SAMPLE NOMINATION FORM

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Project Abstract

A company in the food and beverage processing and packaging industry had an ambitious goal: Use AI to improve utilities performance, but also to make a genuine and statistically significant impact on Sustainability, with the hopes of helping communities across its many regions. Accepting this challenge, the Supply Transformation, Utilities, Environment, and Sustainability teams banded together to implement a reliable set of smart algorithms for optimizing the multi-variable baseline on air compressors and boilers utilities assets.

First, the Technology for Supply team identified the problem: too much fuel waste on Utilities generated by over-use of assets, with manual control and reactive actions. Additionally, there was a real thirst to improve technical ownership and augment the freedom to innovate among front-line operators.

After a data assessment and market review, the company deployed an Automated AI/Machine Learning software platform technology solution, in the course of a Smart Process Optimization & Control Modeling. The goal was to incrementally improve energy consumption inefficiencies attributed to the air compressor and boiler utility asset through the use of advanced closed loop, using realtime AI industrial optimization techniques. Also, this solution should be an Advanced Process Control platform that could be shareable within facilities to gain scale – and allows for creative building of new models and algorithms in the future.

After running a careful data treatment, the AI Engine model was able to run closed loop control and produce a certified around 4% savings in fuel consumption. This created the path for this project to be incorporated into a Global Business Model throughout the company.

Project Timeline

The project could be split in 4 stages during the total time of 6 months, from March to September: The first stage was Data Discovery and took around 1 month to be completed.

This stage aimed to select the equipment to implement the Advanced Process Control tool in a given facility for pilot, in Brazil. This equipment should be connected to the industrial network to be controlled. Then, data requirements should be stablished, and a specific infrastructure should be defined for the AI engine model, such as civil or automation.

The second stage was Setup Infrastructure and took around 2 months to be completed. This stage aimed to install the required infrastructure (civil or automation). All servers should be commissioned, and Virtual Machines should be installed in static IPs. Finally, drivers and OPC UA should be connected and configured. With this, the data gathering was completed.

The third stage was Real Time Validation and took around 2 months to be completed. This stage aimed to validate the automation tags in OPC, starting the deployment of the first models of the tool. Then, a proper Advanced Process Control model with KPI prediction should be created and trained in open loop.

4 of 5 The fourth and last stage was Closed Loop Validation and Rollout, and took around 1 month to be completed.

After a couple of tests, the model should close the loop to be fully deployed. To register the events, the OPC automation tags should be imported and historized. On the business side, the financials gains should be captured, and the tool should be implemented in the routine of the facility. This was the final step to enable further rollouts to other facilities and achieve further benefits.

Process Impact

The value was delivered in two ways: management level and automation level.

On the management level, the AI Engine provided a simple and visual forecast in a real-time dashboard for the main Utilities KPIs. This dashboard should be used by the operators and managers in their daily routine to compare their actual KPIs against the forecast provided by the AI Engine. When any KPI's forecast became out of target, the dashboard would inform immediately, enabling a fast reaction on the operation level to change the deviation, quickly troubleshoot the root cause issue in real-time and restore the parameter back on track, before any unwanted unplanned downtime or costly process oscillation events. This was an example of the concept of exception management in practice.

In the automation level (automatic process control), here is how the AI Engine works: for the cooling compressors, after the AI Engine was properly configured in closed loop, the solution enabled to change the temperature set point for the cooling tower basin such that the General COP is maximized given the cooling tower efficiency of that instance. This reduced the variability of control output.

For boilers, the solution worked similarly, adjusting setpoints for higher efficiency inside desired range. The AI Engine would automatically retrain the control system for real-time process optimization avoiding overshoot in system variability to achieve steady state success and predict process outputs to deliver immediate ROI for the given production.

In 2021 this closed loop model was deployed in 10 facilities around the world (with 5 fully validated) and discovered further applications of the process control to increase capacity, specially acting in brewing areas: filter flow, wort cooling and cooling tower.

Business Impact and ROI

The food and beverage company has identified the potential ROI and immediate business case impact associated with optimizing the hidden complex and multivariate production control problems attributed to the identified utility assets. By the end of 2021, around $7.5 million benefits were delivered year over year as fuel consumption reduction for the 5 validated facilities. In the pilot assessment, around 0.5 tons of CO2 emission were offset in two days, implying more than 456 tons of CO2 avoided each year for those 5 facilities.

In the beginning of December, more than 30 other facilities around the world were starting to use the tool, with a promising ROIC of over 850% on average and payback less than 0.7 years. This includes facilities in the United States, Canada, Mexico, Brazil, Colombia, South Africa, and China.

Strategic Impact and Scale

The AI Engine set the gold standard for prediction modeling in Supply. It was defined as top priority by the Global Utilities team, and several facilities have expressed high interest to use the tool. The solution was incorporated in the Supply Transformation roadmap of the company to be rolled out for all facilities.

By using this AI Engine, the food and beverage company created a digital twin set of algorithms that were easily scalable to other sites. It only requires some configuration and customization based on each new facility's parameters, but the operations were able to copy and paste the generic digital twin, making scaling exponentially faster and internally controlled.

The plan is to expand the algorithm from boilers and compressors, to now build a robust KPI prediction engine with more smart prediction models. This tool will use digital twin and simulation to predict an optimal energy signature integrated with the production schedule from Logistics. This AI Engine would respond to changes in real-time, so that the user continues to get the best energy usage prediction.

The impact will be enormous, because the company is integrating a versatile, working system that can be coupled with scheduling tools globally. This project scale presents a benefit opportunity estimated as a further 2% in Energy savings and 1% water reduction, aligned with the 2025 Sustainability Goals of the company.

Achievements and Innovation

The project improved the company's competitiveness because it is one of the few AI/ML Engines achieving real success, producing an indisputably great ROI month after month. It solves a business problem standard to every company in this sector: How to be more efficient in fuel consumption, while working for a better and sustainable future using less resources. The platform was very innovative because it combined an AI Engine with an open-source dashboard to visualize and enable the delivery of strong benefits.

This project was recognized by peers in the sector given the relevance of the problem this project is solving.

Supporting Technologies

OPC UA Server collects data from Field network and sensors to SCADA level. The Dynamic Consumption Prediction Engine runs in an Ubuntu 18 Operational System. The Inputs are Equipment / Production data, the Outputs are short term (day), long term (month) KPI prediction for electrical energy, heat, water and CO2. Data historian collects manufacturing info and uploads in Microsoft Azure to be accessible to end user clients.