Outdoor Environmental Solutions

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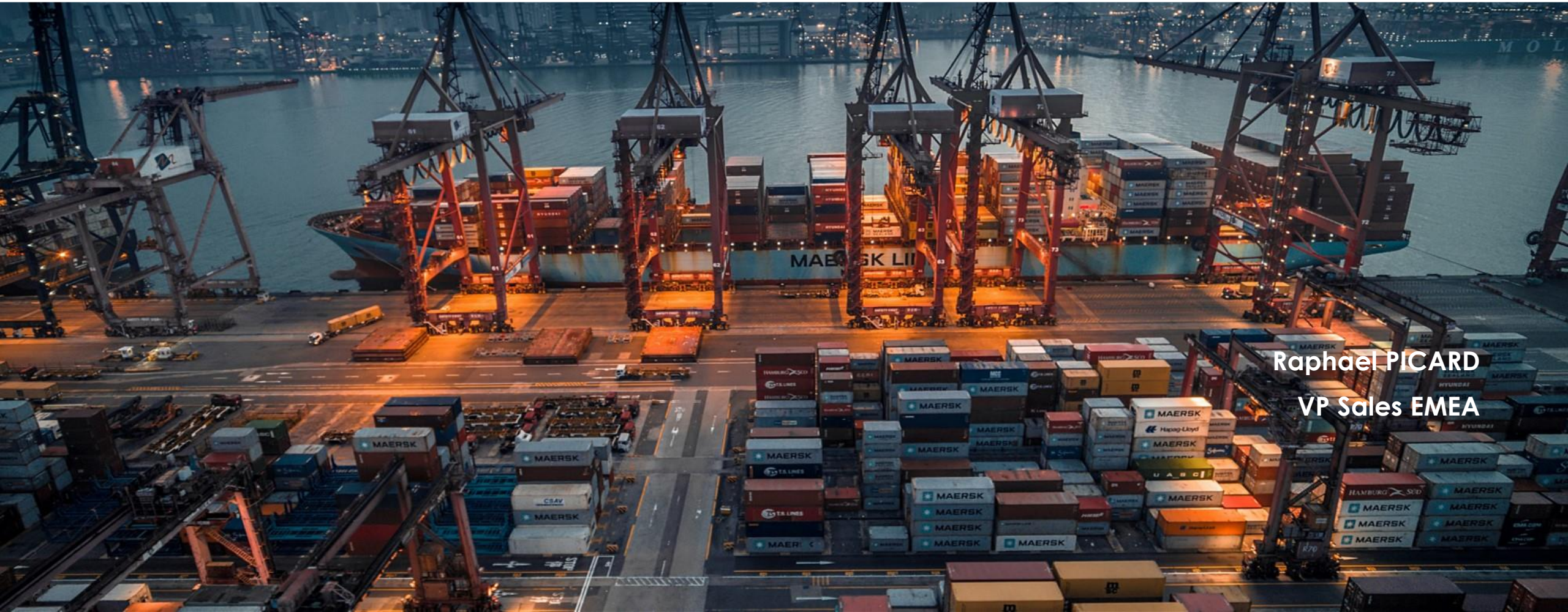


Raphael PICARD

VP Sales EMEA

The challenges for port authorities

Provide a safer, healthier and more comfortable environment for citizens and dockers

Aim for a carbon-free activity to reduce the impact on global warming

Adapt the processes in order to integrate a logic of continuous improvement and reduction of the impacts

Restore trust with stakeholders through the transparent communication of targeted information

How to answer it

Identify in real time the sources of nuisance or insecurity: noise, gas, odors, VOC, particles, pollution, etc.

Control and improve the efficiency of business processes while respecting regulations

Agenda

1. Outdoor environment

2. ELLONA's environmental intelligence

3. Outdoor applications:

- Application fields
- Application examples

4. Outdoor environmental solutions

- WT1
- QR code feedback
- ELLONASoft

5. Case studies:

6. Key takeaways

1.

Outdoor environment

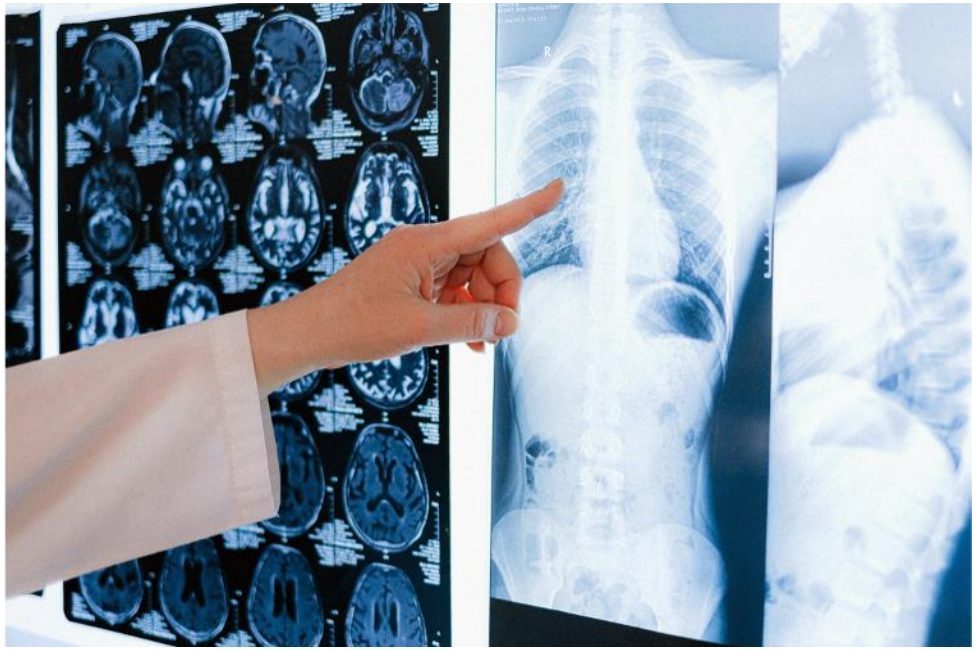
The dangers of outdoor pollution

7 millions of deaths

by stroke, heart disease, lung cancer or chronic respiratory diseases

92% world population

live in places exceeding air quality levels recommendations



Source: World Health Organization (WHO)

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The sources of outdoor pollution

Industry & energy supply

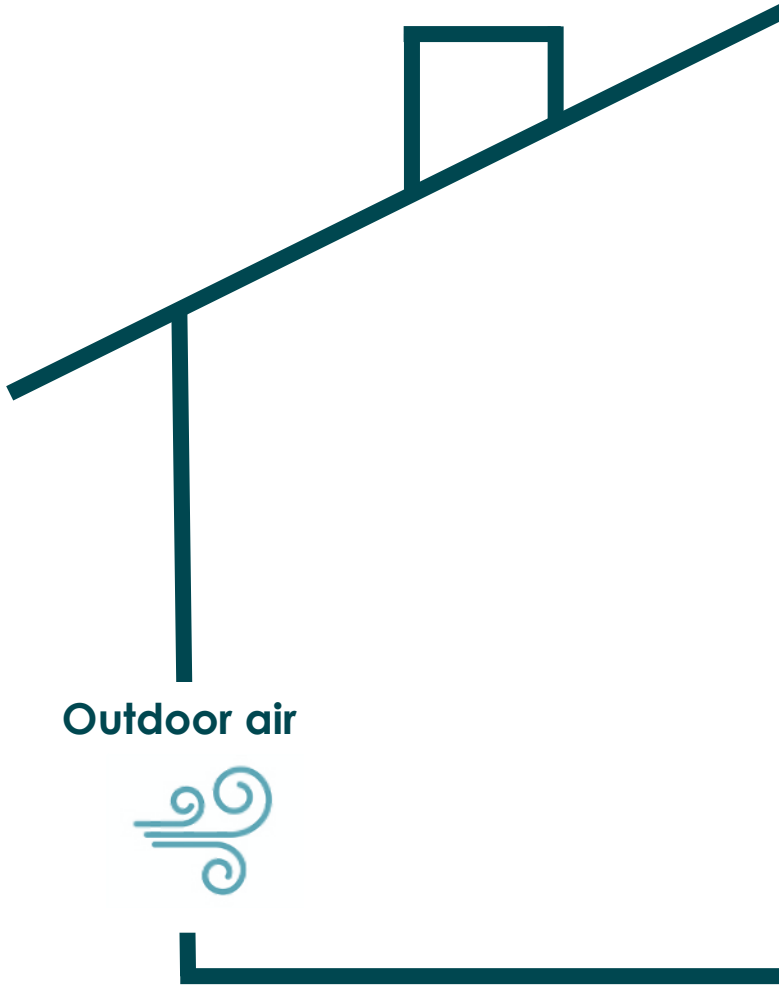
Agricultural practices

Transport

Waste management

Household energy

Dust



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Outdoor environment is more than just air quality

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Environmental data means nothing without a purpose

