



La strategicità del Dato nell'ecosistema della Servitizzazione

Your assets are talking. We help you listen.

Davide Borghi

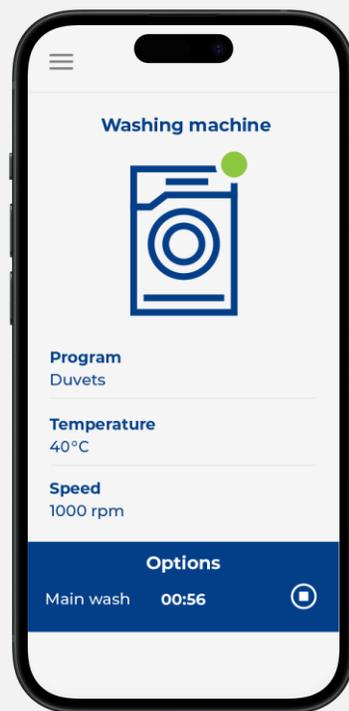
Bologna, 22 Novembre 2023



Everyday equipment is already "smart"



Today, it's common for everyday appliances to be connected and monitored in user friendly way.



Why should your plant be any different?



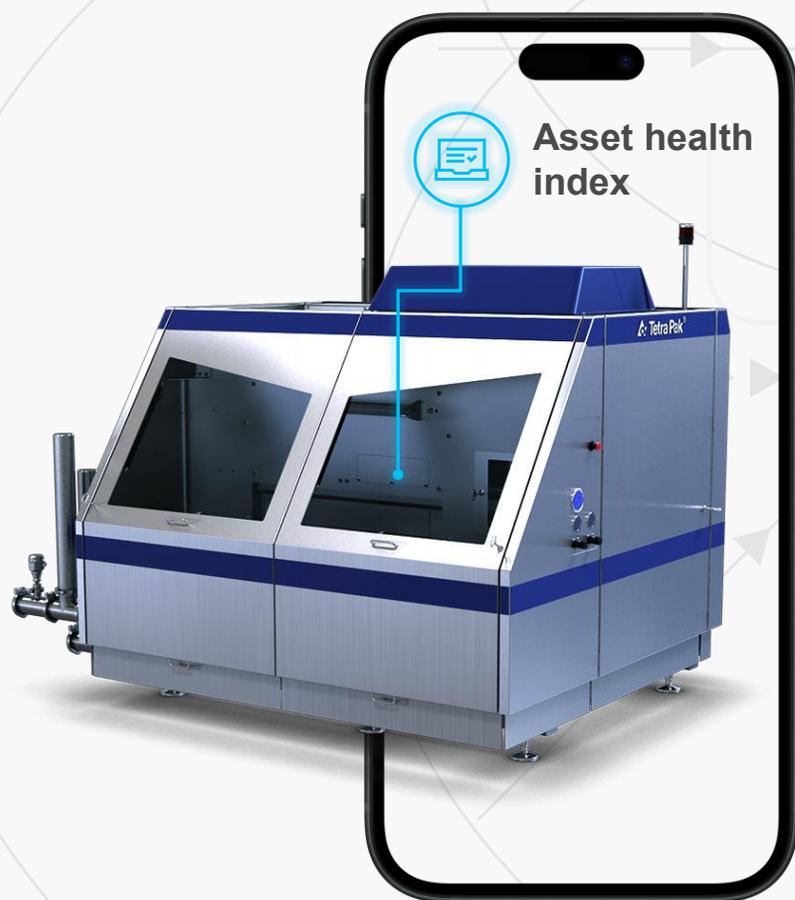


Data gives you greater knowledge

– if you know how to collect and use it



Asset Health Monitoring from Tetra Pak



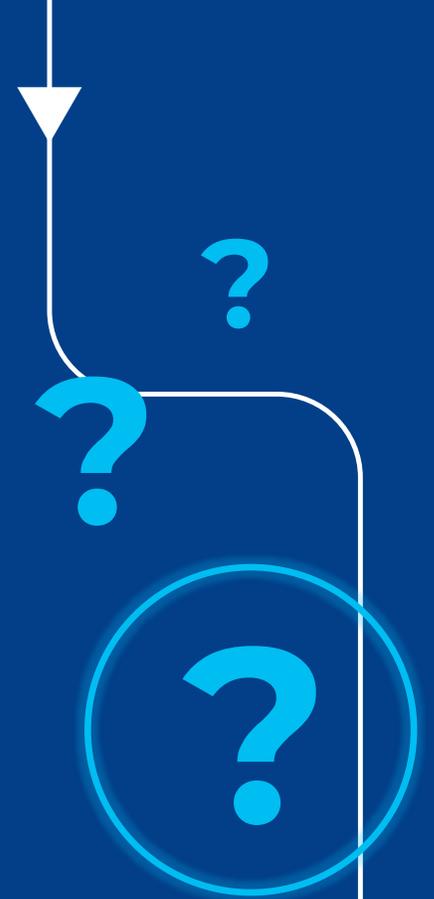
Monitoring your assets provides you more data, which gives you greater **knowledge** – and therefore **benefits your operations**.

How? By giving you the **insights to take the right decisions** based on your specific operating conditions.



So what is Asset Health Monitoring, and how does it work?

- ✓ Customised **sensor kits**, user interface, and a secure network designed for your Tetra Pak equipment
- ✓ This system analyses data linked to your assets' health and generates **notifications**
- ✓ We apply **our OEM expertise** to enhance this data and generate actionable insights
- ✓ Access this data **securely** and evaluate which actions to take based on **your assets' actual health status**
