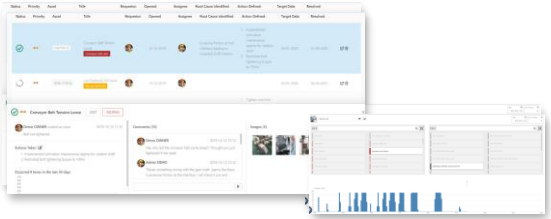
Asset Efficiency Optimization



Energy & Sustainability



Dynamic Maintenance



Quality Management

CLIENT CASE STUDY 1: **BEVERAGE BOTTLING PLANT** (EQUIPMENT PRODUCTIVITY)

Productivity improvement: Throughput increased by >80%, huge CapEx avoidance

Beverage bottling line illustration

Examples of equipment:

Bottle blow-mold

High speed filler

Roll labeller

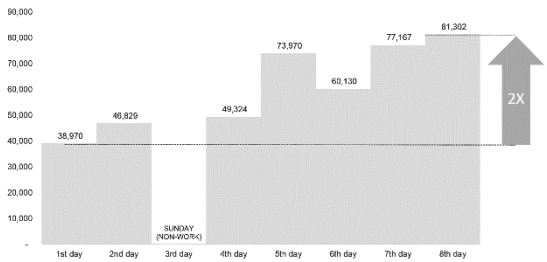
Date code printer

Auto packer

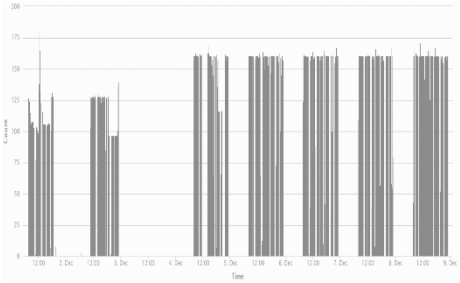
Sleeve labeller

Use case interview:

https://www.auk.industries/case-study-pere-ocean



Equipment throughput (daily)
Captured previously via MES/ERP barcode entry



Equipment throughput (minutely)
High definition data reveal minor stop/speed loss

No. of equipment:	**40+**	Mid complexity
IIoT deployment cost:	**$90,000**	Hardware + SaaS
Operations benefits:	**$2,500,000**	CapEx avoidance
	>90%	Gain in throughput

A leading beverage bottling plant piloted the Auk Industrial IoT system for a single line and subsequently roll out across the entire plant consisting 6 lines with various products.

More than 80% gain in throughput is achieved, enabling **saving of costly CapEx** while meeting demand growth. Levers for rigorous reduction of speed losses and minor stoppages include improving packaging settings, machine alignment calibration, operator skill training, etc.

- Real-time data of plant/line/equipment performance and operation losses
- Single source of data for performance management across departments
- Material first-pass-yield monitoring from raw material to final process

CLIENT CASE STUDY 2: **CENTRAL KITCHEN** (EQUIPMENT UTILIZATION)

Increase equipment utilization, labor productivity: >60% increase in production capacity without CAPEX

OEE state before improvement

OEE state after improvement

No. of equipment:	**50+** Mixed complexity
IIoT deployment cost:	**$100,000** Hardware + SaaS
Operations benefits:	**>60%** Gain in equipment utilization

In a large central kitchen serving ready-to-eat meals, Auk IIoT system is deployed across 3x manufacturing facilities.

Examples of equipment:

Thermopacker

Flattener

Sausage filler

Bowl cutter

Smoke house

Tumbler

Blast Freezer

Combi-oven

Utilization of one of the bottleneck process equipment has increased substantially, resulting in overall improvement at the plant level. Specific levers include load balancing of processes/steps, optimized production scheduling, staggering of break times, reorganization of batch and team sizes to reduce waiting time.

- IoT compatible across very broad range of equipment such as combi-oven, blast-freezer, vege-slicer and etc
- Fact-based data and visualisation enabled constructive workforce rescheduling
- Top losses from minor stoppages and breakdown identified for bottleneck processes

CLIENT CASE STUDY 4: **MEAT PROCESSING PLANT** (MANPOWER EFFICIENCY)

Increase equipment utilization, labor productivity: workshift reduction from 2.5 to 1.5 shifts

