Performance 360

Accelerating Autonomy for every Plant in the World

Today, global competitive pressure is driving manufacturers to become more agile, innovative, and cost-effective. Vendors, analysts, and consultants push for adopting "Smart Manufacturing" or "Factory 4.0." However, combined with a projected shortage of skilled labor and the accelerated growth of technology and data, it is little wonder that companies are overwhelmed and confused about the next steps.

The challenges

Manufacturers need to improve either output quality, yield, throughput, energy efficiency—or all of these. Unfortunately, many obstacles exist, including variability between operators, input quality, feed properties, process speed, and temperature; manual set-point controls; runaway reactions; slow lab-based measurements; and even bad actors. Manufacturers have tried to address these issues with solutions such as advanced process control systems (APC) or predictive asset health management, with varying success. Because most of these solutions use fixed models, they become useless when processes change, and often do not extend far enough into the manufacturing processes.

The answer

Performance 360™ is an all-inclusive process performance management solution that combines process condition insights, performance metrics, and process history. Unlike other solutions, it uses state-of-the-art AI and deep learning technologies to predict how a process will perform in the future. Performance 360 identifies potential process disruptions, quality issues, and trip conditions. It provides these insights with enough time for you to act proactively—thereby avoiding process trips, lost batches, decreased quality, or lost revenue.

How does it work?

Performance 360 provides prediction and situation awareness in real-time with a process health dashboard that displays KPI trends. The process optimization model includes an operational analysis workbench with predictive and prescriptive analytics and smart alerts.

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Solution highlights

Flexible data intake

Performance 360 can assimilate data from multiple heterogeneous systems, including OPC-DA, OPC-UA data through an OPC Gateway, data from a historian (e.g., AspenTech IP.21, OSISoft PI), distributed control systems (DCS), SCADA, or enterprise systems such as IBM Maximo, SAP, etc. This flexibility allows you to keep data collection points intact while enabling them to contribute to process optimization.

Adaptive digital twin

Using multiple neural network models, Performance 360 creates a digital twin to capture operating dynamics in real-time. Armed with this data, the twin learns to adaptively change and give accurate recommendations such as optimal set-points, or predictions such as process trips or upsets. As a result, manufacturers can proactively adjust process parameters that reduce energy consumption, improve quality, increase throughput, or reduce unplanned shutdowns.

Machine learning approach

Performance360 uses a carefully curated library of methods that use best-in-class open-source frameworks such as Google's Tensorflow, Keras, SciPy, and PyTorch to support deep learning algorithms, otherwise known as deep artificial neural networks (a subset of AI).

What makes them "deep"? These networks train with data and self-learn, without needing human programming. Further, this AI approach employs convolutional neural networks and natural language processing (NLP) that help analyze and classify imagery and text analytics of operations and maintenance service records.

Long short-term memory (LSTM) networks classify, process, and make predictions based on time-series data and auto-encoders, blended with methods such as K-nearest neighbor, support vector regression, and ARIMA computational techniques reduces the noise in your data.

Process templates

Performance 360 contains several key process templates designed specifically for manufacturing processes such as grinding mill circuits (mining, cement), ammonia process (petrochemicals, fertilizers), and furnace operations (steel mills and glass making). The open architecture allows your data scientists to write algorithms in Python (or any other language that conforms to REST API standards) and import them into SymphonyAI Industrial solutions.

Powered by Microsoft Azure

By using the Microsoft Azure cloud platform, Performance 360 offers a seamless and secure edge integration with zero disruption to your digital infrastructure. Even better, it combines Azure services (such as IoT Edge, IoT Hub, Event Hub, AKS, and Stream Analytics), and Microsoft Power BI with MathWorks MATLAB to provide fast analytics and actionable insights into plant-wide processes.

Flexibility

A Docker-based architecture seamlessly imports your proprietary analytics into Performance 360. Based on applications need, you have the option to deploy the Performance 360 solution stack as an edge or on-prem variant.
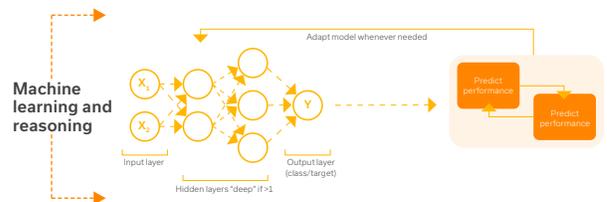
Why choose Performance 360?

