AirAdvanced®-ActiLayer

An advanced filter technology for GHG & odour treatment & reduction

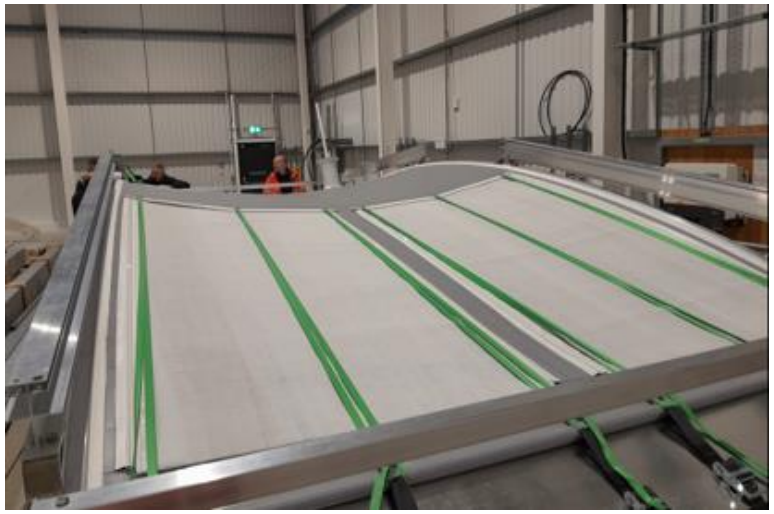
Main sources of GHGs & odours

SECTORS	ASSETS
Wastewater treatment & AD facilities	Treatment basins (Primary & Secondary), Storage tanks/ buildings
Waste management (incineration/ landfill)	Composting piles (open windrows)
Agriculture & Food	
Heavy Industry and manufacturing & Chemical	Stack emissions, OCUs (Biofilters/ Scrubbers)

An efficient solution to mitigate N_2O and odours

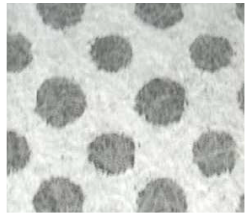
Confinement and treatment

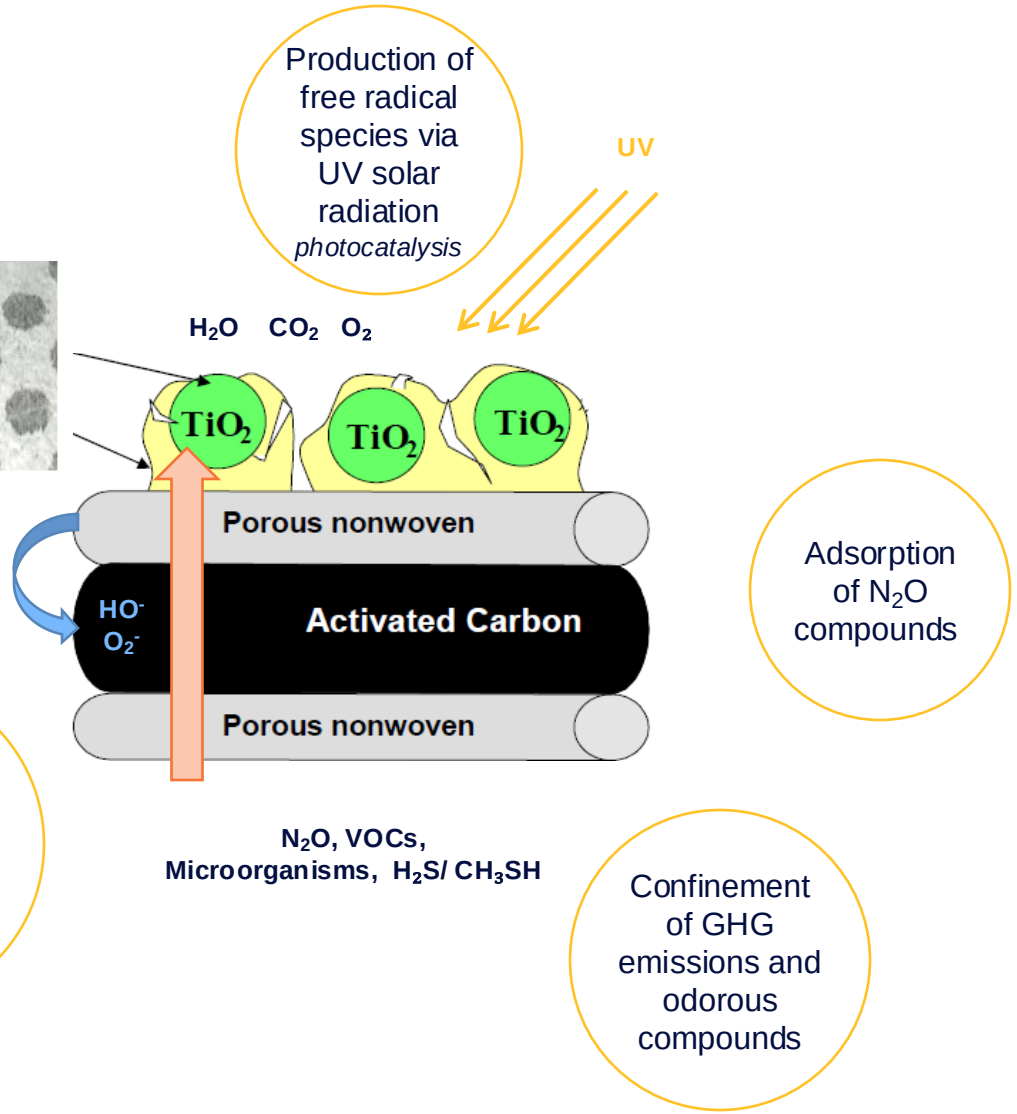
Adsorption of off- gas pollutants → Treatment of adsorbed pollutants → Regeneration of activated carbon