- ✓ Our local and global network of **experts** can then support you through our Service solutions to maximise your operational benefits
- ✓ Securely collecting data at scale helps us to **continuously improve** our algorithms, equipment and services, and benefit your operations





Asset Health Monitoring

How does it make things better?



Optimise maintenance

Lifetime management / early detection

- AHM enables maintenance optimisation through early detection but also through the ability to customise maintenance based on actual equipment health, leading towards condition-based maintenance
- This in turn leads to maintenance cost optimisation



Process Monitoring

Quality focus / manage risk

- Unique features such as cutting and sealing monitoring, or piston seal leakage, means early detection of developing faults and minimised dependency on operator competence
- Controlled risk of quality issues

Prevent downtime

Secure uptime / reliability

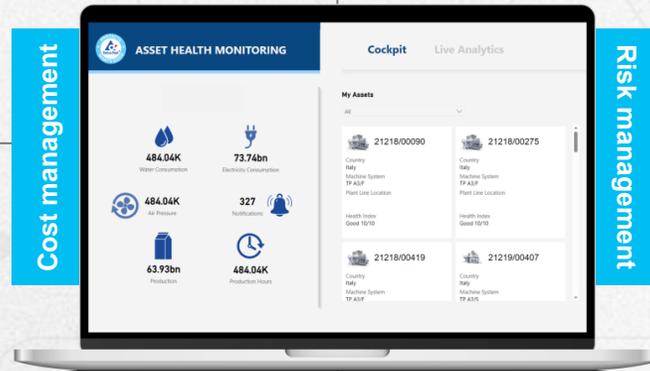
- Continuous monitoring of critical equipment functions means early detection of developing faults and avoiding unplanned downtime.
- If a failure has already occurred, AHM enables faster troubleshooting.
- Once corrective maintenance has been performed, AHM helps validate the corrective action through data



