SpeedWise® ML

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Infinity Water Solutions

Unlocking the value of wastewater using powerful and accurate machine learning models.

In the Permian, one of the most prolific oil and gas basins in the world, produced water is generated at a rate of 15 million barrels per day, that is somewhere between four and eight times more water than oil coming up from ground. Historically this produced water has been considered a byproduct of the industry, a waste stream often disposed of downhole - a practice now widely linked to seismicity.

Today, considering many world-wide water shortages, this produced water is being adopted as an innovative, *new* water supply – and with it comes a whole host of unique challenges *and* opportunities. But you can't manage what you can't measure, and the lack of information around treated produced water quality is handicapping the industry environmentally and economically.

To address this challenge, Infinity Water Solutions wanted to build a revolutionary new AI and machine-learning (ML) software designed to standardize, categorize, and appraise water, most notably the produced water coming from the energy sector, which can be recycled for direct and, potentially, beneficial reuse.

The Goals

Goal 1 – Predict characteristics of water coming into Infinity's treatment facilities.

Goal 2 – Recommend treatment options based on influent water characteristics and customer water specs.

Goal 3 – Forecast water volumes based on existing wells and new upcoming wells.

Goal 4 – Generate diversified revenue streams by predicting valuable resources that can be mined from produced water.

The Challenges

While there are tools on the market that measure volumetric water data, there is no solution that captures and aggregates water quality data in the produced water market. Infinity needed a solution that would provide real-time water data analytics, accelerate decision-making and innovation for their operations, as well as address several challenges:

- **Variable Water Quality:** Produced water quality can vary significantly from one well to another and over time.
- **Optimal Treatment Selection:** Selecting the right treatment methods and chemicals for produced water can be complex, but paramount for meeting and exceeding customer expectations for treated water quality.
- **Cost Management:** Effective produced water treatment requires efficient resource allocation to control costs.
- **Environmental Compliance:** Environmental regulations require treated water to meet specific quality standards before discharge or reuse.
- **Treatment Efficiency:** Ensuring that treatment processes are operating at peak efficiency is critical.
- **Data Management:** Treatment providers deal with vast amounts of data related to water quantity, quality, and treatment processes.

About Infinity Water Solutions

Infinity Water Solutions is one of the largest water recycling companies in the Permian Basin helping operators reduce their freshwater consumption. A cross-industry pioneer, Infinity is reclaiming wastewater, reshaping how it is recycled, reused, manufactured, and exchanged, world-wide.

> **"SpeedWise ML's predictive models enabled the optimization of produced water treatment processes, making direct water reuse scalable, and increasing availability of freshwater for agriculture."**
>
> Dr. Zacariah L. Hildenbrand
> Environmental Scientist

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> “SpeedWise® ML provided a critical component within SpeedWise® Water that furthers things that are impossible now, pulling together technologies and making them work together smoothly.”
>
> Michael Dyson
> CEO at Infinity Water Solutions

The Solution

Infinity teamed up with Quantum Reservoir Impact (QRI), leveraging SpeedWise ML to build predictive models that would forecast future trends and improve Infinity’s operations. The resulting application, SpeedWise® Water, leveraged real-time water data and massive amounts of historical water quality data to aggregate and predict influent water quality and volumes, and recommend treatment based on customer’s water quality needs. Specifically, SpeedWise ML developed the following models:

- Predictive model to forecast water volumes on any lease over the next 3, 6, and 12 months, including ML models for forecasting water volumes for new wells. These predictions are then aggregated on the lease level to provide the basis for Infinity’s capacity planning.
- ML model was created to forecast the quality of water, including concentrations of nickel, lithium, cobalt, and other constituents, using easily measurable characteristics such as pH, TDS, and TSS. These models will help Infinity optimize its water treatment process and ensure high-quality treated water.
- ML model was created to predict effluent water characteristics from influent water quality and treatment process parameters such as the amount of chemical used. This will enable Infinity to optimize its treatment process and adapt the treatment plan based on the varying characteristics of influent water and the standards needed for specific reuse.

Results and Benefits

The machine learning models created by SpeedWise ML meet the challenges and benefited Infinity in the following ways:

- Anticipate water quality variations, and design and optimize treatment processes for specific water compositions.
- Optimize treatment options based on forecasted water quantity and quality and achieve the desired treatment outcomes more efficiently.
- Identify inefficiencies, predict treatment outputs, optimize processes. Generate diversified revenue streams by predicting valuable resources that can be mined.
- Ensure environmental compliance by forecasting water quality and guiding treatment processes to meet these standards consistently. Help Infinity’s clients meet sustainability and ESG goals.
- Predict potential issues and provide recommendations for process optimization to maximize treatment efficiency.
- Leverage data integration and powerful predictive analysis, making it easier to track and improve treatment outcomes.
- Consistently deliver high-quality treated water, enhancing customer satisfaction and loyalty.
- Anticipate scaling and fouling risks, allowing for proactive measures such as adjusting treatment chemistry or implementing preventive maintenance.

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Easily Deploy Machine Learning Capabilities Across Your Organization

Deploying machine learning models effectively within organizations tends to be time-consuming and costly, with the need to have data specialists on staff. It is not uncommon to spend several months and even years implementing machine learning and deploying it in the production environment, even for an integrated team involving domain experts, data engineers, data/machine learning scientists, computer scientists, and IT.

Powered by QRI's enterprise-grade automatic machine learning algorithm, SpeedWise® ML (SML) is a web-based software platform allowing everyone and every company to conduct cutting-edge machine learning practices and predictive analysis. Through the platform, everyone, with or without a deep understanding of machine learning, will be able to deliver high-quality production-level models through a few mouse clicks within minutes, without typing a single line of code.

SpeedWise® ML can be used by any company or organization that has data that is not yet fully exploited. This technology is applicable to any industry or sector.

Benefits

Smart AutoML technology finds the optimal model configuration for your models automatically and super-fast.

Quickly process and clean data needed for ML. Options to autopilot smart data processing are also provided so you don't need to be an AI expert.

A collaborative platform makes sharing data and models across organizational teams as easy as a button click.

Get the answers and the reasons behind the answers using our powerful built- in explainable machine learning module.

Why Choose AWS and QRI?

With high-performance compute options powered by machine learning, Amazon Web Services (AWS) enables organizations to undergo broad digital transformations with modern, cloud-native solutions. Together, QRI's SpeedWise® SaaS solutions and the cloud-based services offered by AWS create increased scalability and security, suitable to be used by businesses of all sizes.

SpeedWise® ML (SML) can be used by any company or organization that has data that is not yet fully exploited. The SML platform is intuitive and educational, and will simply guide you throughout the entire data-to-model process, and not a single line of code will be required.

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