ActiLayer: innovative technology

An advanced filter technology which **harness the power of light energy to trigger a chemical reaction** that breaks down pollutants

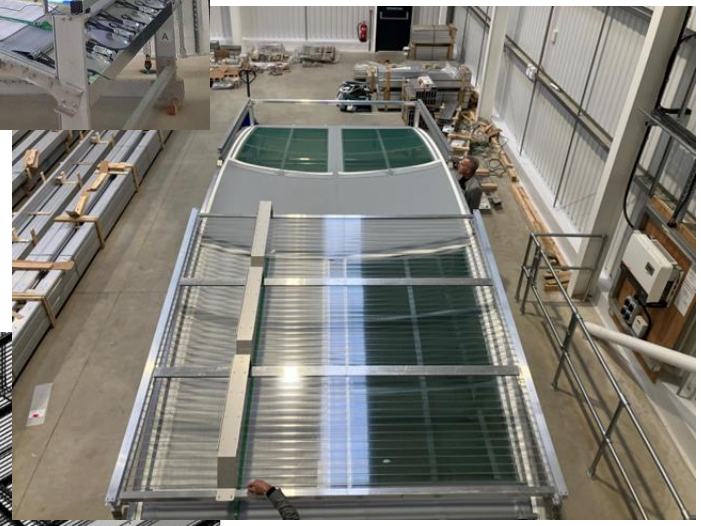


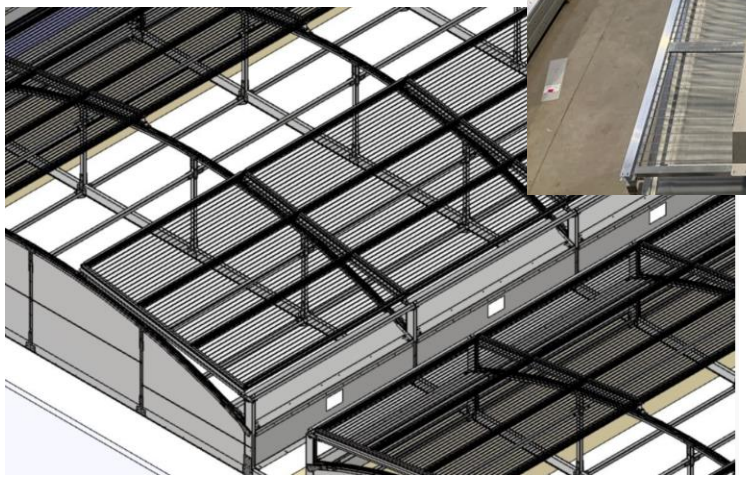


continuous treatment

SUEZ's patented technology

The benefits of ActiLayer





Efficiency
Treatment of a large range of pollutants H_2S, VOCs, Odours, NO_x

Economy
Reduced CAPEX 3 to 10 X vs. conventional covers and OCU

Green solution
No consumption of electrical power nor chemical reagents

Safety
Natural air passage minimizes risk of explosive atmosphere formations

Simplicity
Ease of installation & maintenance

Timeliness
Rapid deployment using covers prefabricated off-site

A solution adapted to the needs of your site

Site emission diagnosis

On site emission monitoring / characterization mapping for GHG and/or odorous emissions.
Delivered with the application of SUEZ's AirAdvanced®-Scan360 service.