Thermo-packing machine

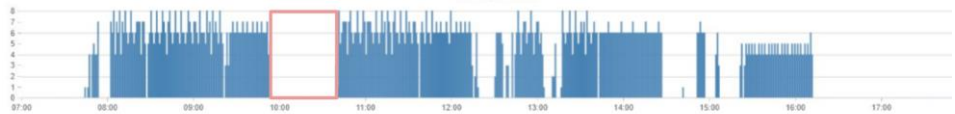
FOOD navigator-asia.com

Trade magazine interview:
https://www.foodnavigator-asia.com/Article/2019/02/15/Hype-or-glory-Can-the-Internet-of-Things-transform-food-manufacturing-in-APAC

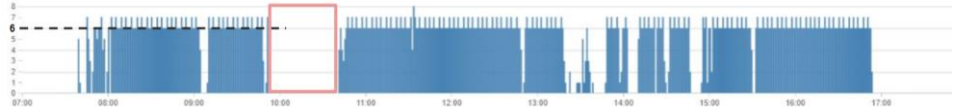
Sausage filler

Tumbler

Smoke house



T+0
OEE = **~40%**



T+2 months
OEE = **~50%**

T+4 months
OEE = **~70%**

No. of equipment:	**80+** Mixed complexity
IIoT deployment cost:	**$120,000** Hardware + SaaS
Operations benefits:	**>40%** Saving in work-hour
	>30% Gain in OEE

In a joint venture between a global top meat processing company and a renowned airline logistics company, Auk IIoT system is deployed across 3x manufacturing facilities.

Manpower efficiency was significantly improved, enabling reduction of workshifts from 2.5 to 1.5 shifts. Specific levers improved operator handling via identification of top stoppages/faults, optimized production scheduling to level-load production equipment for max capacity.

- IoT compatible across very broad range of equipment from manual bandsaws to state-of-the-art laser-guided portioner
- Fact-based data and visualisation enabled constructive workforce rescheduling
- Top losses from minor stoppages and breakdown identified for bottleneck processes

CLIENT CASE STUDY 8: **FOOD MANUFACTURING** (CCP OPTIMIZATION)

Increase overall production line speed/output: >20% increase in line-level OEE and output

Mixer

Wrapping

Cream spreader

Forming

Cartoning

Checkweigher

Conveyor oven

Oven Temperature

Conveyor Speed

No. of equipment:	**100+**	Mixed complexity
IIoT deployment cost:	**$200,000**	Hardware + SaaS
Operations benefits:	**>20%**	Gain in line speed

In a large biscuit manufacturing facility producing for both local and overseas market, Auk IIoT system is deployed across 100x machines at 8 lines.

>20% gain in production line capacity unlocked, enabling the company to meet the demand without incurring additional manpower and CAPEX. Specific levers include optimization of critical CCP such as oven temperature and conveyor speed with real-time high resolution data.

- IoT compatible across very broad range of equipment from relay-controlled legacy upstream machines and new/sophisticated conveyor ovens
- Fact-based data and visualisation enabled constructive workforce rescheduling
- Bottleneck identified and real-time data analytics is used to optimize CCP to unlock production capacity

CLIENT CASE STUDY 10: **PET FOOD PRODUCTION** (ASSET OPTIMIZATION)

*Reduction in changeover/cleaning time **can increase number of batches to 18** per machine/day*

https://ops.auk.industries/asset/6016?from=2022-12-20T17:00:00.000Z&to=2022-12-21T17:00:00.000Z&res_x=5&res_period=minutes&entity_id=396

