



SANEPAR - PASSAÚNA SYSTEM

Case study:

**Intelligent Platform for Optimization
and Energy Efficiency of Water Supply
Systems**



It is the AI leader in Energy Efficiency for Water Systems, to manage networks efficiently by optimizing tactical and strategic decisions.

Scubic's patented technology offers a web platform that provides the management entity with all the information regarding:

- Scheduling of water pumping operations (pumps and valves);
- Operating speeds/frequencies;
- Forecasting the behavior of the entire network for selected parameters (pressure, level of reservoirs, etc.), which can also be viewed on any mobile device.

The solution transforms the way water networks operate, helping utilities achieve greater energy efficiency, water consumption prediction, and better operational control and scheduling.



It was created in 1963 and currently operates in 346 municipalities. It serves more than 11 million people with treated water, representing 100% of the urban population and with a sewage system for more than 8 million people, which represents about 78% of the sewage network coverage for the urban population.

Curitiba is the capital of the state of Paraná, in the southern region with 1.3 million customers/savings. Within the metropolitan region of Curitiba, a Sandbox was determined – Passaúna System/northern section. The Abstraction Station and the ETA Passaúna supply directly Campo Comprido, which in turn supplies the subsystems São Braz, Santa Felicidade, Butiatiuvinha and Lamenha Pequena, in a system with reservoirs in cascade associated with the set of subsystems. Among the various data collected, a total of 43,595,044 m³ of high volume (water), 6,110,179 kWh of energy consumed and R\$ 5,640,220.98 (energy bills) spent on energy in 2021 were identified.

Like other concessionaires, Sanepar has many challenges. One of them is the collection, storage and analysis of a high volume of daily operational data, although much of this data is not used due to the complexity of manual and/or semi-automatic analysis.

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42.609 m	174.431.091 m ³	28.520.497 kWh	94.231	240.000 (*apx)
Water network	Volume produced	Energy consumption per year	Savings	Population

BEFORE SCUBIC DEPLOYMENT

The process of understanding the operational standards of the water network, analyzing trends and programming the activation and shutdown of pumps was done manually and relied on the experience and judgment of the operator.

Another challenge is data integration, since Sanepar has solutions from several suppliers.

The efficient operational management of water production and supply is based on effective procedures in the motor-pump sets that maximize energy efficiency in the systems.

Most of the excessive energy consumption occurs as a result of pump operations outside the ideal working point and/or due to poor dimensioning.



These causes require predictive maintenance actions, such as digital monitoring and control.



In its Strategic Planning, Sanepar recommends that it is essential to promote actions to reduce expenses and energy consumption in the company's facilities and operations, as well as to identify and take advantage of the viable potential for generating alternative energy inherent to its sanitary infrastructures.



To this end, it is necessary to encourage innovation, applied research and the development of good practices that enable the energy efficiency of the Company's processes.

MAIN DRIVERS

Energy efficiency management is a major concern for Sanepar, which is actively working to optimize the water-energy ratio, keeping it balanced throughout the system, from the abstraction stations, treatment and pumping stations.

Water and energy are inputs that are high on Sanepar's list of priorities, when well-managed, they improve the sustainable water cycle.

SCUBIC's WEB PLATFORM

Continuously collected data from SCADA systems, such as meteorological data and operational data from the distribution network, gathered in a "Data Lake".

In conjunction with artificial intelligence and optimization algorithms, it determined the optimal operating parameters to maximize efficiency and minimize energy and operating costs in real time.

This process:

- Created value to the data collected by the measurement equipment;
- Produced practical actions to achieve optimal operational management;
- Promoted the decarbonization (CO₂ emissions) of the operational processes of abstraction, treatment and pumping stations in the face of the challenges of climate transition;
- Optimized the achievement of Sanepar's commitments to the UN SDGs (Sustainable Development Goals);
- Increased the effectiveness level of its ESG Policy (Environmental, Social and Governance).

These objectives, among others, determined the concessionaire's decision to implement the Scubic solution to optimize work processes and promote energy efficiency actions throughout the network.

APPLIED METHODOLOGY

Main objective of the operational diagnosis: Quantify the possible reductions in energy costs that the water supply network can achieve with the implementation of the Scubic optimization platform.

In the course of operational diagnostic work:

- A survey was carried out of the elements that made up the Sandbox (Passaúna System except the abstraction), the operating variables, according to the existing operating mode, as well as the desegregation of energy consumption for each pumping system;
- Subsequently, the calculation of operational performance indicators was carried out as well as an energy characterization based on the 2021-year history in terms of water consumption, energy consumption and energy costs;
- Finally, we proceeded to obtain the estimated savings with the implementation of Scubic's platform.

SCUBIC PLATFORM MODULES

The platform is aligned with the need for efficient management of the operation of water supply network management entities, which have a visible impact on their operating results, without increasing operating risks and high economic return.

In order to assist Sanepar in decision-making and daily management of the supply network, the Scubic platform **gathers data from sensors installed in the water supply network and, together with meteorological data, predicts water consumption for the next 24 hours**, at all consumption points.



Based on these results, **the platform plans all water pumping operations for the next day, minimizing operational and energy costs.**

Scubic's way of operating is therefore based on three pillars:

- Prediction
- Simulation
- Optimization

Which serve as the basis for the modular architecture under which Scubic operates in three modules:

- Operational monitoring and key performance indicators (KPI's) module;
- Prediction module;
- Operational and energy optimization module.