ActiLayer project feasibility

ActiLayer design review to meet construction and operational criteria

ActiLayer deployment

Installation of the solution and commissioning

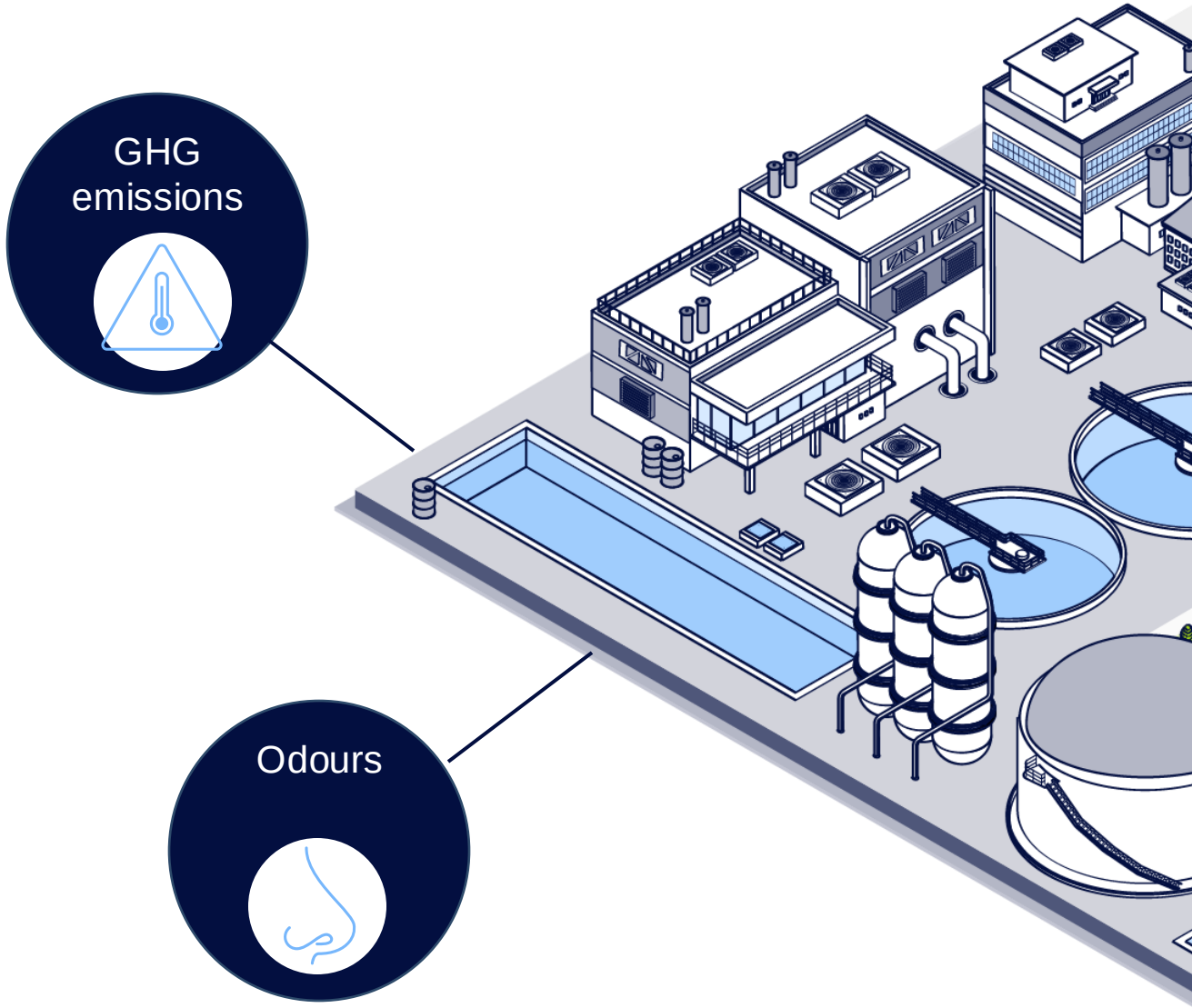
Maintenance

Technical support for operational and maintenance requirements.

Monitoring

Continuous monitoring, modelling and analysis of GHG and odorous emissions thanks to installed sensors and our real-time digital platform AirAdvanced® Sentinel

Wastewater treatment plants (WWTP) are significant contributors to GHGs and odour impact



GHGs in a WWTP

Water use, storage and distribution are responsible for ~10 % of global greenhouse gas (GHG) emissions.