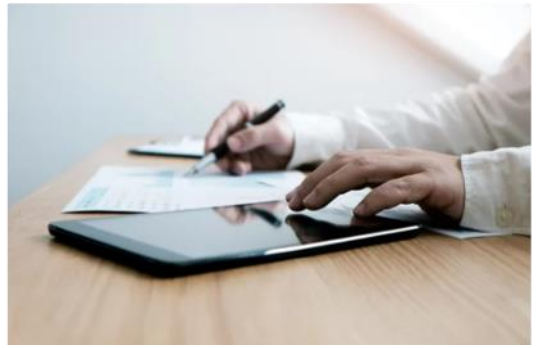
Big data

Collection & monitoring of different environmental data

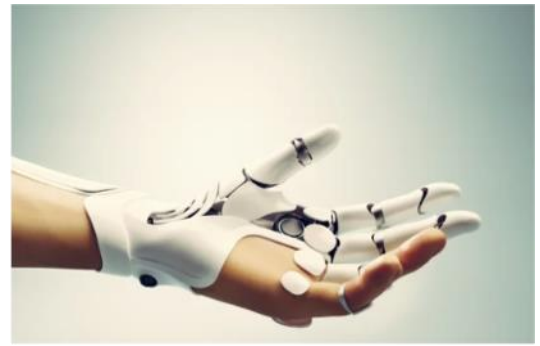
Actionable intelligence

Solving business problems based on customer-specific user cases

Health & Well-being



Safety & Compliance



Increase expert capabilities

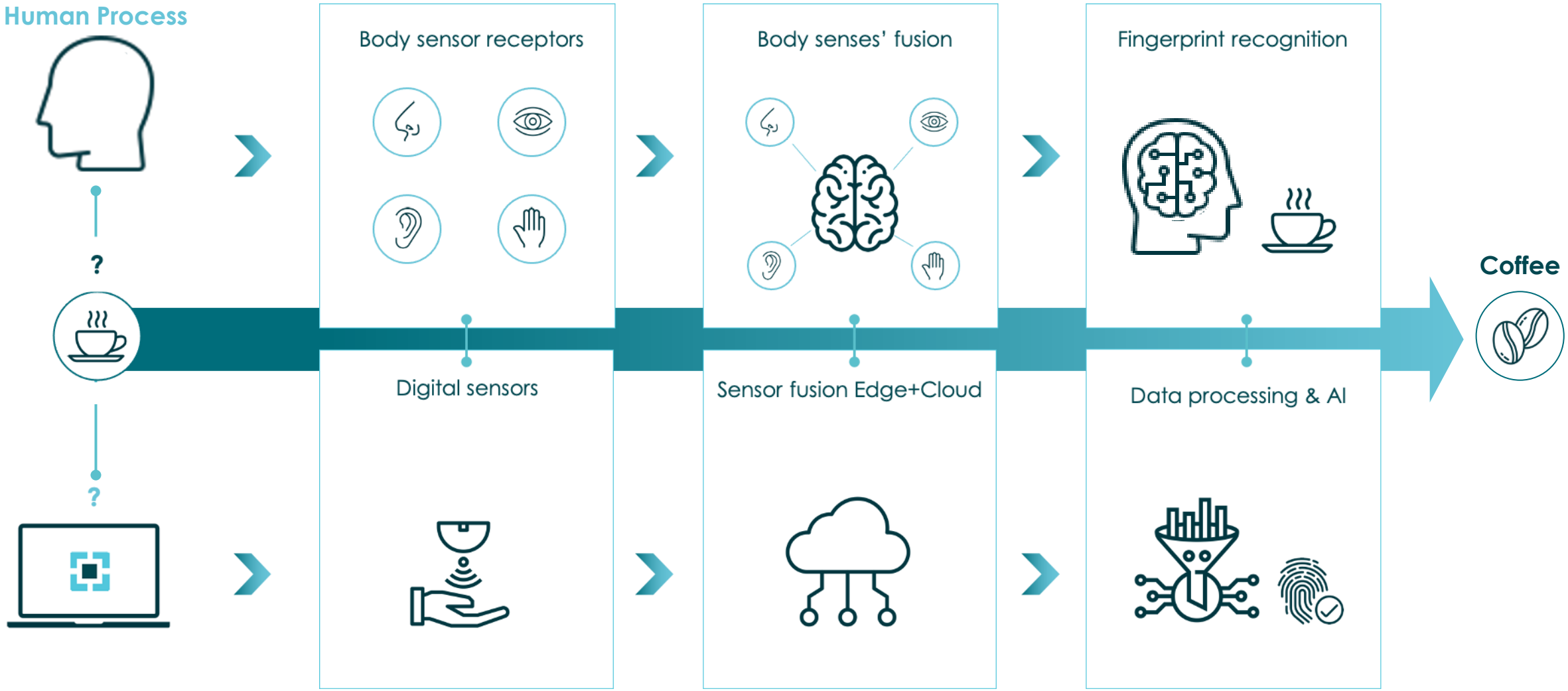
2.

ELLONA's Environmental Intelligence

Environmental Intelligence

Collecting & enriching data on ambient environmental conditions for decision-making using AI & Edge IoT technologies

Biomimetic Approach: Human Senses Digitalization (HSD)



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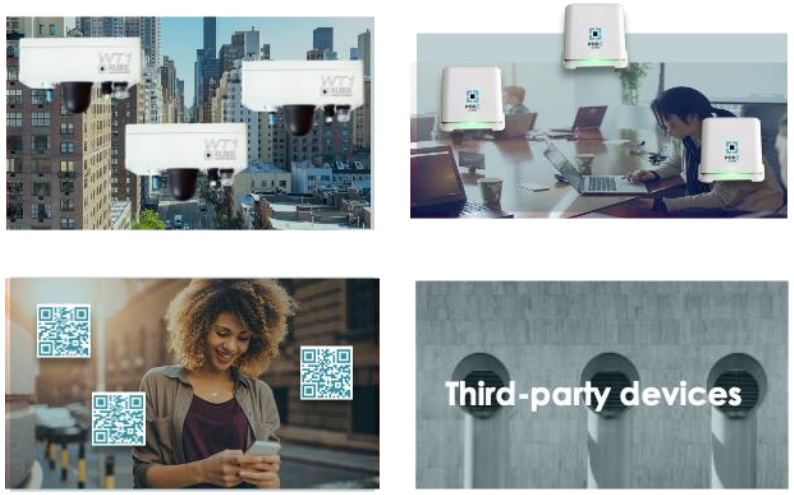
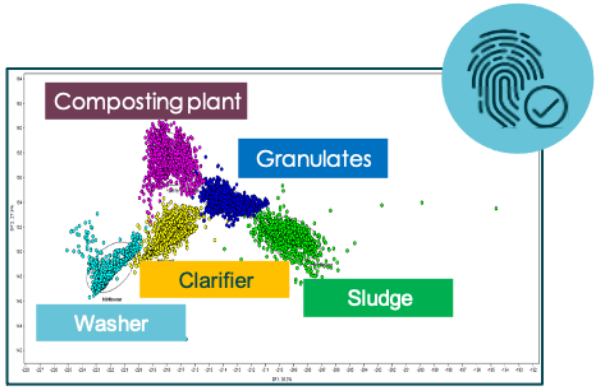
Advanced signature recognition

Sensor fusion



Advanced data analysis

Advanced fingerprint recognition



Network of devices differently equipped

Artificial intelligence & advanced databases

Complex signatures identification

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The missing link

Going BEYOND sensor & data management offering

Data Monitoring

Data Management

Advanced Data Fusion & Analysis

Complex signatures

Specialized team

14 patents

Actionable data to solve business problems

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Augmented data

Our 3-step added value model

1 **Detect & alert**
Continuous data generation

2 **Understand your environment**
Data Analytics

3 **Increase & exploit your knowledge**
Data Merge

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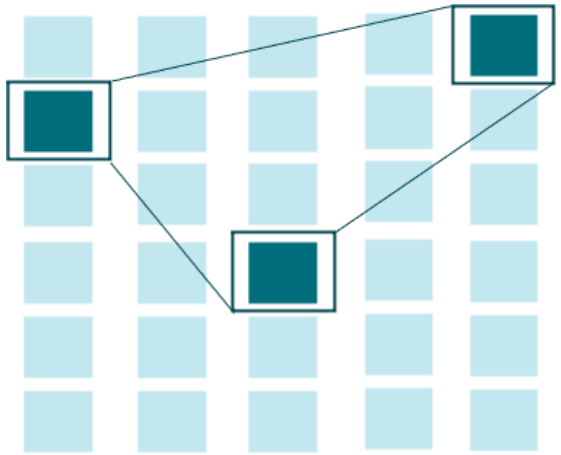
Unlock value beyond compliance monitoring

Accurate data collection → **Advanced data Processing** → **Turn data into action**

DEVICE MANAGEMENT



APPS & SERVICES

DASHBOARD & APIs

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3.

Outdoor applications

Application fields

Construction

Industrial production sites

Extraction industries

Wastewater & Utilities

Transport infrastructure

Agriculture

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Application examples (1/3)

ENVIRONMENTAL IMPACT

Construction site

Tunnels

Seaport / Airport

Petrochemical

	Construction site	Tunnels	Seaport / Airport	Petrochemical
Advantage	Protect workers Optimize site Avoid citizen complaints	Protect workers Optimize site	Identify types of transport Optimize traffic Monitor tech fluids leakages Avoid citizen complaints	Control emission levels Optimize process control Avoid citizen complaints
Parameters	NO_2, SO_2, O_3, PID (alkanes, BTX), CO, PMs, Noise recognition, Odor recognition			H_2S, NO_2, SO_2, O_3, PID (alkanes, BTX), CO, PMs, Odor recognition, Options: - H_2S, CH_4 - Liquid Sensors: pH, Dissolved Oxygen - Noise recognition

Customized applications depending on the industry: paper & pulp, leather, cosmetics, food, rubber, gelatin…

Application examples (2/3)

ENVIRONMENTAL IMPACT

Wastewater plant

Advantage

Optimize processes
Automate remediation
Avoid citizen complaints

Parameters

H_2S, RSH (mercaptans), NH_3, Odor recognition
Options:
- Liquid Sensors: pH, Dissolved Oxygen, Turbidity
- Noise recognition

Landfill

Monitor fermentation
Optimize processes
Automate remediation
Avoid citizen complaints

