



VOLTA

...Une marque NXO

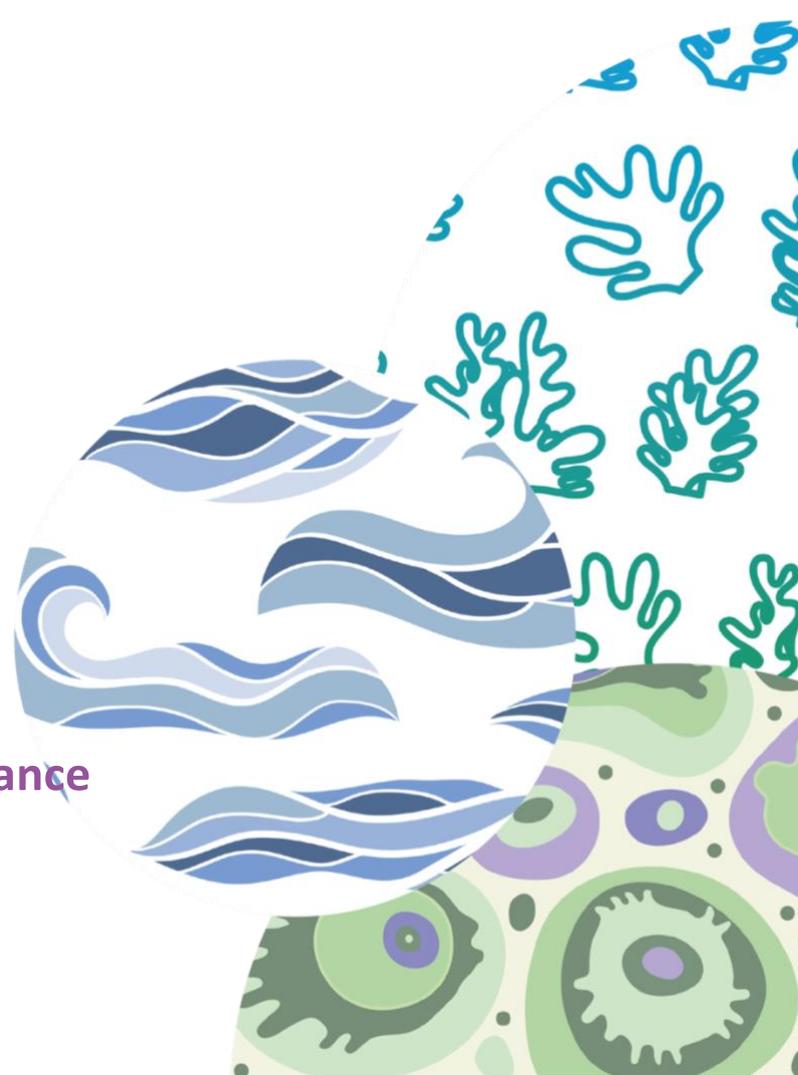
(Valorization of wastewater via light energy and microalgal technologies)

*A new generation of wastewater treatment plant ...
... for new resources*



**WINNER OF THE COMPETITION
INNOVATION "I NOV" 2021**

**(C-)*(E+)=VOLTA
VOLTA, an equation in advance**



- NXO ENGINEERING is a start-up founded in 2016 by César NARVAEZ, Engineer in Process Engineering, weaving roots in the Montpellier agglomeration (COURNONSEC). It is dedicated to the technical and commercial development of innovative and automated processes in the water sector. For each of our applications, the added value is based both on the development of disruptive technologies and the improvement of standardized techniques in terms of efficiency and energy costs.

- In 2021, biological wastewater treatment is the dominant treatment channel worldwide. The generic principle is to cause organic matter to be degraded by bacteria which will then be phagocytosed by microorganisms (protozoa).

Several types of technologies have been developed, free cultures (activated sludge (BA), sequential biological reactors (SBR) and membrane bioreactors (BRM) and fixed cultures (biofilters (BF) and fluidized beds on mobile plastic supports (MBBR)).

Biological wastewater treatment has been in operation since 1914, when it was invented by Arden and Lockett in the United Kingdom.

- The operation of biological treatment plants accounts for many obstacles, which are essentially structural. All sectors are characterized by high energy consumption. The increasing automation and the need for aeration flow of the basins (secondary treatment) consequently impact the operators' sanitation budgets (25 to 45% of the sanitation budget).