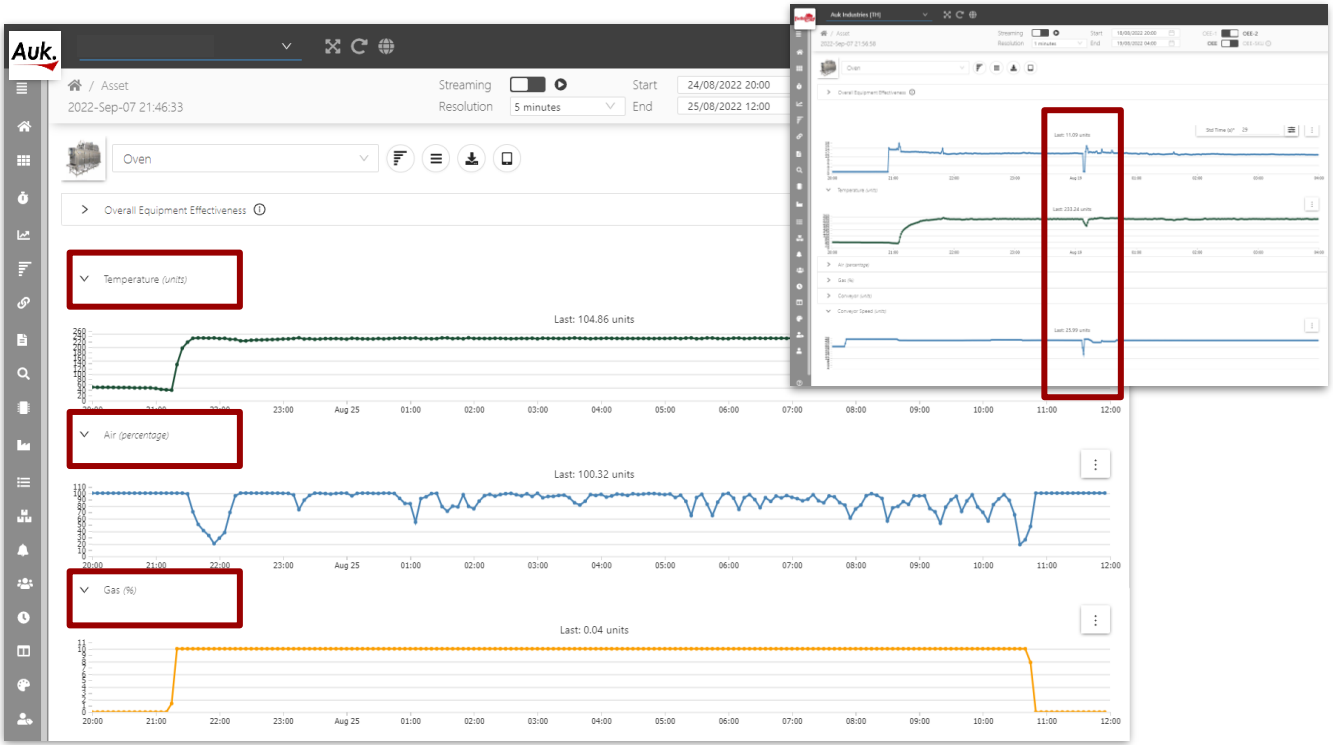
Data Observation

- Time range selected is 21st Dec, 24-hr period. **OEE is 41%**.
- The batch cycle time is ~**74mins**
- **Changeover time** ranges from **5mins - 255mins**
- **Heating & cooling** contributed **32mins** or **43%** of total time

Improvement Potential

- Based on batch cycle time of 74min and changeover time of 5min, the **maximum achievable performance** is **18 batches/day**, vs 8/day currently
- Any ways to shorten heating and cooling duration?

CLIENT CASE STUDY 11: **FOOD PRODUCTION** (CCP OPTIMIZATION)



Data Observation

- Monitoring correlation between connected signals for future improvement and root cause analysis
- Get visibility on each signal type and be able to faster identify when machine have issue
- Also can set notification when have issue for faster response

ENERGY DATA BECOMES ACTIONABLE WHEN **SYNERGIZED WITH PRODUCTION DATA**

Beverage bottling line illustration

Bottle blow-mold

High speed filler

Roll labeller

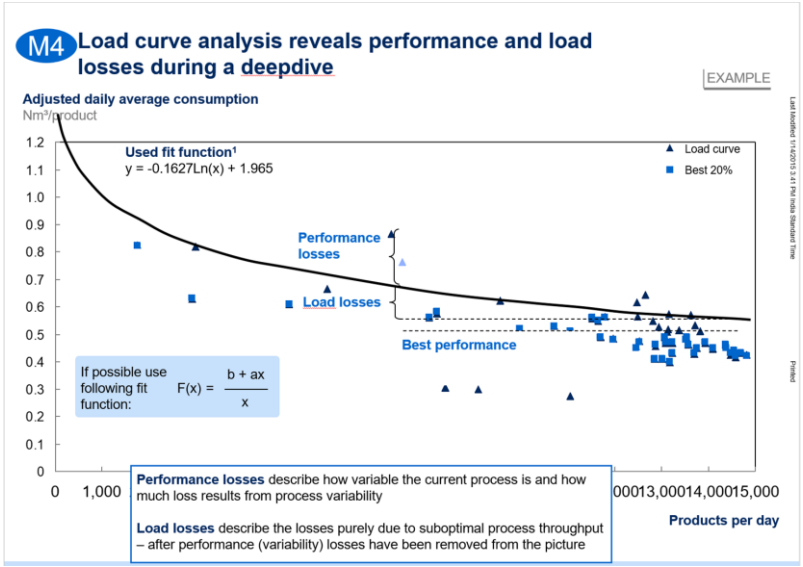
Date coder

Auto packer

Sleeve labeller

Via the fusion of both *energy* and *production* data, specific energy per unit of goods produced can be derived and energy load curve baseline is discovered through multivariate regression analysis.