H_2S, RSH (mercaptans), NH_3, CH_4, PMs, Odor recognition
Options:
- Liquid Sensors: pH, Dissolved Oxygen, Turbidity
- Noise recognition

Rendering plant

Protect workers
Optimize processes
Automate processes
Avoid citizen complaints

Smart cities

Monitor global environmental nuisances
Optimize traffic
Contribute to decarbonation
Automate remediation

NO_2, CO, PMs, Noise recognition, Odor recognition
Options:
- SO_2, O_3

Customized applications depending on the industry: paper & pulp, leather, cosmetics, food, rubber, gelatin…

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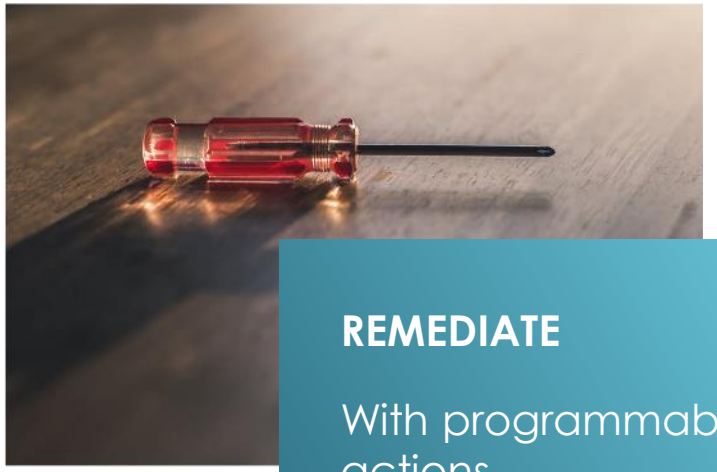
Application examples (3/3)

	PROCESS INDUSTRIES	AGRICULTURE
		
	Livestock	**Agriculture**
Advantage	Ensure animal well-being Monitor production efficiency Monitor lagoon & manure management Avoid citizen & workers' complaints	Trace & reduce fertilizers, pesticides Control & maximize yield production & quality Optimize greenhouse Automate remediation Control emissions, decarbonate Avoid citizen & workers' complaints
Parameters	H_2S, RSH (mercaptans), NH_3, CO_2, Noise recognition, Odor recognition Options: - SO_2, CH_4 - Liquid Sensors: pH, Dissolved Oxygen, Turbidity	MOS, PMs, Odor recognition, Liquids: pH; Soil: NKP, pH, Temperature / Relative Humidity Options: - Noise recognition

Customized applications depending on the industry: paper & pulp, leather, cosmetics, food, rubber, gelatin…

Solve your business problem



REMEDIATE

With programmable actions

IDENTIFY

Sources of health & safety risks

MONITOR

Environmental factors

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4.

Outdoor Environmental Solutions

A complete Environmental Intelligence ecosystem

V1.3 network

QR code feedback

Third-party devices

RubixSoft platform

Third-party applications

ENVIRONMENTAL INTELLIGENCE

Watch Tower 1 (WT1) - Parameters

Size: 260mm x 160mm x 156.5mm

Weight: 3 kg

Monitoring & recognition of outdoor environment

- **VOC**
- **Gas** (up to 8 gases)
- **Particulate Matters** (PM1, 2.5, 10)
- **Odors** (recognition)
- **Noise** (intensity, recognition)
- **Temperature**
- **Humidity**
- **Atmospheric pressure**

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Watch Tower 1 (WT1) - Sensors

Monitoring & recognition of outdoor environment

- 6 electrochemical: H_2S, NH_3, NO_2…
- 1 optical: CO_2 or CH_4
- 1 PID*
- 1 PM optical sensor: PM1-2.5-10**
- 4 MOS: odors card
- 1 Temperature
- 1 Humidity
- 1 Noise
- Virtual sensors

* When a PID sensor is not used, it is possible to have two optical sensors instead of on

** From a list of 2 sensors: one specialized in size and concentration and one specialized in type fingerprinting (only for Construction site and on demand)

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WT1 - Key Features (1/2)

Personalized

Adjust the combination of sensors to your needs

Virtual sensors

Created on the cloud

Connected

Wi-Fi, Ethernet, LTE-M/GPRS

Real-time

Data upload every 10 seconds

Dispersion plume

Real time & historical neighborhood impact

Dynamic

Double air entry/exit channel for separated gas & PM measure

Continuous

Data logger
(up to 2 years*)

* Permanent back-up on cloud

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WT1 - Key Features (2/2)

On-Off relay

Real-time automatic sampling

4-20mA switch

Automatic triggering of remediation

Power

12V DC input*, PoE, solar panel battery

Compact structure

IP54 housing & -30°C / + 60°C

Easy installation

Less than 2 hours

Secured

Data stored in our cloud

Flexible

IP networked device

* 110-240V AC – 12V DC power adapter

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Options

Solar panel

Automated sample vacuum chamber

Sampling chamber

Protective shelter

Dryer & Diluter

Soil & liquid sensors

Weather stations

Calbox

Other options on demand

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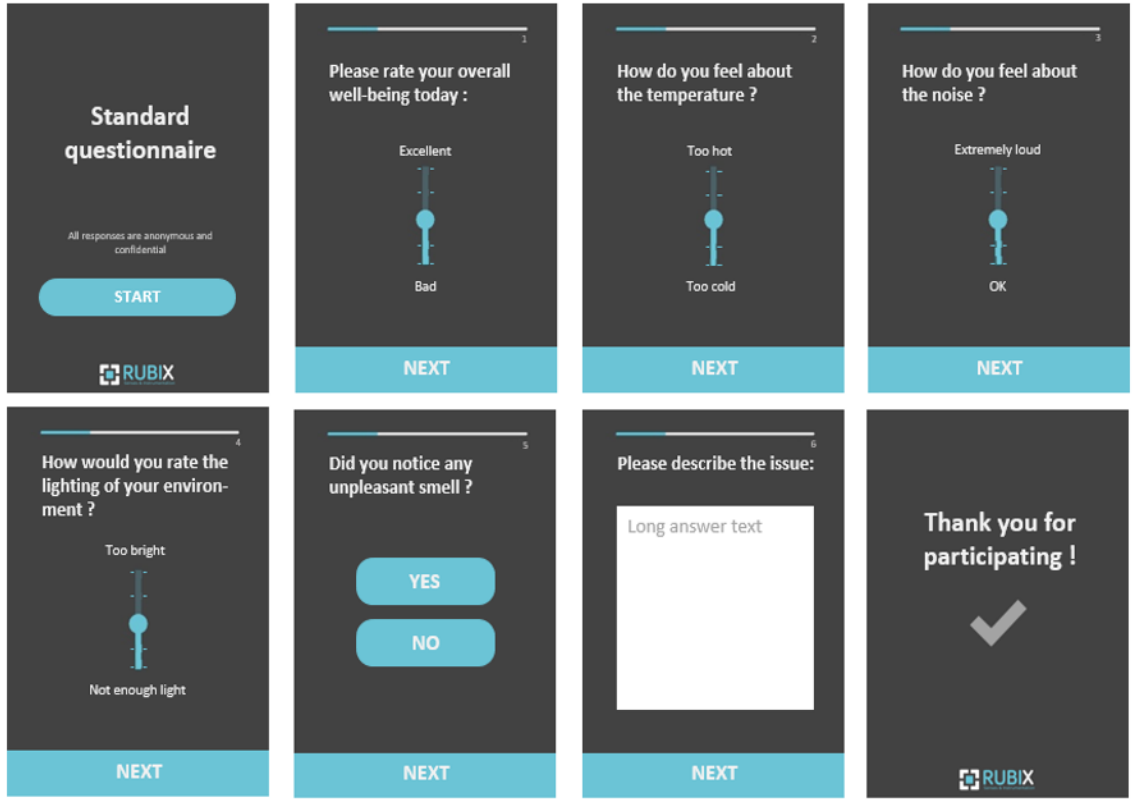
QR code feedback

- Individual & subjective assessment of wellbeing via QR code
- Personalized surveys