In-depth operational understanding

Data availability

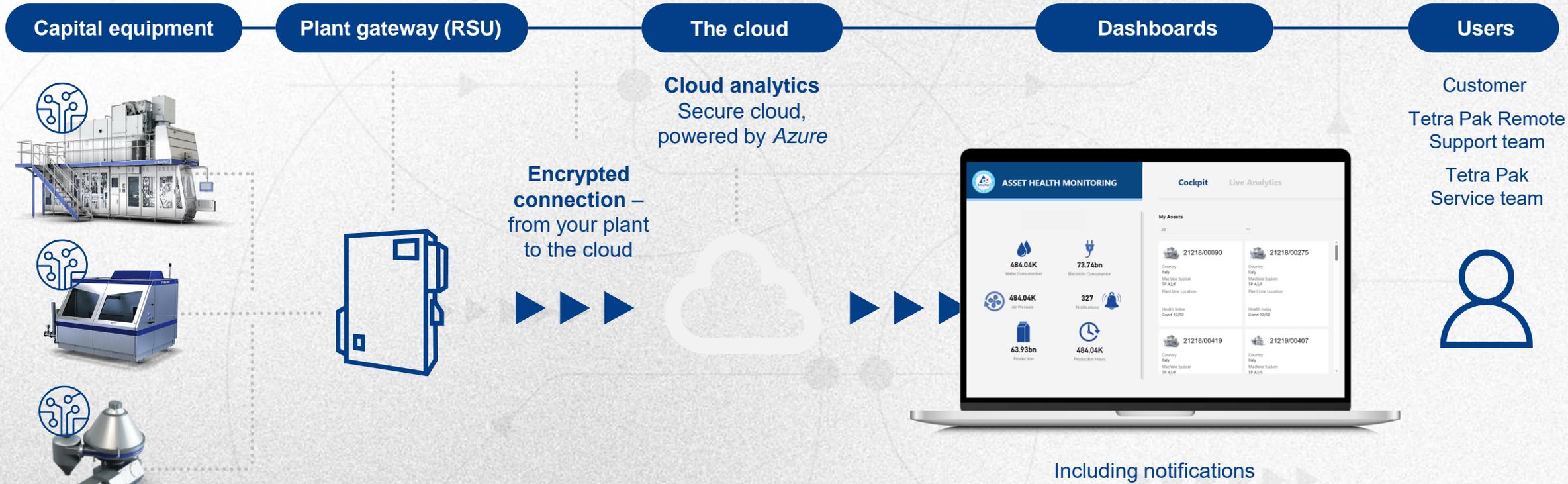
- Data on utilities consumption, collected continuously and automatically, creates baseline awareness for sustainability improvements
- Automatic notifications and reports, better visual representation of data, and benchmarking capabilities enable richer, deeper asset insights and aid decision-making





Asset health monitoring

– a secure, scalable architecture





AHM: a baseline for sustainability awareness

Know your utilities consumption – the starting point for improvement

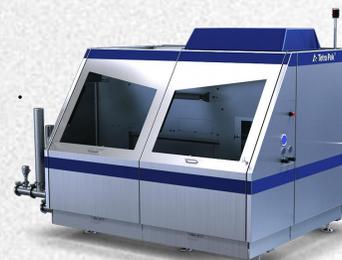


Electricity consumption monitoring

The starting point for concrete **actions** for cost and operational optimisation and validate results



Water consumption monitoring



Improved **visibility** of consumption data to drive sustainability agenda



Compressed air consumption monitoring

Create awareness and highlight **opportunities for consumption optimisation**





Asset Health Monitoring solutions for your plant

Drive quality and throughput optimisation opportunities

PROCESSING EQUIPMENT

Pumps

Alfa Laval Analytics

- ▶ Impeller
- ▶ Misalignment
- ▶ Looseness
- ▶ Bearings



Separator ▶

- ▶ Bowl
- ▶ Motor
- ▶ Spindle
- ▶ Horizontal drive
- ▶ Electrical power
- ▶ Utilities consumptions awareness



Homogenizer ▶

- ▶ Motor
- ▶ Crankcase
- ▶ Gearbox
- ▶ Wear
- ▶ Pressure
- ▶ Utilities consumptions awareness



PACKAGING EQUIPMENT

A3 Filling Machines ▶

- ▶ Motors
- ▶ Peroxide pump
- ▶ TS sealing
- ▶ Knives (A3/CF, A3/F)
- ▶ Catches (A3/CF, A3/F)
- ▶ Electrical power
- ▶ Utilities consumptions awareness



DOWNSTREAM EQUIPMENT

CAP 40

- ▶ Glue application
- ▶ Cap applicator
- ▶ Cap picking





Tetra Pak® A3/Flex

Points of interest and their respective failure modes

Electrical power

- ▶ Voltage dip, swell, spikes,
- ▶ Phases unbalance
- ▶ Voltage harmonics/quality
- ▶ Consumption monitoring (KWh/packs/kg of prod)

DIMC drive system

- ▶ Servo bearing wear
- ▶ Shaft coupling broken

Powered by the latest Industrial PC technology

Peroxide pump

- ▶ Motor bearing wear
- ▶ Coupled unit bearing wear
- ▶ Coupled unit looseness, misalignment, unbalance
- ▶ Impeller wheel wear /cavitation

Yoke drive motors

- ▶ Lubrication issue
- ▶ Belt tension loss/wear
- ▶ Runner block wear
- ▶ Servo bearing wear
- ▶ Yoke bushing wear