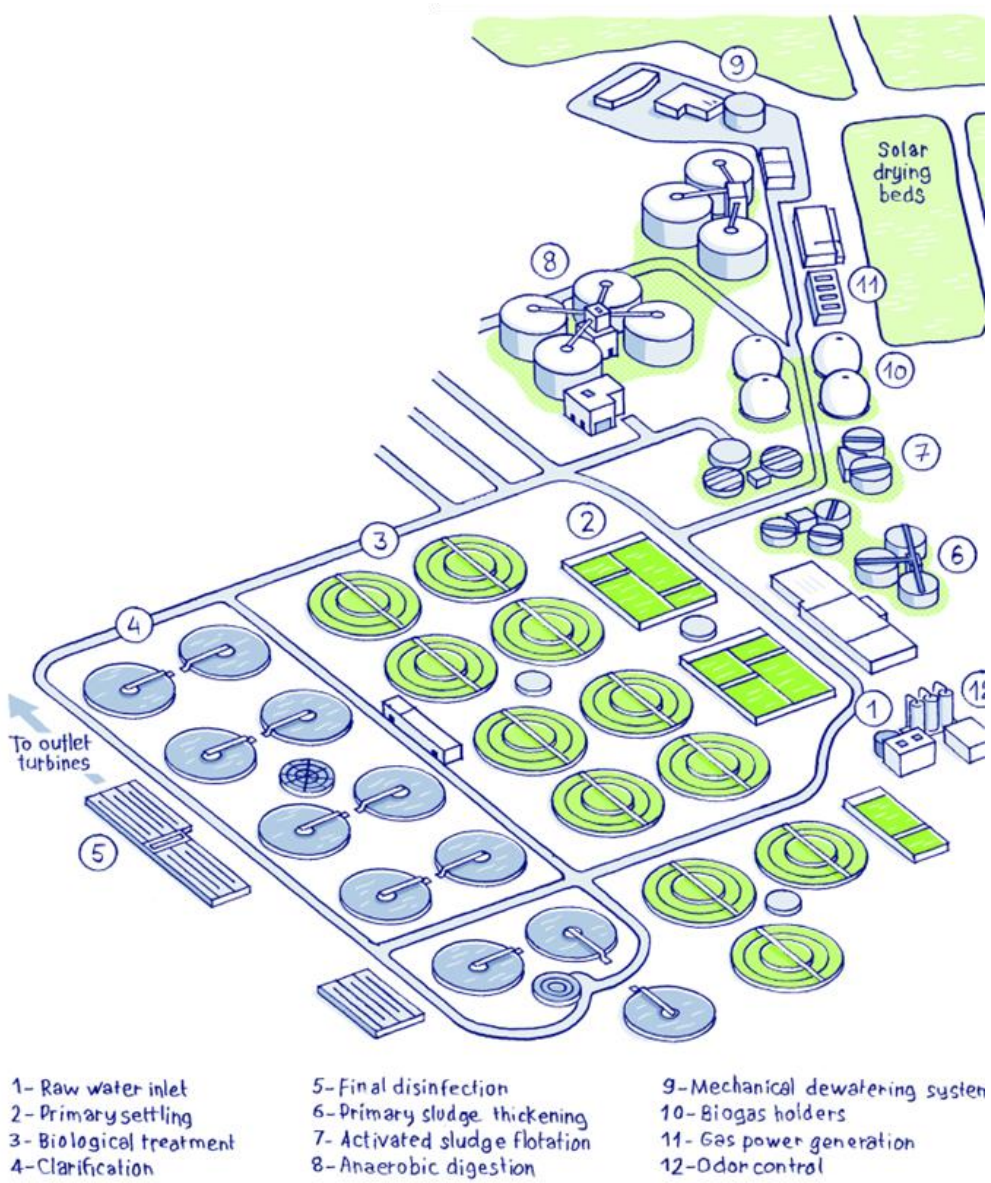
- Wastewater conveyance and treatment accounts for 9% and 3% of the total world CH_4 and N_2O emissions respectively.
- CH_4 and N_2O are potent GHGs, with global warming potentials 25-fold and 265-fold, respectively, stronger than that of CO_2.
- N_2O emissions contribute up to 80% of the overall carbon footprint of a wastewater treatment plant.

IPCC's 3 Classification Scopes:

- **Scope 1 "direct emissions"** from the treatment of wastewater accounts for **2/3 of GHG** output from water and wastewater companies
- **Scope 2 "indirect emissions"** generated by electricity, transport, fossil fuels
- **Scope 3 "indirect value chain emissions"** including materials and consumables used for treatment of wastewater, infrastructure works, etc.

