AVEVA™ PI System™ as the industrial sustainability platform

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Agenda

• What is sustainability?
• AVEVA™ PI System™ as the industrial sustainability platform
• AVEVA™ PI System™ sustainability customer stories
• How AVEVA accelerates sustainability journeys
• Call to action
What is sustainability?
What is sustainability?

“Meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

Source: United Nations
Digitalization and sustainability are creating new opportunities

Realizing the United Nations Sustainable Development Goals could unlock USD $12 trillion in new market opportunities per year by 2030.

A 1.5 °C future requires a surge in annual investment in clean energy projects and infrastructure to nearly USD 4 trillion by 2030 incl. x 15 increase in efficiency investments and x 3 increase in renewables by 2026.
Reduce emissions: Scope 1, 2 & 3

**Emissions Type**

<table>
<thead>
<tr>
<th>Direct emissions</th>
<th>Scope 1</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Emissions from operations that are owned or controlled by the reporting company</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indirect emissions</th>
<th>Scope 2</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Scope 3</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions</td>
</tr>
</tbody>
</table>

**Source:** GHG Protocol
AVEVA™ PI System™ as the industrial sustainability platform
AVEVA™ PI System™: Industrial data backbone for digital transformation

**INDUSTRIAL DATA INFRASTRUCTURE BACKBONE**

- **Oil & Gas**: 95% of top 60 companies
- **Power & Utilities**: 1000+ of the world’s leading companies
- **Chemicals**: 38/50 of the world’s largest companies
- **Metals & Mining**: 100% of Fortune 500 companies
- **Life Sciences**: 9/10 of top pharma companies
- **Pulp & Paper**: 400+ Sites
- **Infrastructure**: 600+ Sites

**Key Figures**

- 40% market share
- 2.0B+ data streams
- 30,000+ sites
- 130+ countries
- 1500+ case studies
- 68% of Industrial Fortune 500

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Enabling faster sustainability discovery & analysis

- How do you measure & track your sustainability now?
- Is data in disparate, siloed systems & databases?
- Is it collecting, storing & contextualizing all necessary data?

Any organization’s sustainability journey needs to begin with PI

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**TAGS**
- Asset 97: Springfield
- Asset 42: Springfield

**ASSETS**
- Average uptime
- Total energy usage
- Total GHG Emissions
- Underperforming asset

**Data Archive**
- Optimized storage & access to massive volumes of operational data

**Asset Framework**
- Add structure and meaningful context to your operations data

**Asset Analytics**
- Transform raw data into actionable KPIs using streaming calculations

**Event Frames**
- Automatically pinpoint important events in your operations

**Notifications**
- Send automatic alerts to the right people with the right information

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### AVEVA™ PI System™ drives sustainability outcomes

<table>
<thead>
<tr>
<th>Minimize utilities usage</th>
<th>Reduce emissions</th>
<th>Improve circularity</th>
<th>Shift to renewables</th>
<th>Improve safety &amp; asset life</th>
<th>Automate reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce usage by up to 30%</td>
<td>Decrease emissions by up to 35%</td>
<td>Reduce waste up to 50%</td>
<td>Increase renewables use up to 75%</td>
<td>Extend equipment life up to 40%</td>
<td>Increase reporting efficiency up to 25%</td>
</tr>
<tr>
<td>Water, air, gas, electric, steam (WAGES) monitoring</td>
<td>CO2 &amp; GHG emissions monitoring</td>
<td>Waste &amp; value leak identification</td>
<td>Renewable electricity &amp; fuels use tracking</td>
<td>Equipment health, life &amp; environmental impact</td>
<td>Automated internal &amp; external reports</td>
</tr>
<tr>
<td>Energy footprint of manufactured products</td>
<td>Carbon footprint of manufactured products</td>
<td>Waste / scrap recycling program impact</td>
<td></td>
<td>Safety program/initiative effectiveness</td>
<td>Mobile dashboards, alerts &amp; notifications</td>
</tr>
</tbody>
</table>

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Sustainability use cases by AVEVA™ PI System™ maturity levels

Level 1
- Data directory (tag mapping)
- Abstraction (std. Lexicon)
- Normalization (UOM, time zones)
- Organization (Dynamic hierarchy)

Level 2
- Metadata integration - add context via Data references and linked tables
- Simple calculations (data quality, totals, averages)

Level 3
- Complex calculations (CBM, OEE, rollups)
- Use of Event Frames (downtime, startups, shifts tracking)
- Notifications (emails, work order generation via web service)

Level 4
- Advanced analytics (predictive, equation-based)
- Forecasting & actual vs predicted comparisons

**Renewable electricity & fuels use tracking**
**CO2 & GHG emissions monitoring**
**Water, air, gas, electric, steam (WAGES) monitoring**

**Data Archive**
- Tag-based, high fidelity historical data ingress/egress
- “Rich” time series data created by PI AF analytics & calculations (health index, efficiency etc.)
- Future data (forecasts, projections etc.)