At the same time, the importance of greenhouse gas emissions (1% of total emissions in France for around 22,000 units), the growing need for skills for operators (88% of operators are located in rural areas and have low-skilled labor) and insufficient yields without tertiary treatment in sensitive areas tend to reduce the attractiveness of current sectors.

- In 2018, after 5 years of research and development, NXO developed VOLTA 100, a prototype of a new generation 100EH wastewater treatment plant. VOLTA is a reasoned utopia. Thanks to a disruptive bio-micro algal remediation technology, it offers a major paradigm shift in wastewater treatment.

In light of unavoidable environmental and societal challenges, VOLTA aims to simultaneously respond to the continuous improvement of purification performance while being a stakeholder in the energy and environmental transition.

This new collective sanitation sector, with negative carbon and positive energy, advocates full recovery of all purification products by rationalizing operating costs.

New syntax...



- Supported by the RMC Water Agency and accompanied by benchmark institutional partners (CNRS / IFREMER / INRA), this program has demonstrated the relevance and efficiency of the technological choices made. Two years of operation made it possible to establish an operating report:

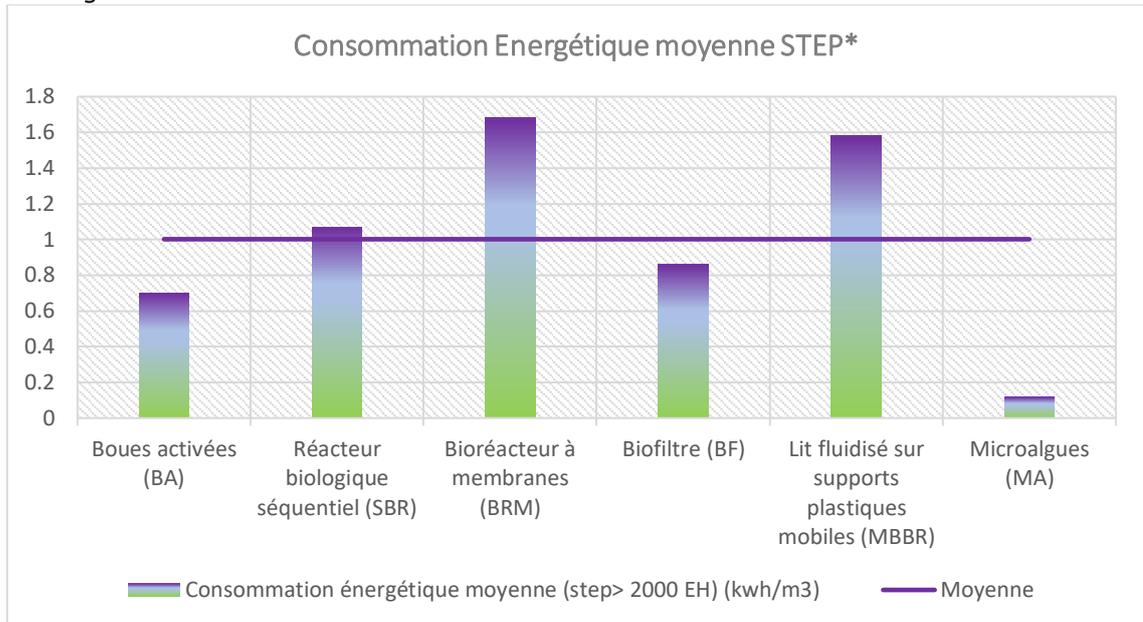
VOLTA, Positive energy wastewater treatment plant

> A totem: Energy sobriety

The average energy consumption of French stations in 2018 (activated sludge sector which represents 35% of the French fleet) was 0.8 kWh / m³ of treated water. The technological choices made on the prototype made it possible to significantly increase energy efficiency, ie 0.12kwh / m³.

> One ambition: energy autonomy

As a corollary, the operation of a VOLTA station is autonomous thanks to the production of renewable energies (methane) from wastewater. The sludge generates an energy surplus that can be marketed or used in cogeneration.



! VOLTA, wastewater treatment plant with a negative carbon footprint

The results of the prototype show strong trends in terms of reducing greenhouse gas emissions. The consumption of CO₂ by the micro algal pool during photosynthesis (26 tons of CO₂ remedied / year / 100EH), the energy efficiency of the project (255 tons of CO₂ avoided / year / 100EH) and the absence of release of N₂O (nitrous oxide) induce a NEGATIVE IMPACT.