Utilities consumption monitoring

- ▶ Water
- ▶ Compressed air
- ▶ Energy

Jaw drive motors

- ▶ Lubrication issue
- ▶ Belt tension loss/wear
- ▶ Runner block wear
- ▶ Servo bearing wear
- ▶ Jaw bushing wear

FFU drive motors

- ▶ Belt tension loss/wear
- ▶ Servo bearing wear

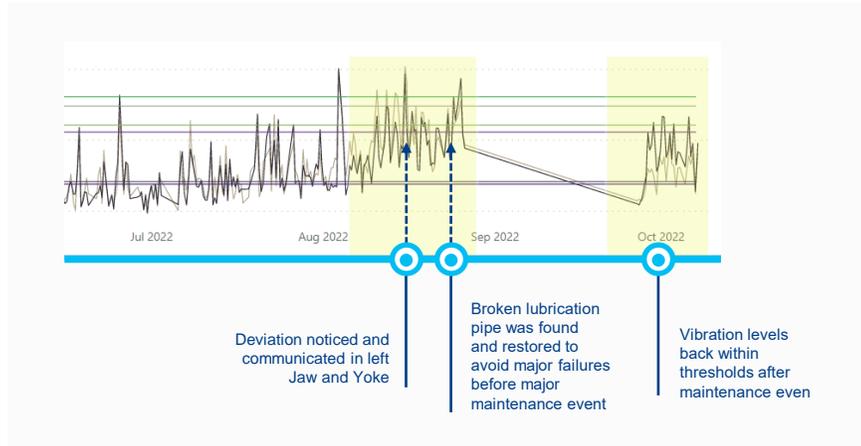
TS components

- ▶ Inductor corrosion/wear
- ▶ Coaxial cable electrical issue
- ▶ Transformer electrical issue

Cutting function

- ▶ Knives blade sharpness loss
- ▶ Cutting function deterioration

Case: Minimise impact of failures



Without Asset Health Monitoring

With Asset Health Monitoring

-  **Problem:** Jaw crash*
-  **Time to fix:** 12 work hours
-  **Spare Part Cost:** up to €5,000
-  **Downtime Cost:** up to €15,000

-  **Problem:** Broken pipe
-  **Time to fix:** 5 mins
-  **Spare Part Cost:** €10
-  **Downtime Cost:** €100

*Potential evolution of the problem

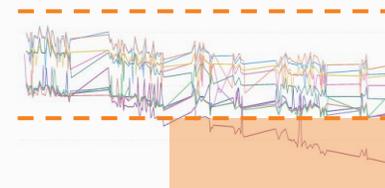


AHM for failure prevention Tetra Pak® A3 / Speed



- ▶ A3/S 0400 is running and sealing parameters are monitored by CM system.
- ▶ All parameters shows normal wearing trends of inductors, except one.
- ▶ Site-based engineer is notified about the anomaly.

1



Anomaly detected

Anomaly detection in AHM data triggers notification with details to Tetra Pak Site-based engineer

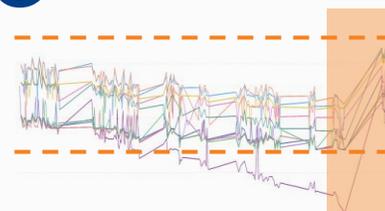
2



Fault finding

During a planned stop, the Site-based engineer investigates the function to identify the root cause (worn inductors)

3



Corrective action

Site-based engineer replaces all TS inductors during a planned stop. Effectiveness validated through AHM data

4



Full operation

Operation fully restored with NO impact on production

Computer
Science/IT

Machine
Learning

Math and
Statistics

Data
Science

Software
Development

Traditional
Research

Domains/Business
Knowledge



Smart Data:

Smart Data is the intelligent sustainable energy





Data is the new oil, but...