In the dashboard referring to the KPI's, it is possible to verify the system's performance metrics, specifically, the Specific Production Cost (CEP), the Specific Energy Cost (CEE) and the Normalized Specific Consumption of Energy (CEN), measured in R\$/ m³, R\$/kWh and kWh/m³, respectively.

THE BENEFITS OF USING THE SCUBIC SOLUTION

↓ 19.47%	Reduction of the cost of electricity in the monthly bill
↓ 100%	Reduction of consumption at peak hours in Pumping Stations
↓ 67 Ton	Reduction of carbon emissions per year through energy efficiency in Pumping Stations.

DIRECT BENEFITS

The Scubic operational optimization platform presents itself as a multifactorial economy tool, with its effects being felt at the most diverse points of the operation of a water collection-treatment-distribution system for the population.

Among others, we highlight its ability to save resources in the following lines:

1. Relocation of pumping operation schedules to periods when the energy cost proves to be more favorable, that is, not to operate the electric pumps at peak times;
2. Reprogramming of frequencies and operating mode of the electric pump set motors for times of greater energy efficiency, with consequent reduction in energy consumption for the same pumping work;
3. Improved operational safety for the CCO, in the pressure control of the distribution network and consequent reduction in the volume of treated water losses;
4. Reduction of labor costs with the automation of the pumping operations as well as the operational supply planning, with Performance Indicators (KPI's) in real time;
5. Reduction of carbon emissions, driven by the efficient programming of pumping station frequencies.

QUANTITATIVE RESULTS

Given the existing time constraints to obtain the complete set of optimizations listed above, we highlight the quantitative results obtained in the reallocation of operating hours, mode and frequency of engines in operations, as well as qualitatively the results that helped in a decisive way the planning and operation of the system, indirectly culminating in the labor costs dedicated to the process as a whole. However, results were also achieved in terms of effectiveness in reducing carbon emissions into the atmosphere.

a) Reduction in peak consumption: Comparing Sanepar's mode of operation before and after the introduction of Scubic's optimization platform, a reduction of 60% and for the Pumping Stations a 100% reduction in consumption verified in the peak tariff period.

b) Potential savings: When considering the calculation with the costs of energy tariffs (Dec/2021), a saving of around 19.47% is concluded, that is, in a total of energy bills of BRL 3.9 million, the annual savings will be R\$ 776,154.04 in the Sandbox alone.

c) Reduction of CO₂ emissions: The reduction of CO₂ emissions was also calculated only for ETA Passaúna - EE Campo Comprido and EE Butiatuvinha - EE Lamenha Pequena, as only these present relevant value, totalizing, for both, the final value of 67,456 kg.CO₂/year, using an emission factor of 0.1264 kg.CO₂/kWh.

PRIORITIZATION AND DECISION SUPPORT

With Scubic, Sanepar benefits from 100% **real-time analysis of its data**. This makes it possible **to improve short- and long-term planning and decision-making**, prioritizing **operational safety, energy efficiency and the automatization of operating orders and station control**.



TESTIMONIALS

"The Scubic solution gives us a wide set of benefits, which bring significant value to our management, as well as in strategic planning and decision-making that aim to improve the operating system and still help us to be more and more sustainable."

Cláudio Stabile, President - Sanepar

"Our consumption at peak hours decreased by 100% in the Pumping Stations and 60% in the Treatment Station. The Artificial Intelligence applied to the system is an indispensable tool."

Gustavo Possetti, Innovation Manager – Sanepar

"Scubic makes use of various types of data from different sources, applying its Artificial Intelligence algorithms for prediction, being a comprehensive platform that can be integrated into various operational and strategic functions. For SANEPAR, SCUBIC made an operational impact, bringing significant benefits in daily operations and especially in electricity expenses."

Anderson Schamme, PoC Coordinator - Sanepar



MANAGERS - SANEPAR

Cláudio Stabile - Executive Director
Sérgio Wippel - Operations Director

MANAGEMENT COMMITTEE

Technical, Financial and Administrative Management:
Eng. Gustavo Rafael Collere Possetti

Technical Coordination:
Anderson Schamme

PARTICIPANTS

Andre Biscaia
Anderson Schamme
Edymilson Luiz dos Santos
Leonardo da Maia
Gilmar Ribeiro da Rosa
Kátia Garcia
Marcelo Dalcul Depexe
Ricardo Lino da Silva
Rodrigo Garcia da Silva
Rodrigo Rosa Fragoso

ADMINISTRATIVE SUPPORT

Dulcio Mendes - User Support
Coordinator - GTIN
Ernane Pereira - Manager GTIN -
information Technology Management
Juliana Seixas Pilotto - Manager GPAG -
Water Process
Luciana Dolci Alves Balbinot - Manager
GPDAG - Water Production and
Distribution Management



MANAGERS - GOTAS DIGITAIS LDA & C3D ECOTECH LDA.

Bruno Abreu - CEO

Cezar Bittencourt - CEO

MANAGEMENT COMMITTEE

Technical, Financial and Administrative Management:
Bruno A. Abreu Silva

Technical Coordination:
Miguel Oliveira C3D

Technical, Financial and Administrative Management:
Cezar Bittencourt

Technical Coordination:
Manuel Pichel