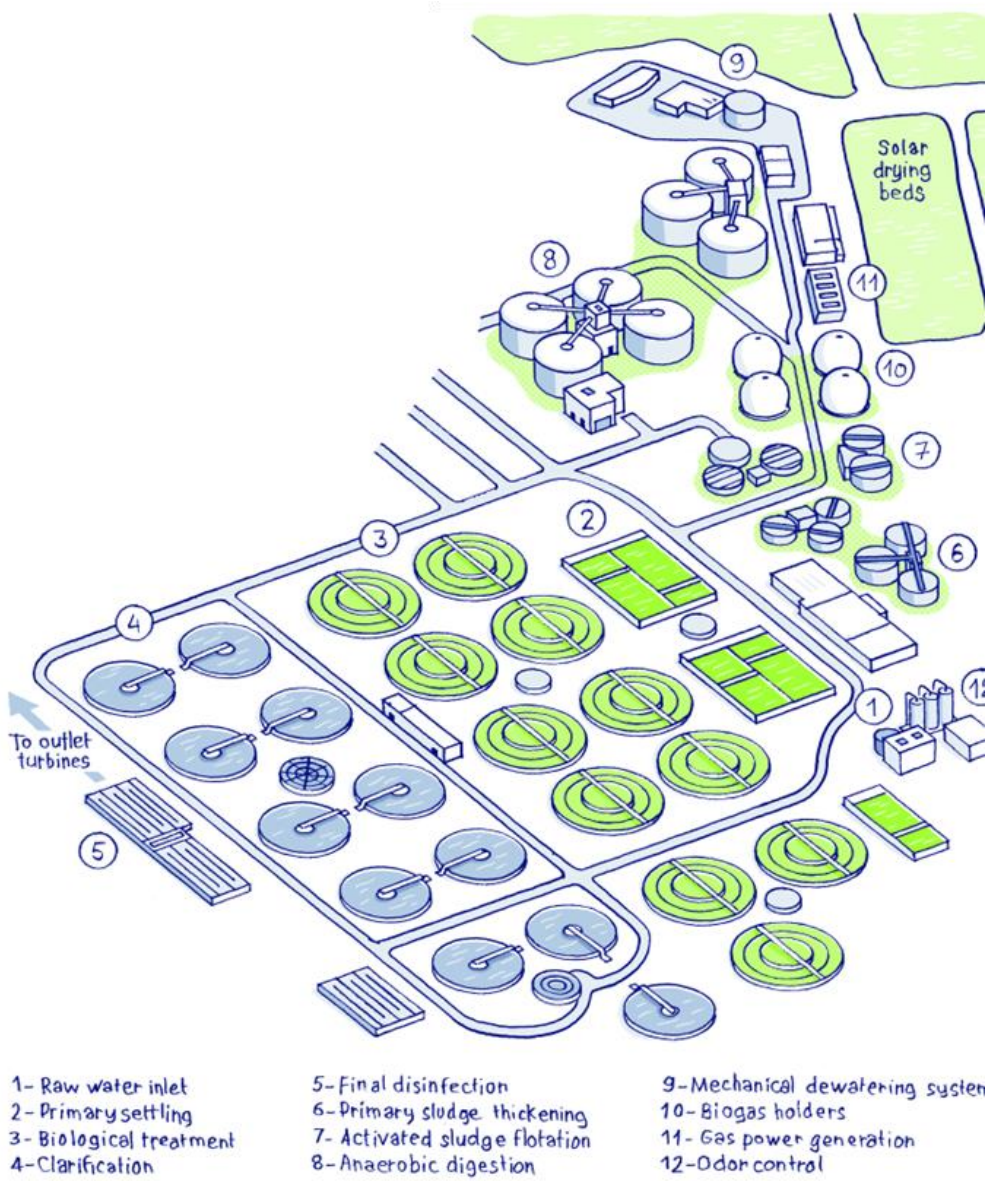
GHGs: N_2O, CH_4 & CO_2

Main sources: biological treatment, biogas production



Odours in a WWTP

- Wastewater treatment has an **inherent risk of odour** which naturally can be particularly problematic where works are located close to housing or other developments.
- When odour issues do arise, they can have a very high public profile and engineered solutions to mitigate against the issues can be costly.
- When molecular oxygen is depleted, nitrate is used as an oxygen source under anoxic conditions. Once nitrate is used up, anaerobic (or septic) conditions develop which allow sulphate to be reduced to **hydrogen sulphide** (H_2S).



ActiLayer Development GHG Program Roadmap

Nov. 2022 — July 2023 — March. 2024

Lab test → *TRL 6** → **POC pilot** → *TRL 7** → **Semi-industrial pilot** → *TRL 8** → **At scale project**

Evaluation of critical design parameters under fully controlled environment.

⇒ **SUEZ R&D center + CNRS Lyon (FRA)**

Technical feasibility demonstrated with periods of significant N_2O removal performance. Definition of performance monitoring methodology.

