

# MACHINE LEARNING-DRIVEN PROCESS OPTIMIZATION FOR WASTE WATER TREATMENT PLANTS

## Key Highlights

- One platform for real-time data inputs from multiple sources, internal and external
- On-going optimization efforts incorporating analytics insights, including reagent cost optimization of around 20%
- Turnkey plant management solution provided by Atos now available

Waste water treatment plants typically process hundreds of thousands of cubic metres of water daily, applying multiple chemical, biological and physical processes to remove contaminants and ensure safe release of the waste water back into the environment. Due to stringent environmental regulations, the treatment operations typically involve significant cost and process complexity.

Recently, a French waste water treatment plant began a project to optimize its processes from a cost, time and quality perspective, while avoiding the risk of regulatory penalties that may result from water quality issues. The plant team leveraged data analytics to uncover cost and quality optimization opportunities at every stage of water treatment. Specifically, the optimization exercise prioritized processes involving high chemical and energy usage, where analytics enabled insights that could potentially unlock significant savings.

Throughout the project duration, the plant team developed multiple smart solutions to optimize plant operations, leading up to 20% cost reduction and lower environmental impact driven by water quality improvement.

## Background

Waste water treatment is an extremely expensive and complex process. Leveraging plant data and Atos' big data solution the plant team identified a number of different opportunities for optimization in the treatment process.

With Atos leading the project, the aim was to help the plant in the following ways:

- Build one platform to view real-time data inputs from multiple sources, internal and external
- Process the data captured in real-time on this platform
- Identify and predict the potential impact of optimization opportunities to drive support in decision-making

## Solution

The predictive solution is based on the processing of thousands of data elements that are both internal or external to the plant, including alternative data such as weather forecasts, variations in population and behaviours, that might impact the plant functioning. Included in this solution were predictive and optimization algorithms, developed with the machine learning tools of the platform. The integration of heterogeneous data was made possible by Atos' processing platform, at the heart of which is the [Codex Data Lake Engine](#) powered and certified by [Cloudera](#).

To build this solution, Atos data scientists collaborated with plant processing specialists to qualify and process the historical data stored in the Atos Codex Data Lake Engine. [Atos' domain expertise in the utilities space](#) and a collaborative approach ensured deep knowledge and expertise sharing with the team on-site to enable solution development in a timely and efficient manner.

The trained algorithms were packaged in micro-services, downloaded to the edge and run on site in real-time using [Atos Codex Smart Edge](#) solution thus allowing both a co-pilot facility offered to the plant operator, and real-time decision making in an automated closed control loop for plant optimization.

The goal of this project was for cost optimization of both energy and chemical reagents to be reduced about 20%, thereby demonstrating the value in this enterprise analytics solution. Ultimately this would lead this water treatment plant to have the ultimate competitive edge.

The Atos built solution, leveraging Cloudera technology, now forms part of a turnkey plant management solution that this client intends to not only use more broadly within its organisation, but also take to market to support other industry players facing the same challenges.

This comprehensive platform allows the ingestion and processing of any data type, in any state - in motion or at rest - from any location. This provides the plant a distinctive capability to deploy real-time analytics through edge devices, as well as deploy multiple predictive machine learning algorithms.

### Result

The output of this project provided algorithms for machine learning and advanced analytics to be created and packaged centrally in the [Atos Codex Data Lake Engine](#) and downloaded and executed in real-time at the edge. Combined with clean historical data, third-party external data and batch and real-time IOT data collected at the plant, the algorithms were constantly trained and models were created. Thanks to analytics and [Atos Codex Smart Edge](#), Atos provided a comprehensive tool for real-time decision making. This led to predictive process optimization on a day-to-day basis and reduced costs for better profits management.

The customer achieved their goal of optimizing operating costs by up to 20% to improve plant profitability, with an investment payback of less than 2 years. In addition, the solution helped reduce the plant's environmental impact due to the increased water quality standard over time.

Furthermore, the plant was also able to better predict water volumes that would be treated over the next 36 hours, hour by hour. This was based on equipment settings measured at the edge, in addition to base budgets observed in the past and combined with relevant external data.

Finally, energy consumption and therefore carbon emissions were reduced as a beneficial side effect.

**About Cloudera**

At Cloudera, we believe that data can make what is impossible today, possible tomorrow. We empower people to transform complex data into clear and actionable insights. Cloudera delivers an enterprise data cloud for any data, anywhere, from the Edge to AI. Powered by the relentless innovation of the open source community, Cloudera advances digital transformation for the world's largest enterprises. Learn more at [cloudera.com](https://cloudera.com)

**The value in a partnership**

Combining the expertise and products in big data technology from Atos and Cloudera, the team produced the insights needed to optimize the plant and its processes in real-time. The rapid deployment and ability to manage the entire data lifecycle - from data capture to driving insights - was a key project accelerator. [Atos' technology expertise in the utilities domain](#) enabled end-to-end solution development and integration into the customer environment, ultimately driving material impact on plant profitability.

As this specific solution has now been industrialised, Atos estimates that this solution could be replicated in other businesses as a first iteration in around 6 months, depending on the data quality, internal processes and other key factors. Proof of concept is available for customers today.

IT has always been complex. Flexible, scalable change is achievable in a hybrid environment, simplifying, optimizing and enabling new digital technologies and applications to drive business success. Atos and Cloudera jointly work together to provide solutions that:

- **Connect people and data.** Generating business value by connecting people, data and machines using cloud-enabled IoT and AI.
- **Generate new revenue streams.** Rapidly design, build and rollout cloud-native applications.
- **Simplify your IT landscape.** Seamlessly manage a multitude of platforms with ease and agility with continuous automation and orchestration.
- **Automate governance.** Manage costs and control deployment and orchestration workloads with automation.

Atos is certified on [Cloudera Data Hub](#) and soon to be certified on [Cloudera Data Platform](#). To find out more about Atos and Cloudera, visit our [partnership page](#) or email Daniel Nutburn [dnutburn \(at\) cloudera.com](mailto:dnutburn@cloudera.com).