Real-time user feedback



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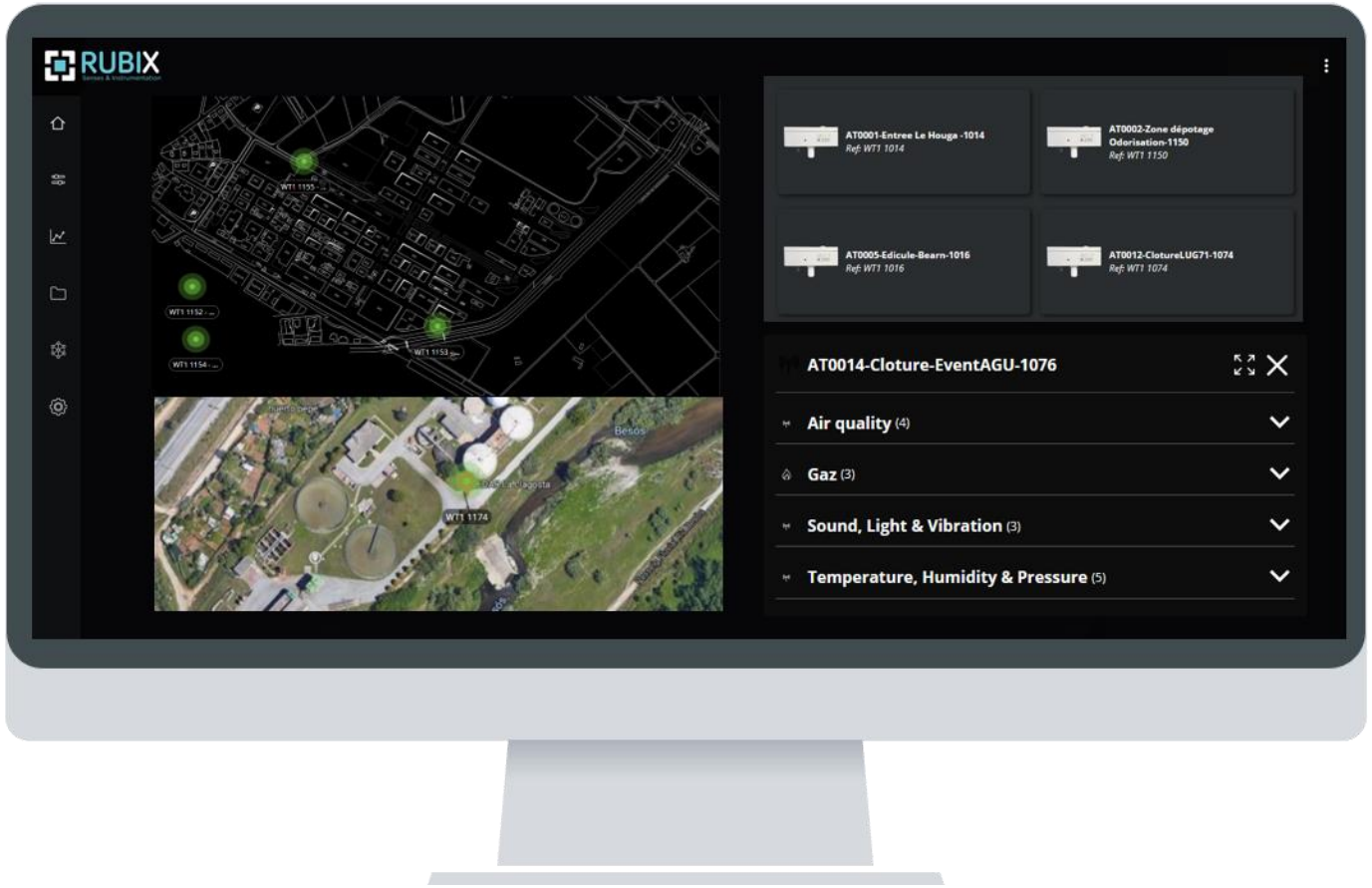
ELLONASoft platform

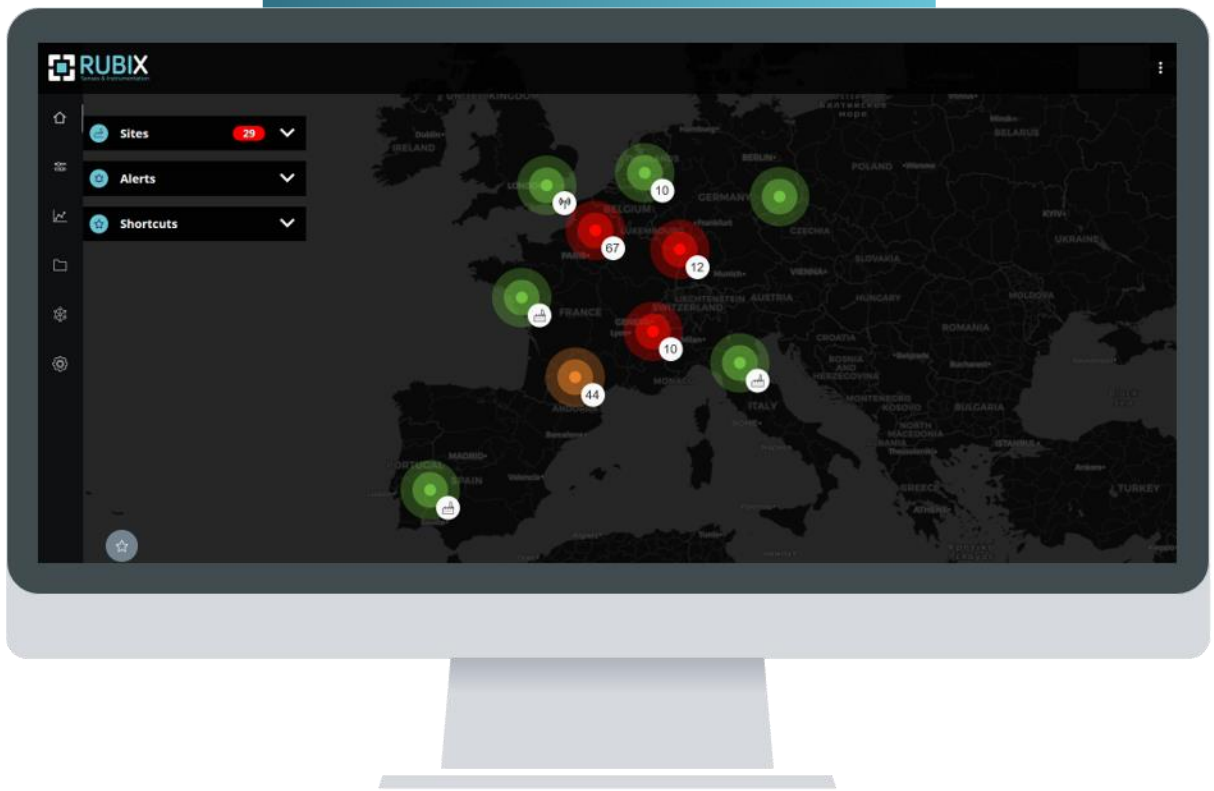


Environmental Intelligence Platform

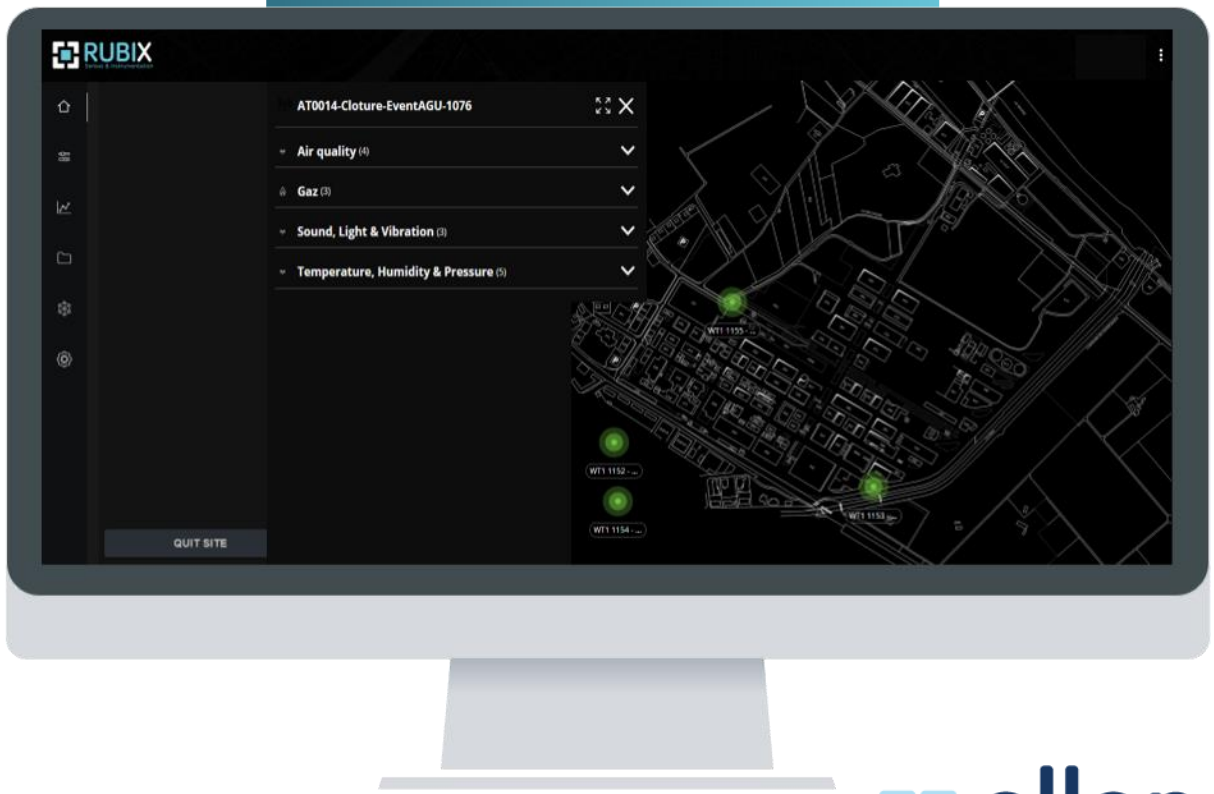
- ✓ Easy-to-use real-time & continuous monitoring & data visualization
- ✓ Identification of signatures/nuisances
- ✓ Weather data integration
- ✓ Customized & automatic alert notifications
- ✓ Multilingual & responsive access
- ✓ Data export
- ✓ Advanced reports
- ✓ API integration

ELLONASoft - Key features (1/5)