This establishes optimal performance at each throughput level, and breaks down energy inefficiency into (A) Performance Losses and (B) Load Losses for respective mitigation actions.



CLIENT CASE STUDY 12: **CHEMICAL PLANT** (ENERGY OPTIMIZATION)

In a chemical plant in the ASEAN region, the **energy consumption trend and composition across different areas/blocks and different Work Orders** can now be determined in real-time. Utility equipment with the highest running cost is identified.

This means that the total **energy consumption for specific product/batch** can be tracked and potential adjustments made, where the **high energy consuming operations** are scheduled at **periods of low tariffs**.

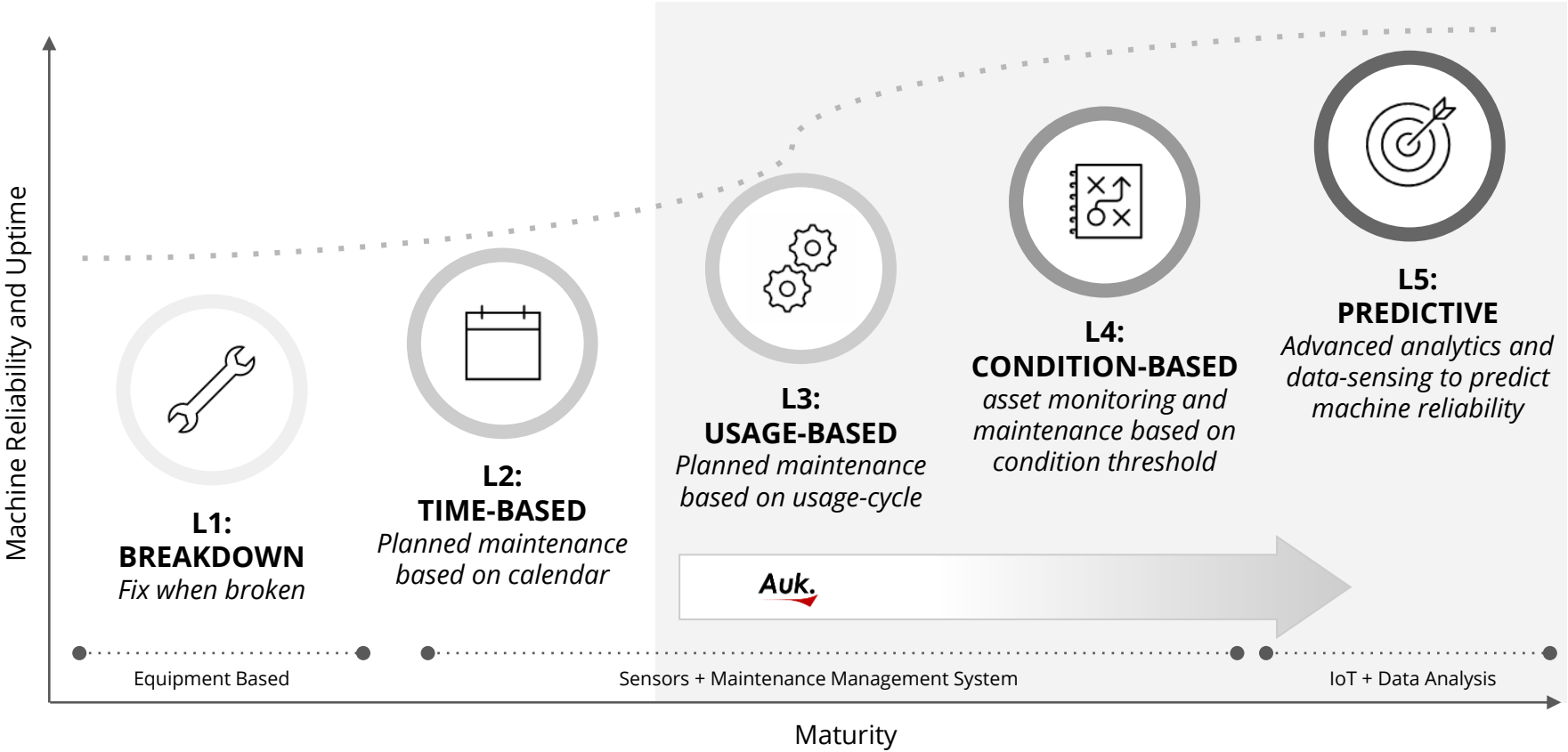
Auk's robust long-range mesh-network architecture means that **no additional investment in LAN/WIFI** infrastructure is required.