**Notifications**
**Event Frames**
**Asset Analytics**
**Asset Framework**

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Sustainability customer stories
Toyota reduces energy consumption by 35% & CO2 emissions by 28%

Challenge

• Reduce energy consumption and CO2 emissions at all European plants
• Create single, centralized energy monitoring system (EnMS) to communicate with all plant devices & collect data automatically
• Different plants had large disparities in data monitoring capabilities & lacked standardization

Solution

• Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

• 35% reduction in energy consumption
• 28% drop in CO2 emissions (equivalent to 300-acre forest or 30,000 trees)
• Cut energy data aggregation & validation time from 8 plants from hours to seconds
Pfizer ensures COVID-19 vaccine production quality & targets with lower energy use

Challenge

• Constant acceleration of efforts for full data visibility across existing and new assets in COVID program
• Regulatory compliance during unprecedented concurrent deployment of phase 2 & 3 trials
• Re-invention & innovation to meet deadlines in areas of equipment, delivery & processes
• Ramp-up target dose production from 100 million in Q3 2020 to 2.5 billion in 2021

Solution

• Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

• Delivered 3.2 billion doses by the end of 2021, exceeding dose production target
• Three critical projects were enabled by AVEVA PI System data:
  • Freezer farm analytics hub for cold chain monitoring
  • mRNA concentration prediction for ensuring batch quality
  • Real-time scheduling for capacity modeling & de-bottlenecking
Kellogg’s saves $3.3 million in energy & water costs and claimed $1.8 million in rebates

Challenge

• Meet company-wide 10-year energy-reduction targets for natural gas, electricity, and water usage
• Without data-informed view of plant energy use, difficult to optimize energy efficiency

Solution

• Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

• Annual savings of $3.3 million in energy and water costs, and an additional $1.8 million in rebates, in one plant alone
• AVEVA PI System responsible for 30 out of 35 sustainability initiatives
• Achieved consistent downward trend in natural gas, energy, and water usage (reduced kW / Ton consumption by 30% since 2005)
• Increased OEE to 80%, eliminating waste & improving circularity
NASA reduces energy use by 14,500 MWh annually in just one building

Challenge
- Problems with meter data quality, gaps detected after issues
- Old system focused on summary reporting for agency data calls
- Problem with night, weekend & holiday energy consumption
- Existing tools required levels of permission & training not possible for all staff

Solution
- Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results
- For even one building, NASA expects annual savings from that building to reach 14,500 MWh (equivalent to planting 1,225,400 trees/year)
- Weekend savings of over 3,000 kWh (250 trees planted)
- Data platform for monitoring building level demand at different time scales & periods to find efficiencies & overconsumption
How AVEVA accelerates your sustainability journey
Stop thinking tags, start thinking assets

Build once, deploy many!

Counter object

- Better alignment with Operations, Maintenance & Engineering
- Scalable & consistent
- Less time to develop & deploy
- Safer, fewer errors
- => Structure & context for enterprise analytics

Meta data
Sensor ‘tag’ data
Calculations, analytics & workflows
PI Digital Twin Library (Please review AWC Presentation on Wed, Oct 25 from 16:30 – 17:00 in PI System User track for more information)

**Base Library**
- Container
- Sensors
- Calculations

**Asset Libraries**
- Centrifugal Pump
- Compressor
- Gear Reducer
- Electric Motor
- Valve
- Heat Exchanger

**Asset Classes**

**Asset Super Classes**

**Accessory Libraries:**
- Vibration Monitoring
- PID, Composition
- OEE
- **Energy/Sustainability**
- Forecasting
- SAP, Maximo
- Asset Specification storage
- Geographic Tracking
- AVEVA Predictive Analytics
- AVEVA Process Simulation
- AVEVA Connect – AIM

**PIVision:**
- Anomaly Display: Discovery, Overlays, Annotate
- Asset Displays by class
- Accessory Displays by class
- HOME Screen navigation organizer

**MS PowerBI:**
- Asset Dashboard
PI digital twin AVEVA™ PI Vision™ dashboard templates
Ecosystem partners have Asset Framework Libraries.
Ecosystem partners have AVEVA PI Vision template screens
Call to action
Step 1

Identify a test case

Consider relevant use cases & identify one use case. Consider equipment with high energy/emissions or criticality

Outcome

Mutual understanding of use case to develop & evaluate

Step 2

Build and deploy data model

During workshop, define success criteria & work together to develop & deploy initial use case

Outcome

Use case achieved with AVEVA/partner support & success criteria understood

Step 3

Confirm value

Evaluate use case developed against defined success criteria to confirm value of solution

Outcome

Potential value identified & use case utilized as example for future roll-outs
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Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life’s essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world’s most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

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