While other solutions promote the ability to configure assets and use process templates, Performance 360 uniquely optimizes process manufacturing by working with modern, advanced process control, and real-time optimization systems.
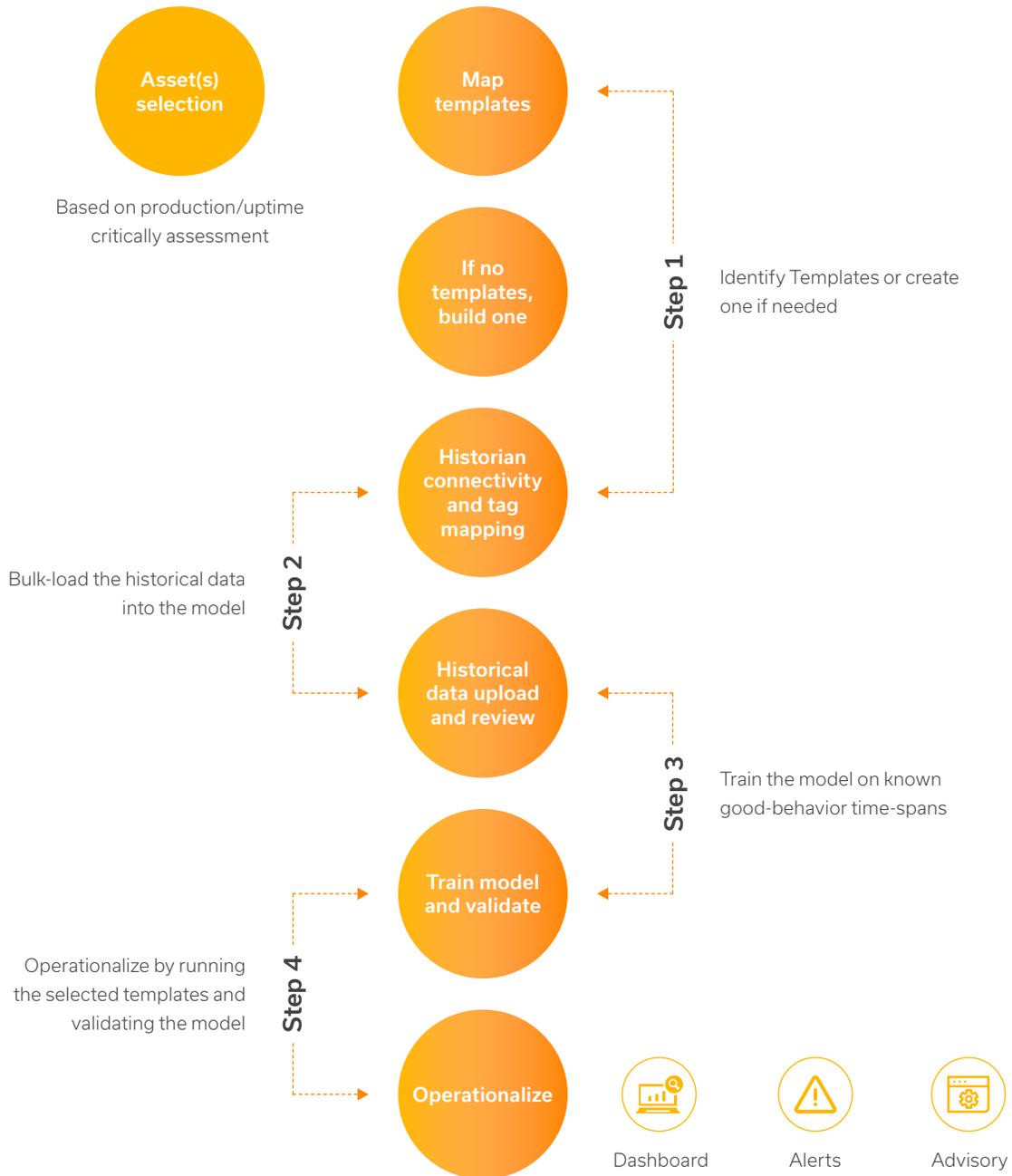
Performance 360 customers benefit from:

- Real-time guidance resulting in reduced variability (e.g., manual operators, temperature, set-points, input settings).
- Incomparable accuracy via adaptive machine learning that drives the loss function down. For example, soft-sensing estimates at 10X higher resolution than lab measurements allow for more informed, real-time decision making which in turn leads to greater energy efficiency and improved output quality.
- Online, process-wide monitoring creates earlier warnings of process trips and bad actor identification. Combined with a calculated course of correction, manufacturers experience minimal unplanned outages and reduced costs.

With Performance 360, companies can reach the ultimate goal of self-optimizing operations where the factory continuously adapts to demand, variations in supply, process deviations, and human factors.

Performance 360 architecture

Multi-parametric data

| Data lakes | EAM, inspection logs | Historians | DCS/SCADA | Edge monitors |

Images and inspection data | Process and vibration time series | Inspection logs work orders

Layered analytics

Data cleansing | Data imputation | Data transformation

Machine learning and reasoning

Adapt model whenever needed

X_1 X_2 ... Y

Input layer | Output layer (class/target)

Hidden layers "deep" if >1

Predict performance

Machine learning and reasoning

Asset health insights | Apparent causes | Maintenance recommendations

Performance 360 how-to step-by-step

Asset(s) selection

Based on production/uptime critically assessment

Map templates

If no templates, build one

Step 1 — Identify Templates or create one if needed

Historian connectivity and tag mapping

Step 2 — Bulk-load the historical data into the model

Historical data upload and review

Step 3 — Train the model on known good-behavior time-spans

Train model and validate

Step 4 — Operationalize by running the selected templates and validating the model

Operationalize

Dashboard   Alerts   Advisory

About SymphonyAI Industrial

SymphonyAI Industrial, a SymphonyAI business, is an innovator in industrial insight, accelerating autonomous plant operations. The industry-leading EurekaAI/IoT platform and industrial optimization solutions connect tens of thousands of assets and workflows in manufacturing plants globally and process billions of data points daily, pushing new plateaus in operational intelligence. SymphonyAI Industrial solutions provide high value to users by driving variability out of processes and optimizing operations for throughput, yield, energy efficiency, and sustainability.