⇒ **Phase 1 & 2 at WWTP Spernal (UK)**

Technical optimisation on the main design parameters. Maximization of the N_2O removal performance

⇒ **Nantes WWTP (FRA)**

Design and installation at a full scale operational WWTP. Validation of the efficiency and lifespan of filter. Review design to optimize performance "Inclusion of UV"

⇒ **Strongford WWTP (UK)**

**TRL: Technology Readiness Level*

ActiLayer – Strongford Net Carbon Zero Hub

13,5 m£ project for **N_2O capture** and treatment

- **17 000 m²** of surface coverage with photocatalytic cover
- Most significant contributor to Net Zero reduction (2 000T CO_{2eq} per year per asset)

Severn Trent will scale-up to ~30 sites between 2025-30.

➔ **Time lapse camera** (SUEZ / IFStrongford23!)

APPENDIXES

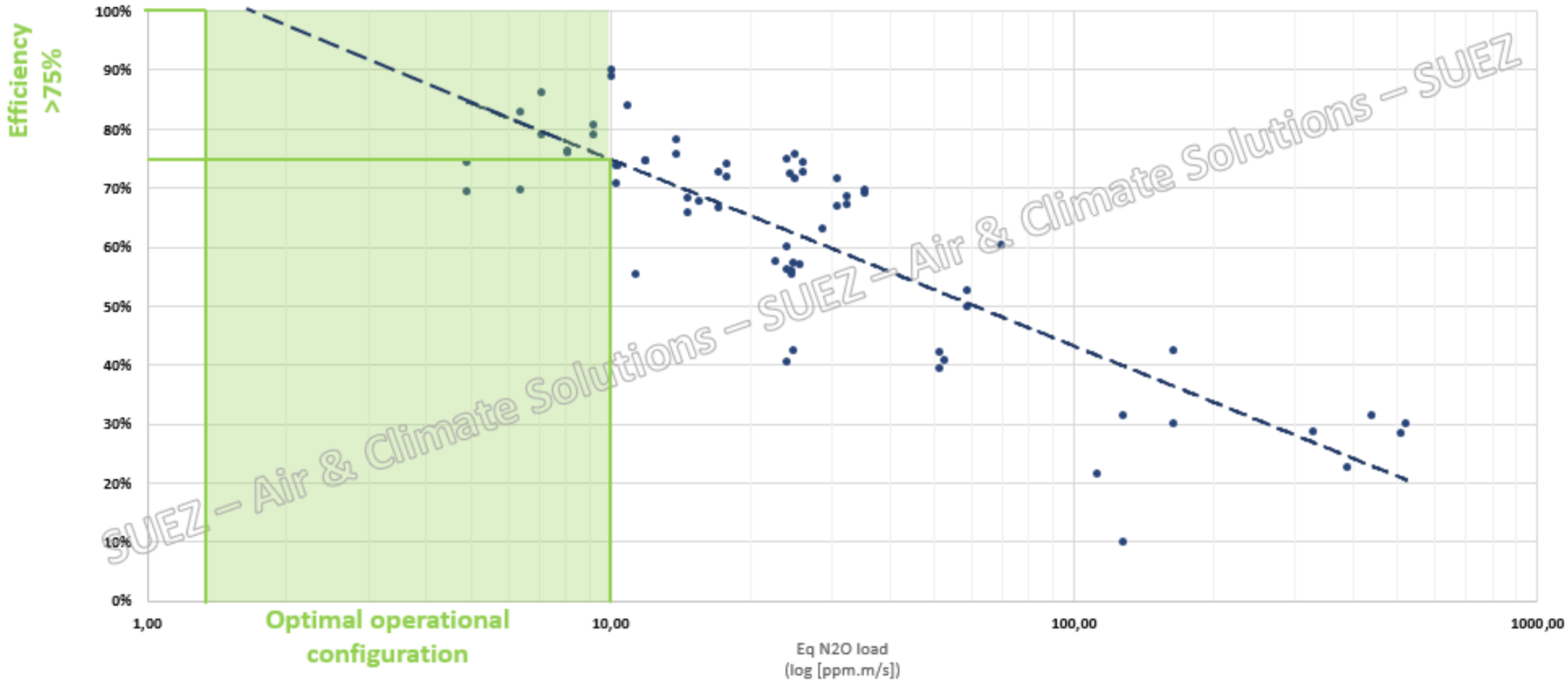
1 – ActiLayer’s results and details

2 - AirAdvanced® Scan360

3 - AirAdvanced® Sentinel

ActiLayer results: +80% of N_2O removal in optimized conditions

⇒ Field test to maximise the N_2O removal above 80% and optimise key design parameters