Device Localization

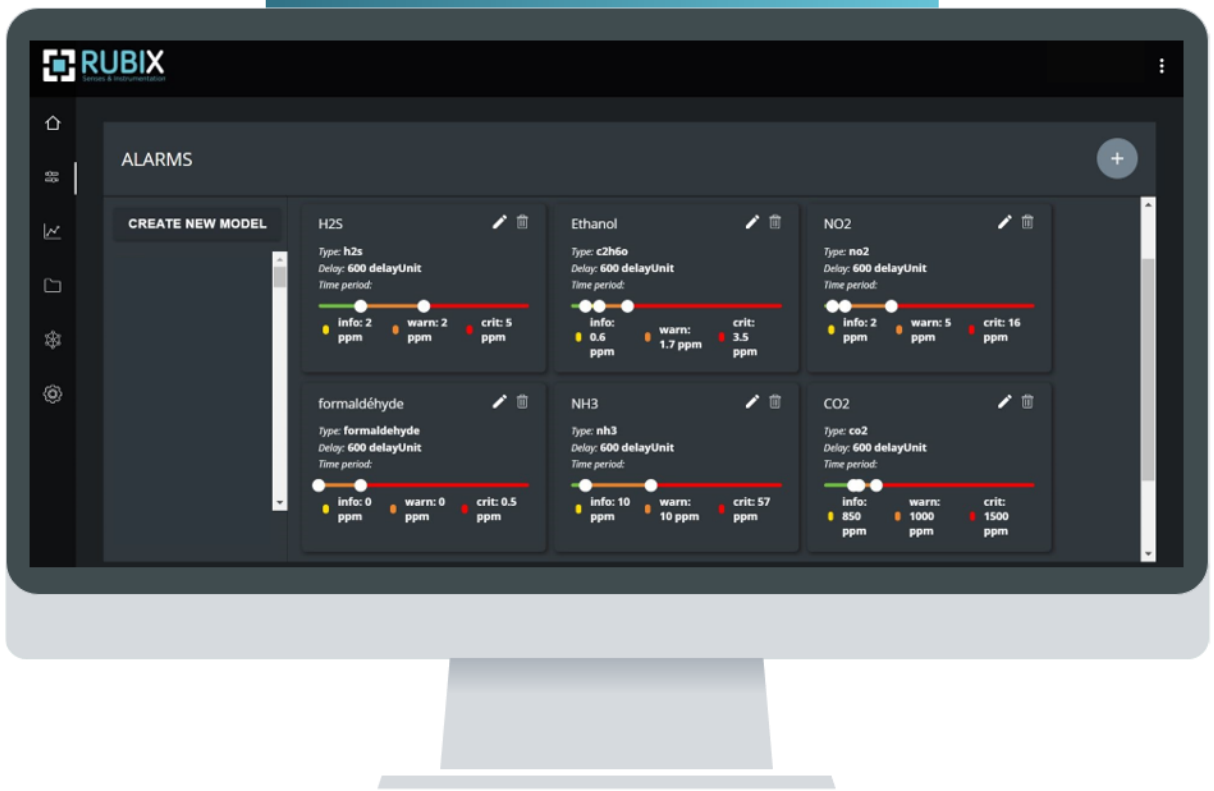


Site & Device Management

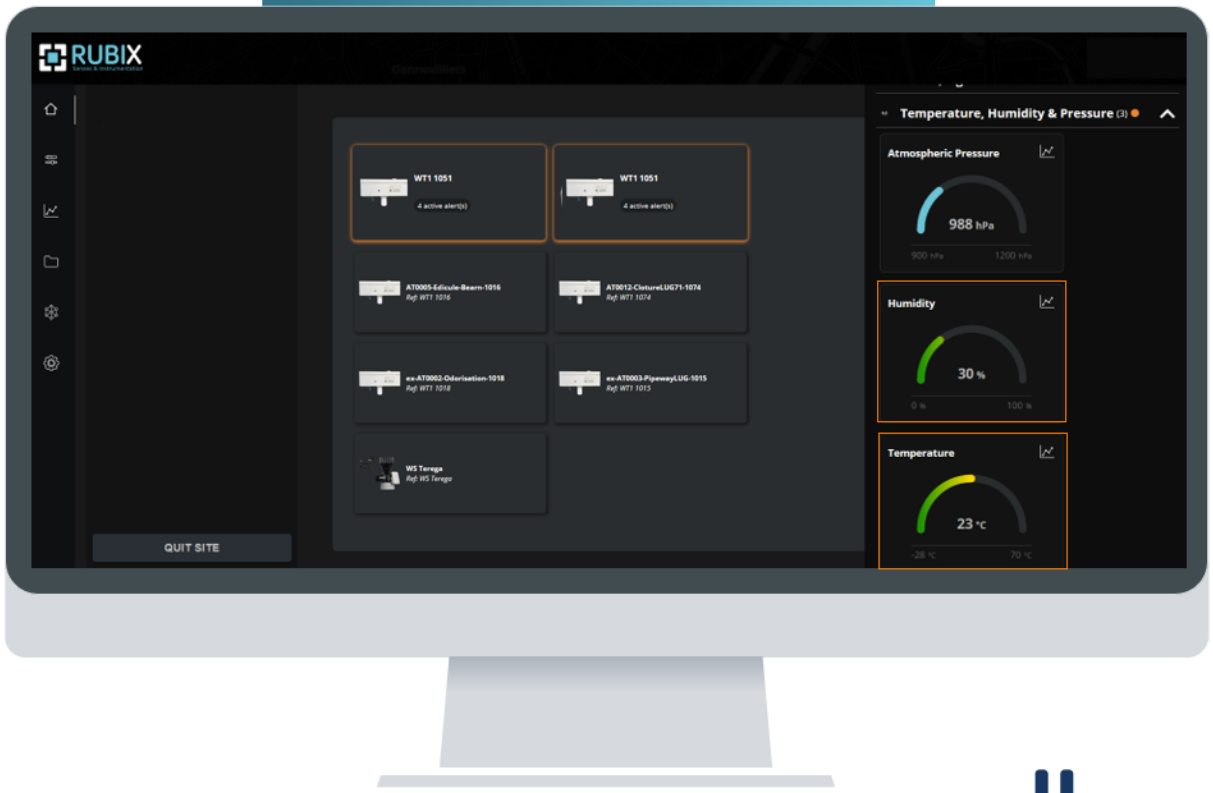


ELLONASoft - Key features (2/5)

Customized Alerts

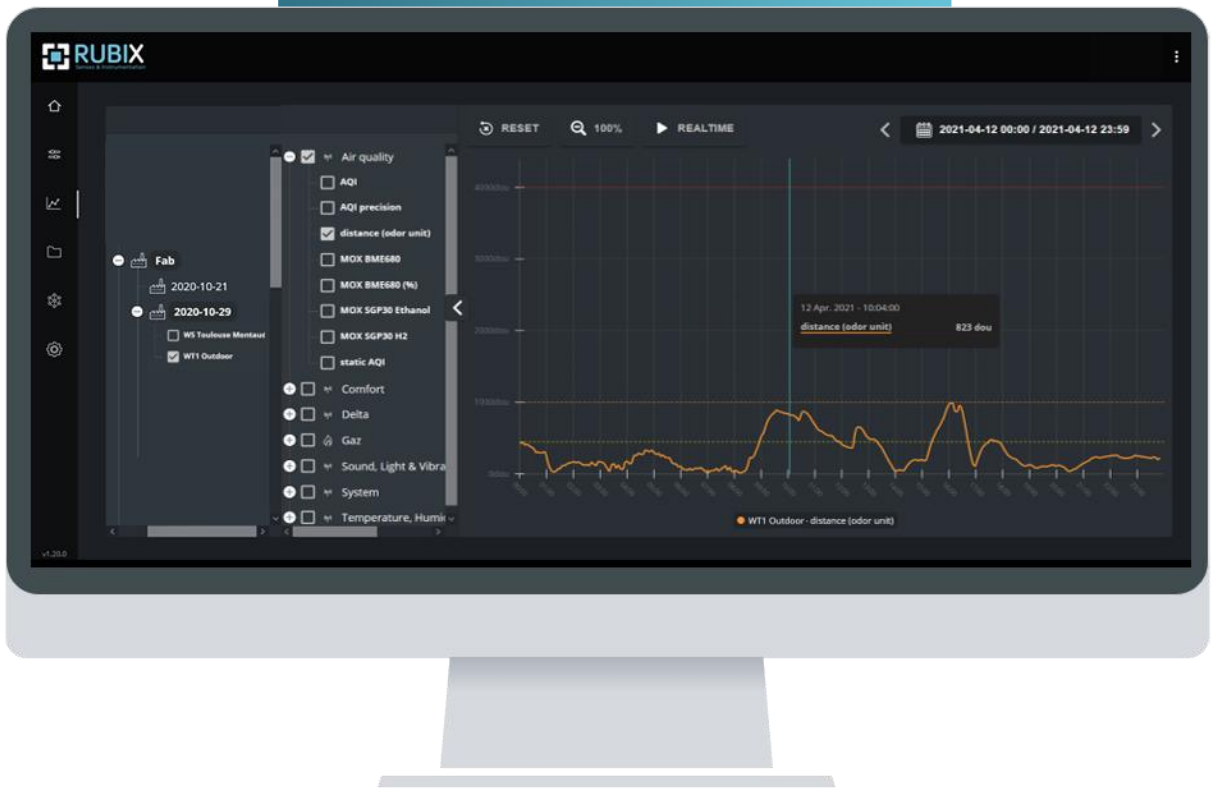


Alerts Management



ELLONASoft - Key features (3/5)

Real-Time Monitoring



Historical Data

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ELLONASoft - Key features (4/5)