As part of the implementation of Territorial Climate Air Energy Plans, local decision-makers incidentally have at their disposal an effective tool for reducing greenhouse gas emissions (40 to 55% of GHG emissions from the operation of local authorities). are attributable to the treatment of domestic wastewater).

> A station WITHOUT organic waste and WITHOUT chemicals

The research actions carried out by NXO have made it possible to develop a biocoagulant based on cacti slime allowing to bypass the metal salts generally used for the destabilization of suspended and colloidal matter upstream of a flotation phase. Finally, like vegetable waste, algal digestates are valued as biofertilizers.

> Optimum performance levels

Anxious to respond to future regulatory changes, NXO opted, from the design stage, for a “sensitive area” treatment target. Two years of experience feedback and several measurement campaigns (CNRS monitoring) made it possible to ensure the efficiency of the process.

! VOLTA, new economic perspectives

This new process calls for a profound paradigm shift. It is no longer a question of treating wastewater but of developing its resources:

- Reusable water at the station outlet, the quality of the water allows reuse in agriculture or industrial recovery (fertirrigation)
- Calories

- Cellulose ingots for the construction industry (cellulose is extracted during the pre-treatment / thermal and acoustic insulation phase - cellulose wadding)
- Resale of surplus electricity generated

- Bioplastic from microalgae
- Solid fertilizers (vermicompost / struvite) and liquids
- Green hydrogen
- Trading carbon credits to companies via the ClimateSeed platform

These productions generate income and also reduce the treatment costs of secondary products resulting from conventional treatment (refusal of screening, sludge, digestates, etc.).

VOLTA, a flexible sector

The technology is generalizable worldwide because NXO is based on proven and robust technologies, namely microalgae, synonymous with ubiquity, and anaerobic digestion. These 2 processes are set up spontaneously when the ideal proliferation conditions are met.

VOLTA is a semi-extensive technology, its land consumption is similar to that of beds planted with reeds. In order to adapt the process to urban planning constraints and therefore strictly limit land use, NXO has invested financial and intellectual resources in order to design photo-bioreactors (PBRs) where favorable growing conditions are constantly met. PBRs are microcosms of controlled eutrophication where we purify wastewater through the production of microalgae which will then be used to generate biogas.

VOLTA, national recognition

This new technology was selected by ADEME, as part of the I-NOV wave 7 competition.

In the world to come, signage will not be enough to meet environmental challenges. VOLTA aims to tackle all the themes of energy and environmental transition to offer a structuring and integrated approach to sanitation.

In the light of this new century and the related challenges, sanitation should no longer constitute a financial burden for the community but an opportunity for resources. Microalgae contribute to this

change in status and image. By offering a virtuous and economically innovative sanitation model, this new model augurs new hopes.

For further...

NXO Engineering

Our know-how is based on technologies:

- micro-algal and bacterial bio-remediation [sanitation];
- dissolved air flotation for the purification of micro and nanoparticles;
- drinking water in container [aquaculture].

NXO has positioned itself as a provider of turnkey solutions closely related to energy. The short-term goal of our startup is to become the national benchmark in sanitation, thanks to the synergistic integration of our processes.

This will allow us to validate the concept of a positive-energy wastewater treatment plant where we rationally use the resources present in the wastewater (not to be confused with a positive-energy building where the investment expenses, CAPEX, are considerable).

The NXO team is convinced that today, WWTPs are real hydrocarbon deposits. They can produce non-intermittent biogas, a renewable energy source, and thus generate revenue. They also have the potential to bio-remedy CO₂ and mitigate the harmful effects of global warming and ocean acidification if microalgal bioreactor techniques are promoted.

Several communities are showing an interest in low operating expenses (OPEX) and more environmentally friendly lawsuits. Our technical development, based on the pillars of R + D and innovation, is made available to meet their expectations.

Nxo's strength today rests on a multidisciplinary team that combines its experience in the fields of hydraulics, mechatronics, electrical engineering, civil engineering and IT. Integrating these skills into the very heart of Nxo-Engineering allows us to be the go-to provider for reliable, compact and automated energy-efficient solutions.

Our passion drives us to find new alternatives to face global challenges (global warming, circular economy and sustainable development) while innovating in the field of wastewater management and reuse. The implementation of our procedures is the result of our research and development and engineering activities.

Aware of our role in improving the profitability of our customers, the Nxo team is committed to fulfilling their most ambitious objectives. For Nxo-Engineering, it is by targeting the impossible that companies and people surpass themselves.

Want to write a page together?

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