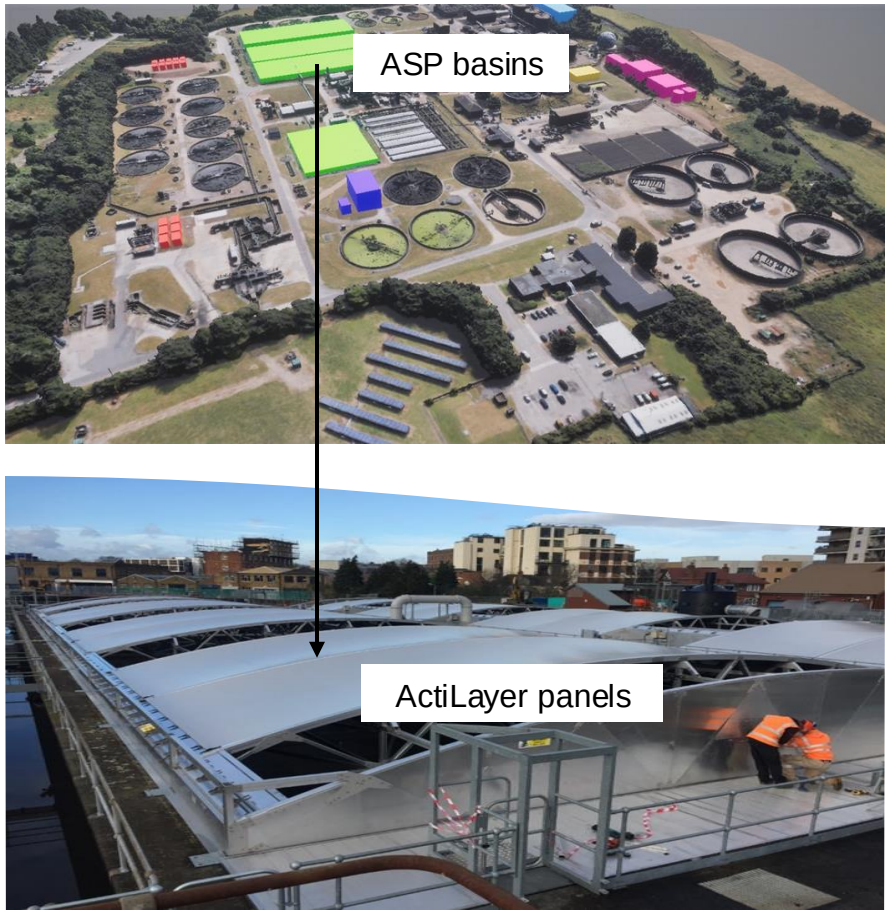
ActiLayer deployment at Strongford WWTP (Severn Trent Net Zero Hub)

Strongford WWTP set up ambitious engagements and action plans to become a GHG Net Zero Hub

Strongford WWTP is a **major sewage treatment serving ~350k People Equivalent** (PE) operated by Severn Trent. The plant is located in the **semi rural area** in Barlaston (South of Stroke-on-Trent). Sixteen innovative Net-Zero technologies to reduce carbon emissions will be tested at Strongford. If successful, the project will deliver a substantial direct short-term benefit – reducing approximately 19,000 TCO_2e per year through the full-scale implementation of the Net-Zero technologies.

ActiLayer panels are set up at the plant on 5 ASP basins, fully compliant with operational needs. To follow the performance of the solution, an on-site data collection system that **controls air quality** has been implemented.

ActiLayer is the most important contributor solution to achieve this objective by **reducing 80% N_2O emission** and **saving 10,000 T CO_2e per year.**