Dispersion Modelling

Sources Identification

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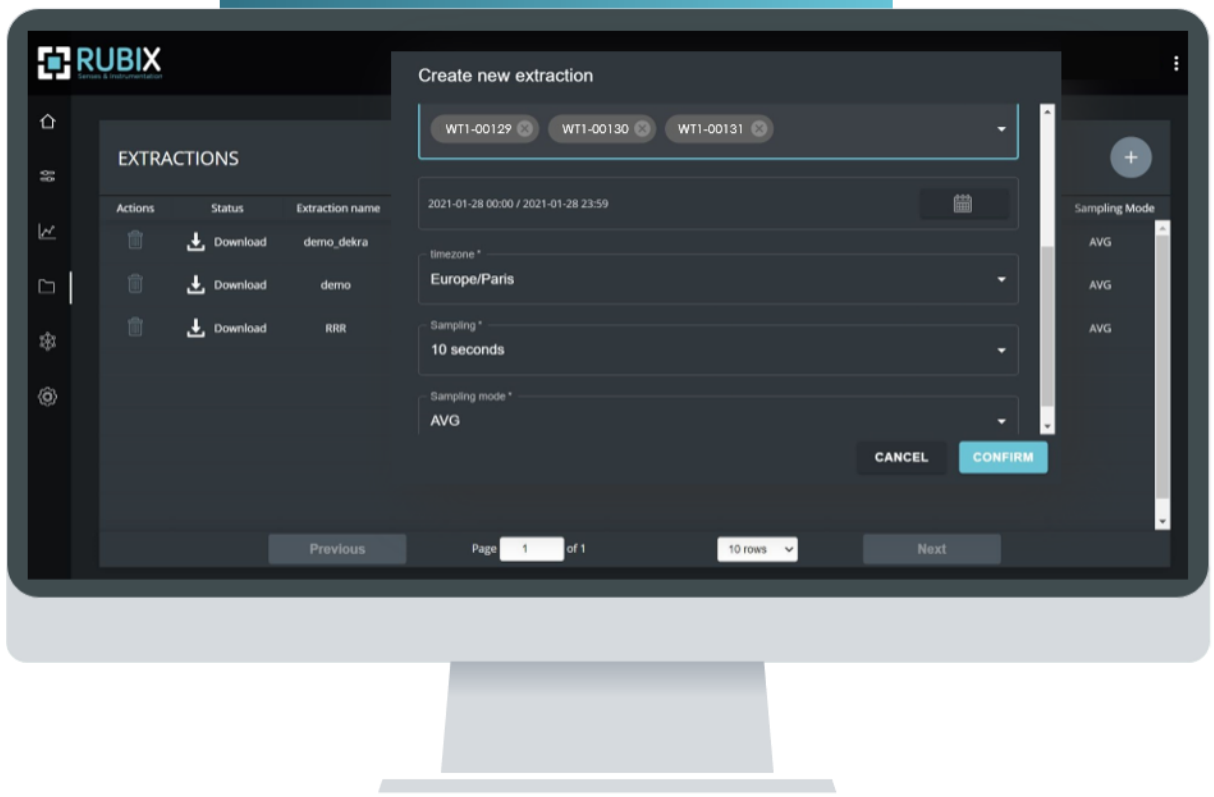
ELLONASoft - Key features (5/5)

Data Export

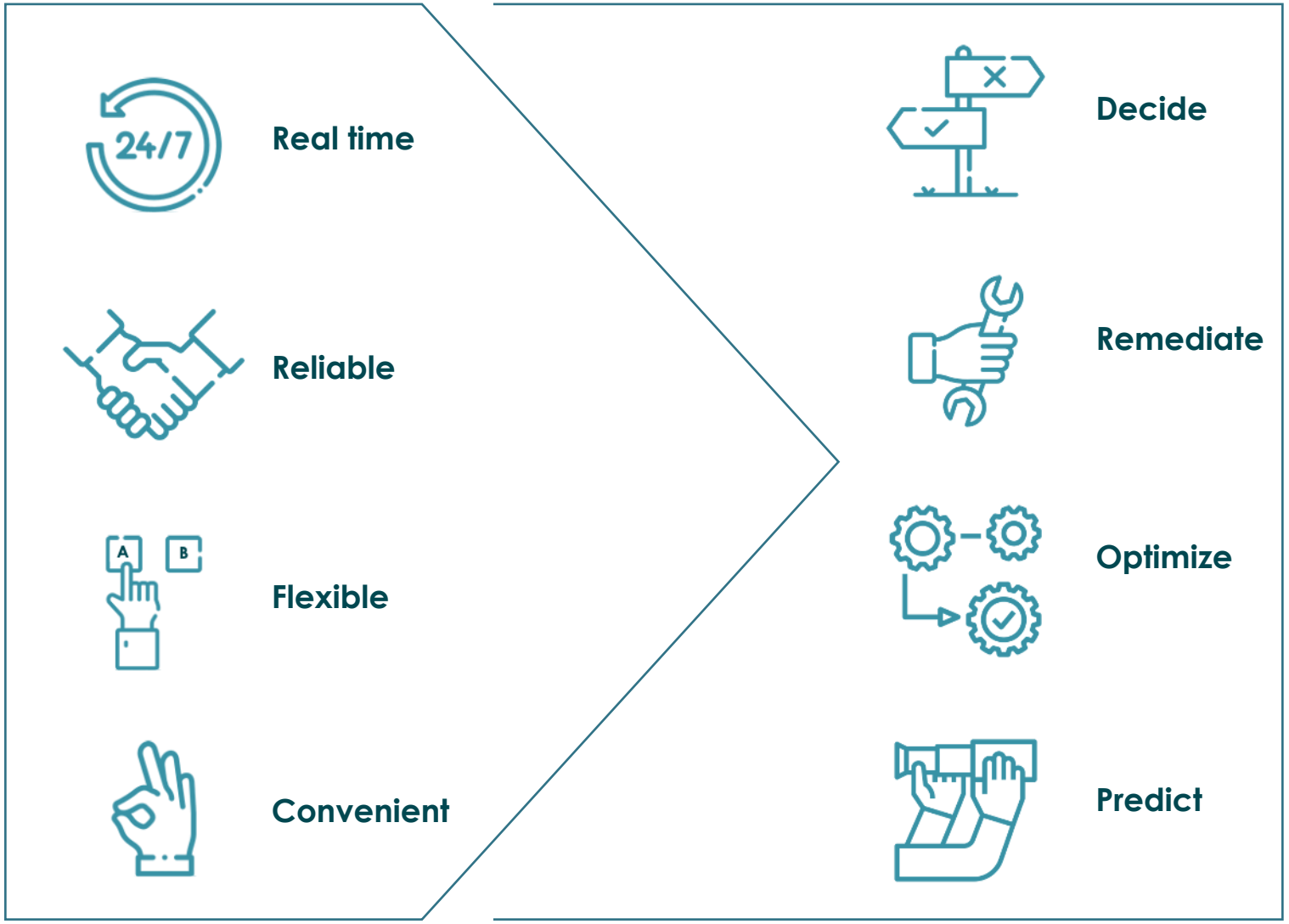


Advanced Reports

Benefits of ELLONA solutions

Holistic

All-in-one solution to **measure, monitor, visualize & manage** indoor environment quality



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5.

Case studies

Port management Case study

Oil & Gas Port Ventspils/ Latvia

Fence Monitoring, “Odor Fingerprinting” and Source identification

Context:
Industrial Port of Ventspils in Latvia. It includes 12 cargo terminals dedicated to the unloading, short-term storage & loading of oil products with up to 25 tankers concurrently loading and unloading oil & gas products

Challenge:
Citizen complaints due to emission of smelling substances originated by dynamic air pollution sources. New requirements from the local council to control & improve the odor control situation. Need to assess specific odor levels at the terminal fence line & **be able to determine the specific origin of smelling emissions.**

Solution:
Odor level assessment program with ELLE-Environment (partner): dynamic olfactometry odor study (human reference panel). Deployment of WT1 network to monitor, identify & alert odor levels excesses in real-time. **Established a “Fingerprinting” data process to identify different substances with similar odorous behavior**

Impact:
Non-biased & comprehensive identification of sources thanks to odor recognition supporting remediation, mitigation & prevention activities