A new paradigm

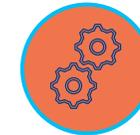
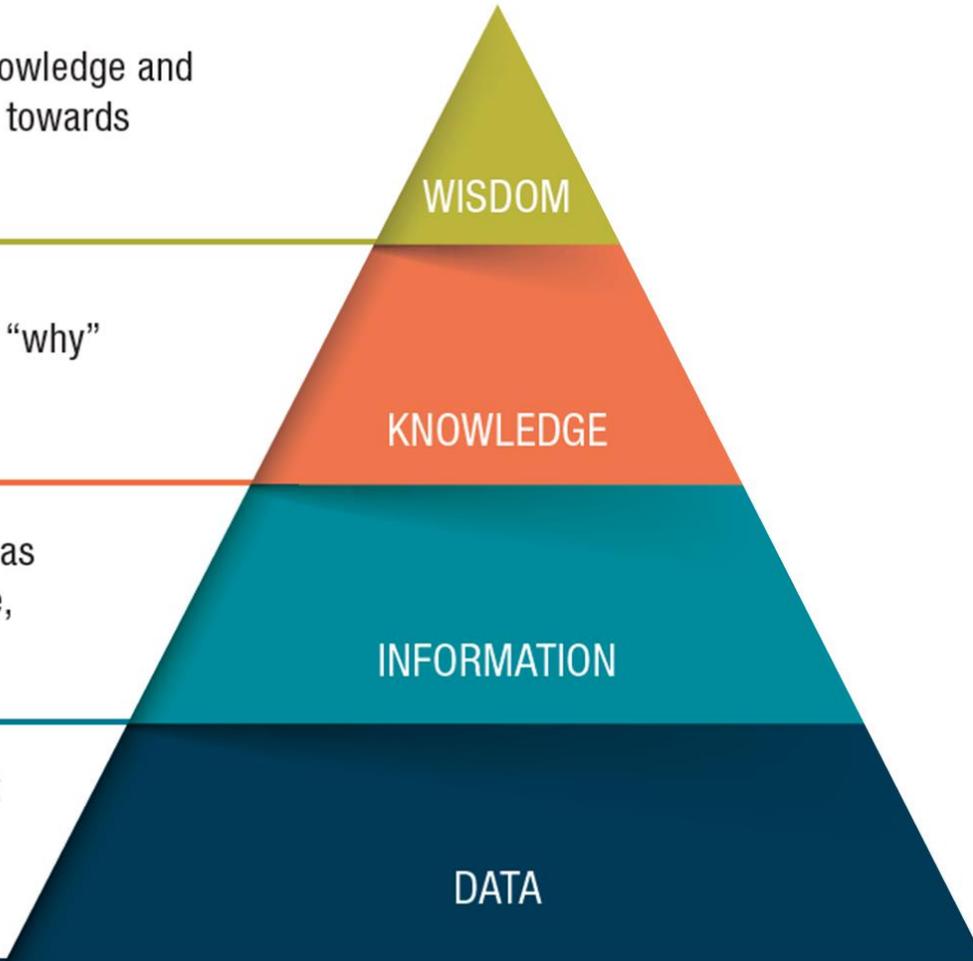
The saddest aspect of life right now, is that science gathers knowledge faster than society gathers wisdom
ISAAC ASIMOV

Captures both high level of knowledge and the ability to apply knowledge towards particular goals

Information applied to answer “why” questions

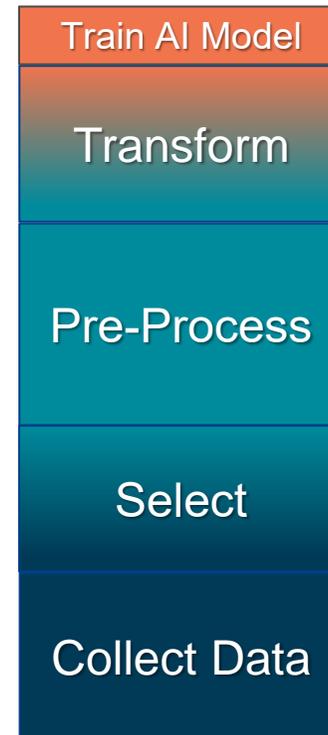
Data used and contextualized as answers to “who, what, where, when” questions

Discrete, objective facts about phenomena, often obtained from sensors, experiments or surveys



ACTIVITY

EFFORT



10%
Machine Learning

90%
Data Preparation,
of which 70% with
Domain expertise



Tetra Pak is a world leading food processing and packaging solutions company. Working closely with our customers and suppliers, we provide safe, innovative and environmentally sound products that each day meet the needs of hundreds of millions of people in more than 160 countries. With more than 25,000 employees around the world, we believe in responsible industry leadership and a sustainable approach to business.

www.tetrapak.com