CLIENT CASE STUDY 13: **CPG MANUFACTURING** (Specific Energy Cost Optimization)

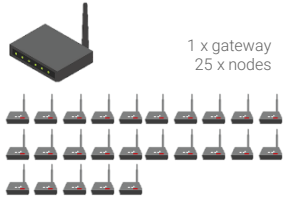
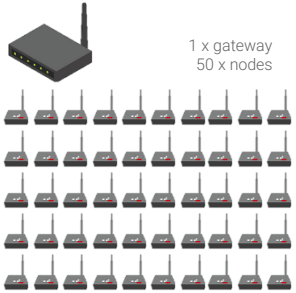
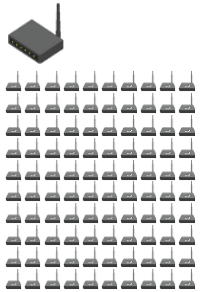
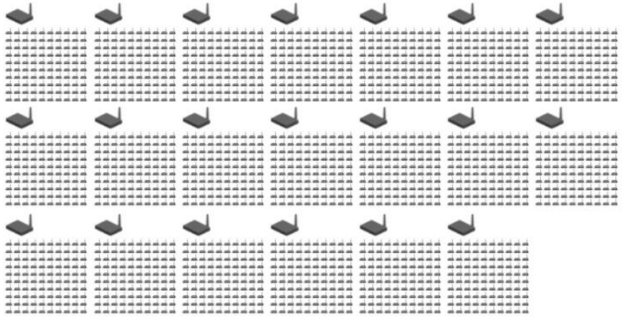
In a beverage bottling plant in Malaysia, the **specific energy cost** for a particular product SKU can now be determined. Management has a much clearer sense of cost and margin for every product.

Production and engineering team performed a detailed study on **energy cost analysis between different packaging materials** and made the switch to carton box packaging due to its lower overall cost (despite having a higher raw material cost).

MAINTENANCE STRATEGY



WE ARE 3-5X MORE COST-EFFECTIVE *(inclusive 12 months software & support)*

	Pilot	**Mid factory**	**Large factory**	**Global Enterprise & MNCs**
	25 machines Typical company rev: <$10M	**1 factory (50 machines)** Typical company rev: $10~50M	**~2 factories (200 machines)** Typical company rev: $100~500M	**>20 factories (2000 machines)** Typical company rev: >$1B
Hardware	 1 x gateway 25 x nodes	 1 x gateway 50 x nodes	 2 x gateways 200 x nodes	20 x gateway 2000 x nodes 
Software Analytics Platform (Professional tier)	 1 x year 25 x nodes 75 user accounts	 1 x year 50 x nodes 150 user accounts	 1 x year 200 x nodes 600 user accounts	 1 x year 2000 x nodes 6000 user accounts
*Training & Onboarding	 **[Basic]** Lean I4.0 Onboarding Program 1x Deployment Training	 **[Intermediate]** Lean I4.0 Onboarding Program 1x Deployment Training	 **[Advanced]** Lean I4.0 Onboarding Program 2x Deployment Training	 **[Advanced]** Lean I4.0 Onboarding Program 2x Deployment Training
	USD **28k** upfront USD **1.3k**/month *12m *(billed every 1 year)* USD **43k** total for year 1	USD **44k** upfront USD **2.3k**/month *12m *(billed every 1 year)* USD **73k** total for year 1	USD **134k** upfront USD **8k**/month *12m *(billed every 1 year)* USD **233k** total for year 1	USD **970k** upfront USD **66k**/month *12m *(billed every 1 year)* USD **1.78M** total for year 1

Auk.

Our mission is to build the ***most powerful digital engine*** for Industry 4.0, ***disrupt the big incumbents***, and ***level the playing field*** by making the *best-in-class arsenal* accessible to *every industrial operations*, from the *smallest Mittelstand* to the world's *largest* conglomerates.

"Why would a line worker in a developing country save so hard to buy an Apple Iphone?" "Because unlike cars & houses, it is probably the only great thing that even a billionaire like Elon Musk loves using, that he too has a chance to own.."

Get in touch with us

+65 9459 1086
samuel.tan@auk.industries

+65 8111 9459
euharn.lee@auk.industries

https://auk.industries/