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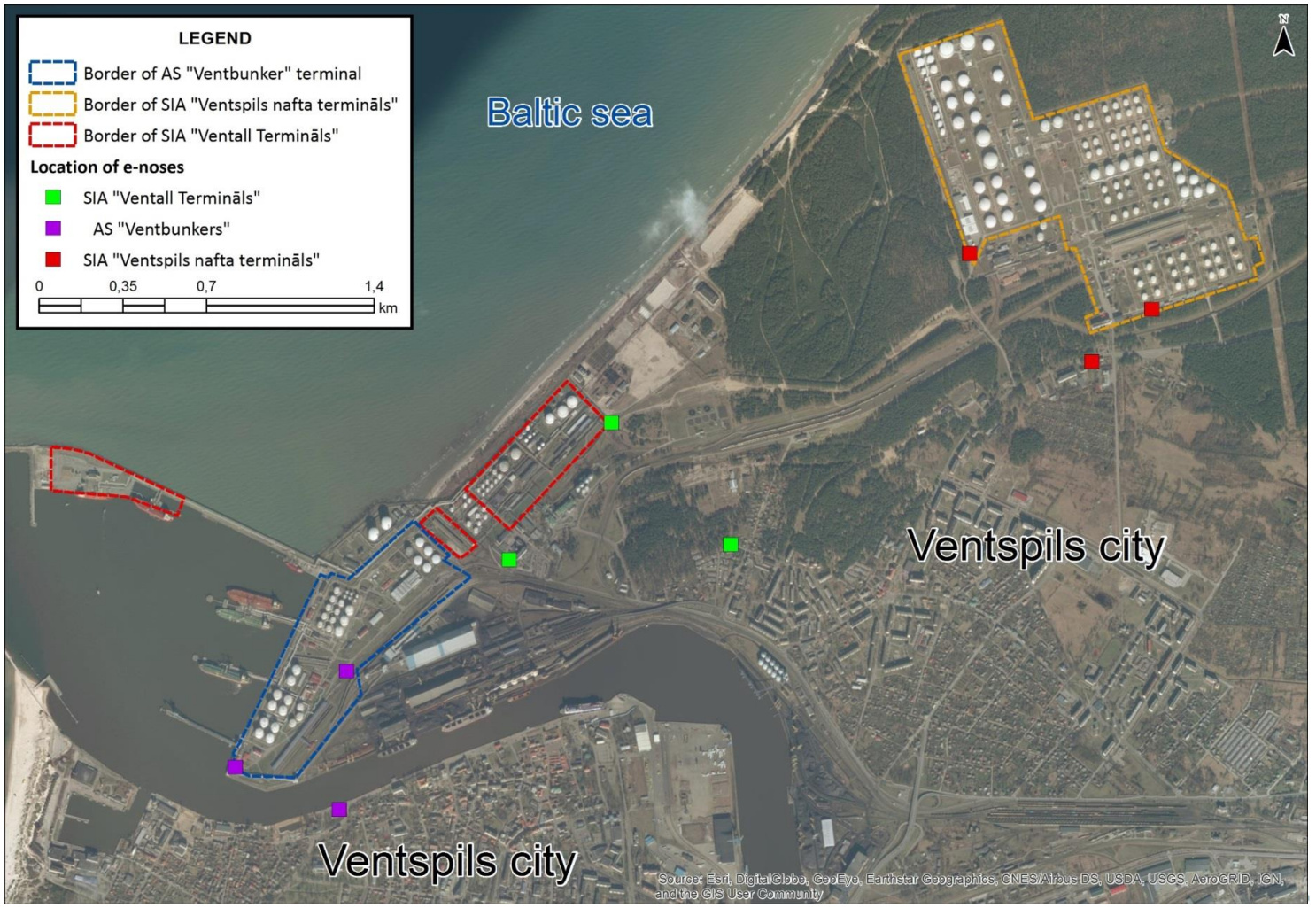
Port management Case study

Oil & Gas Port Ventspils/ Latvia

Problem: 1) Malodors were frequently impacting the Residential area located to the East 2) Site required compliance check

Challenge: - Fence odor levels required to be assessed
- Odor Source was not clear and remediation was not possible



Fence Monitoring, "Odor Fingerprinting" and Source identification

Port management Case study

Oil & Gas Port Ventspils/ Latvia

Fence Monitoring, “Odor Fingerprinting” and Source identification

Solution:

- Continuous Fence monitoring assessing Odor Units
- Fingerprinting of potential Odor Sources and sample contrast with Databank

Outcome:

Alert of fence level threshold violation, Identification of the Odor Source/s in real time, enablement of remediation and prevention

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Port management Case study

Oil & Gas Port Ventspils/ Latvia

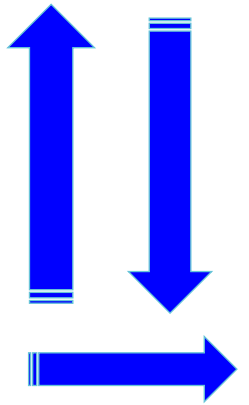
Fence Monitoring, “Odor Fingerprinting” and Source identification

Methodology:

1 - Odor study according to EN 13725 (dynamic olfactometry)

2 - Main odor samples – black fuel oil, petrol, solvent naphtha, diesel and kerosine. Odor Unit determination

3 – Analyzer Training. Each instrument becomes a permanent “panel member”



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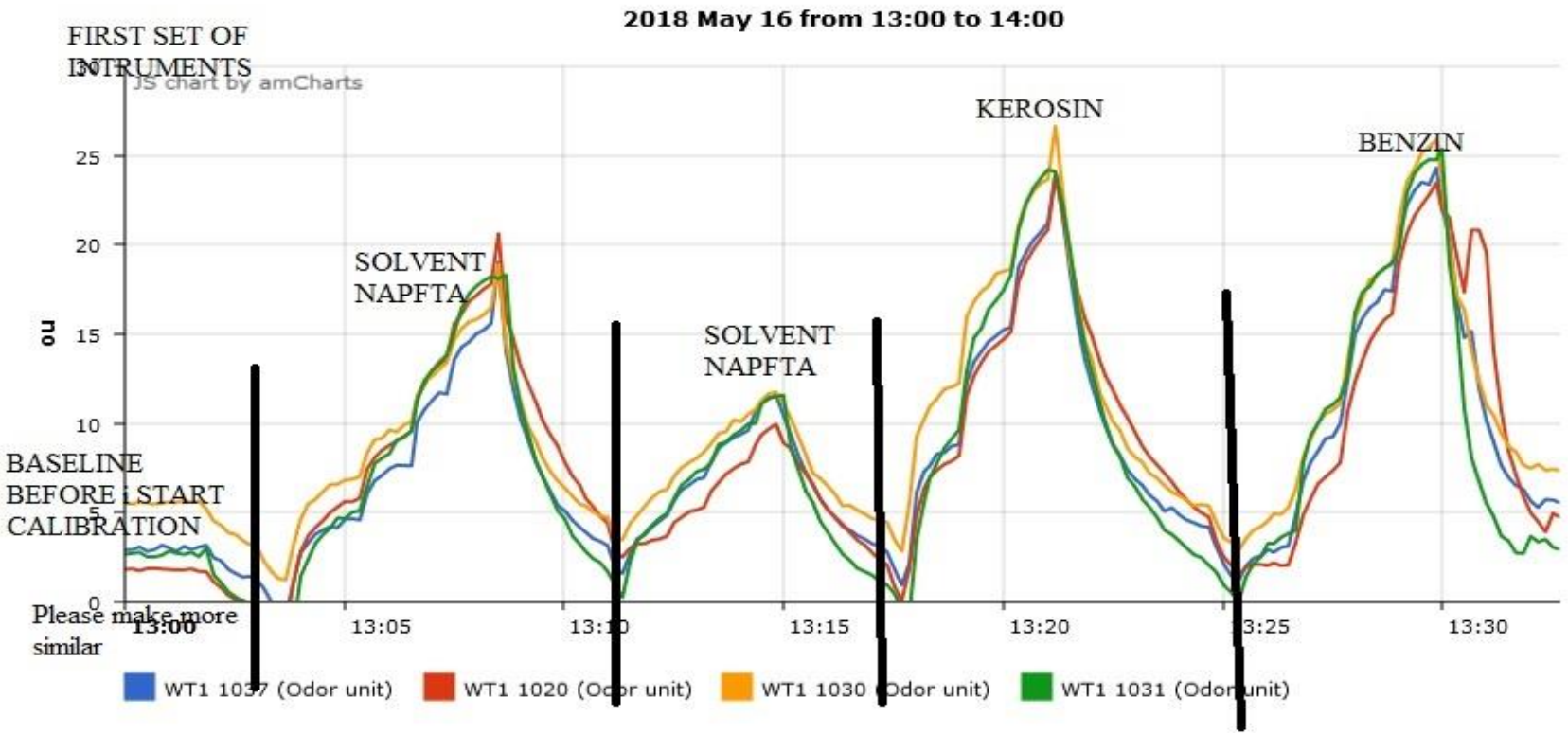
Port management Case study

Oil & Gas Port Ventspils/ Latvia

Methodology: Fingerprinting of known sources. Mapping of Database.



Fence Monitoring, “Odor Fingerprinting” and Source identification

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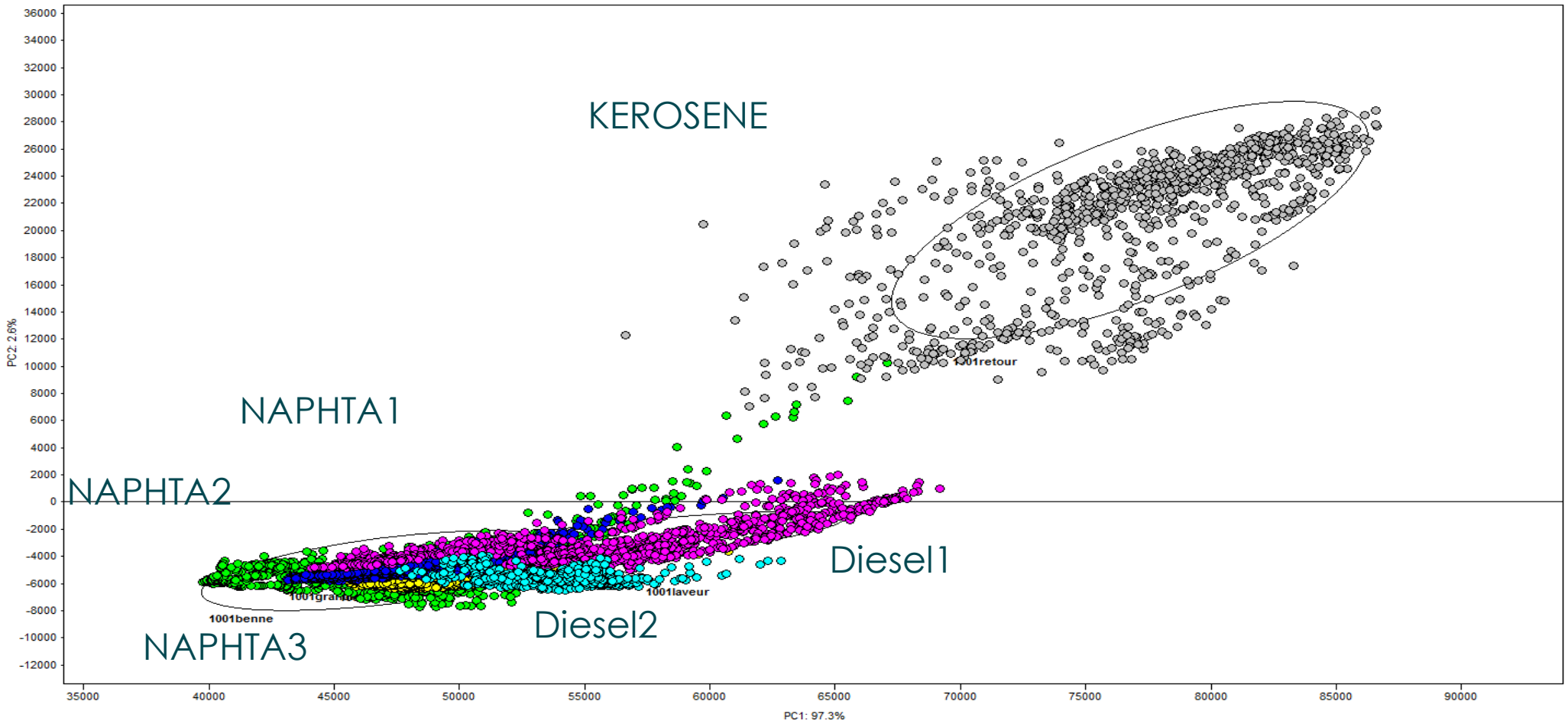
VENTSPILLS SEAPORT MONITORING