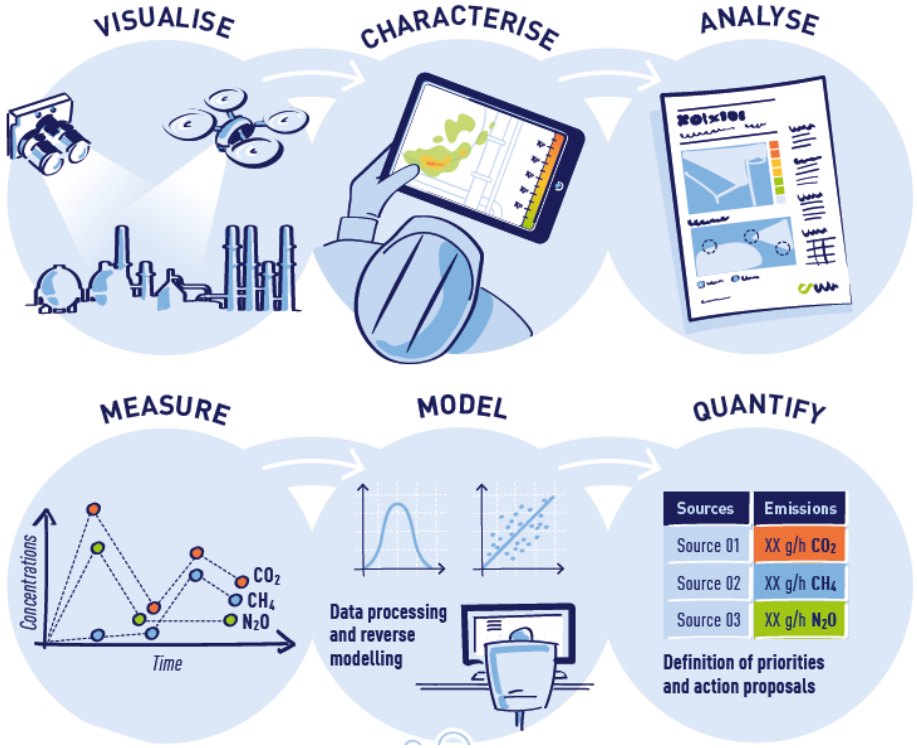


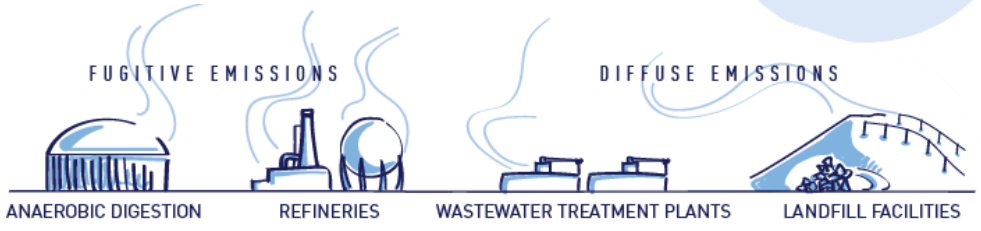
AirAdvanced®-Scan360: on-site GHG

Location and quantification of channeled, fugitive or diffuse CO_2, CH_4 and N_2O emissions

Precision ambient air sensor

Prioritising sources





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BENEFITS

- Detect, locate and quantify GHG emissions
- Refine the site CO_2eq factor emission
- Reduce GHG emissions by optimising operating practices
- Improve the environmental footprint of industrial sites

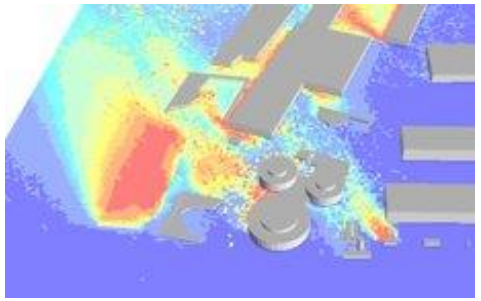
AirAdvanced®-Scan360: In situ measurement of GHG emissions flux

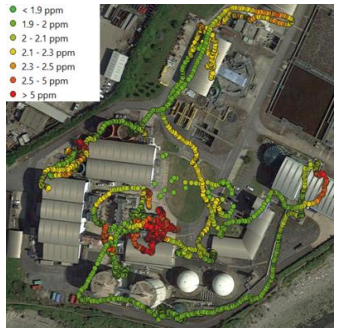
1 Localise and Quantify

- Highly **precise Spectroscopy based analysers** with high frequency and detection limit at ppb level
- Measurement of **CO_2**, **CH_4** and **N_2O**
- LWIR camera for **leak visualisation**
- Sensor on drone possible

2 Concentrations > emissions

- Use of recognized **dispersion models**
- Quantification of the **GHG emission levels** (kg/hr)





3 Operational recommendations

- Emission **map**
- **Hot spots** localization
- Emission **quantification**
- Emissions **sources prioritization**
- Proposal for **mitigations actions**
- **Validation of the emissions reductions** after implementation of mitigation measures

⇒ Co-benefits: assessment via complementary analysis of H_2S/RSH, NH_3, VOC, NO_2
⇒ Simultaneous analysis of N_2O, CH_4 & CO_2

AirAdvanced® Sentinel: on-site odour monitoring and modeling

The only solution designed by operators and experts to measure and analyse in real-time air quality on site

Continuous on-site measurement, data collection and modeling 24/7

Intuitive web interface for operators

Automatic alerts if defined thresholds are exceeded

Real-time and forecast modeling of environmental impact

BENEFITS

- **Air quality measurement at and around your site**
- **Facilitated relationships with stakeholders**
- **Experts to support you in the long term**
- **Improve the environmental footprint of industrial sites**