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EllonaSoft Platform | Statistical tools (Multivariate Statistics)

PCA or Principal Component Analysis

Principle: Find component axes that maximize the variance of the data

Use: Data exploration & visualization

LDA or Linear Discriminant Analysis

Principle: Find component axes that maximizes class-separation. Linear classifier.

Use: Odor classification, source identification

SQC or Statistical Quality Control

Principle: a distance that assesses the similarity of the data with a reference

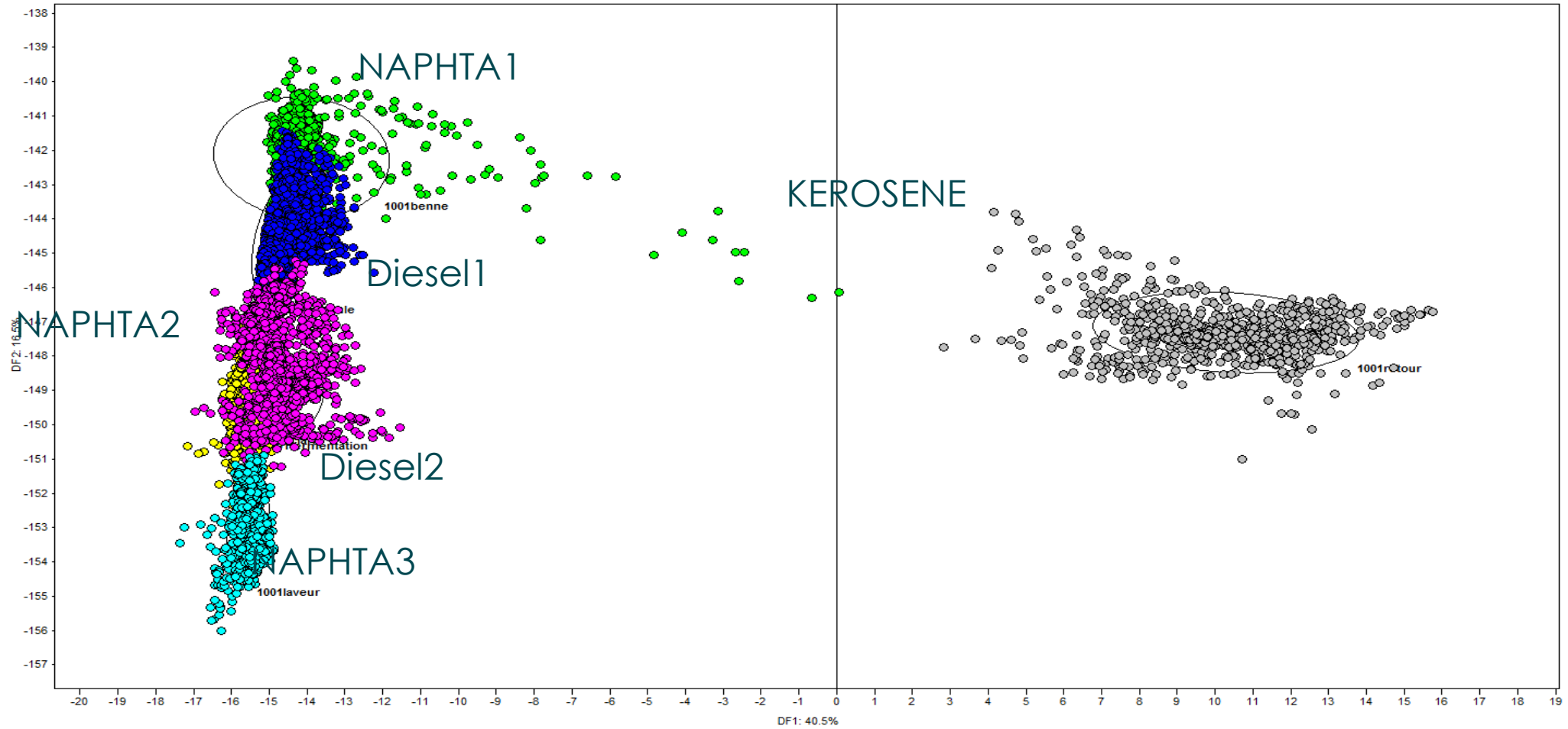
Use: Trigger alarms when unusual events happen

PLS or Partial Least Squares regression

Principle: a regression technique often used when the number of variables is significantly larger than the number of data points

Use: Get Odor intensity (following EN13725/ ASTM679 standard) from a set of sensors values

VENTSPILLS SEAPORT MONITORING



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Wastewater Plant

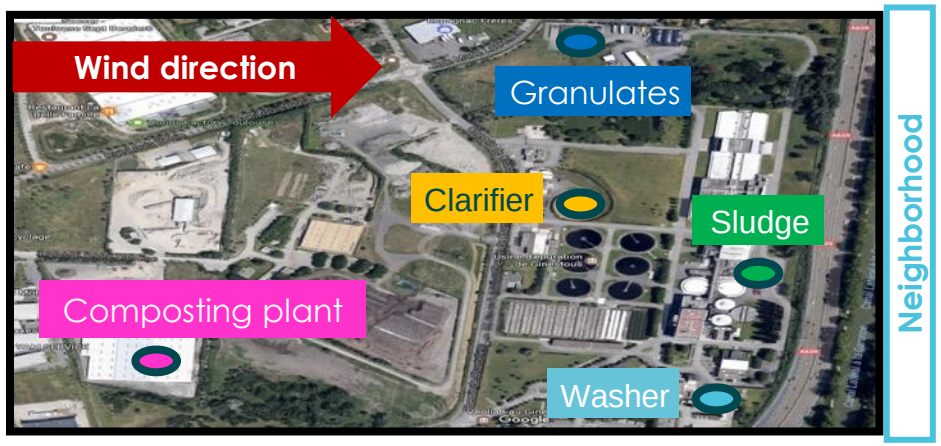
Case study

Context:
- Emissive pollution, particularly odors & gases
- Toxic gases: Hydrogen Sulfide or Methane
- Regular monitoring audits by local authorities

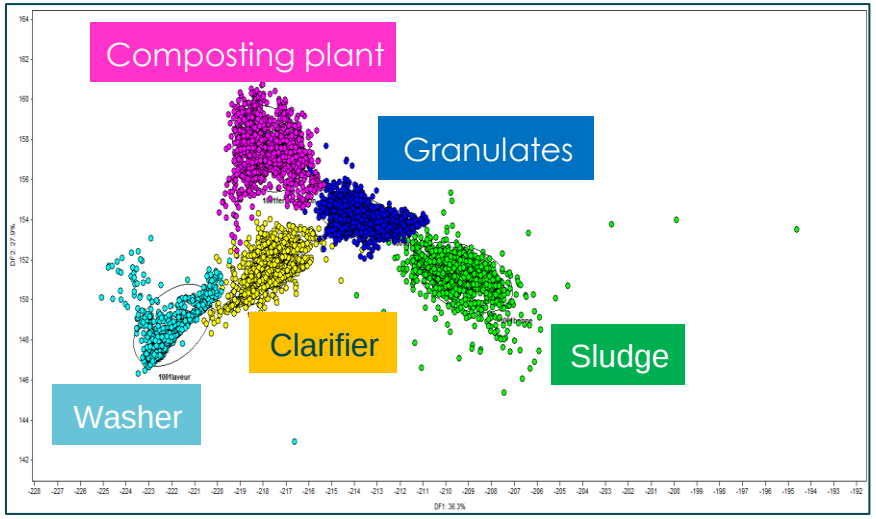
Challenge:
- Not representative samples taken by external auditing companies
- Need of real-time analysis for quantification & on-time remediation
- Local complaints of odors coming from the sludge

Wastewater plant – Case study

Possible sources of pollution



Fingerprinting of sources



Solution: WT1 network

- Real-time measurement of wastewater / water purification system
- Identification of gas & odor source emissions
- Continuous monitoring of intrinsic liquids parameters

Impact:

- Composting plant and not sludge as main source of bad odors
- Reduction of odor impact on employees & local communities
- Optimization of processes & teams' collaboration
- Energy savings of chemical additives (emulsifiers, smell-masking chemicals)
- Operating costs' savings through real-time activation processes

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Wastewater plant – Case study

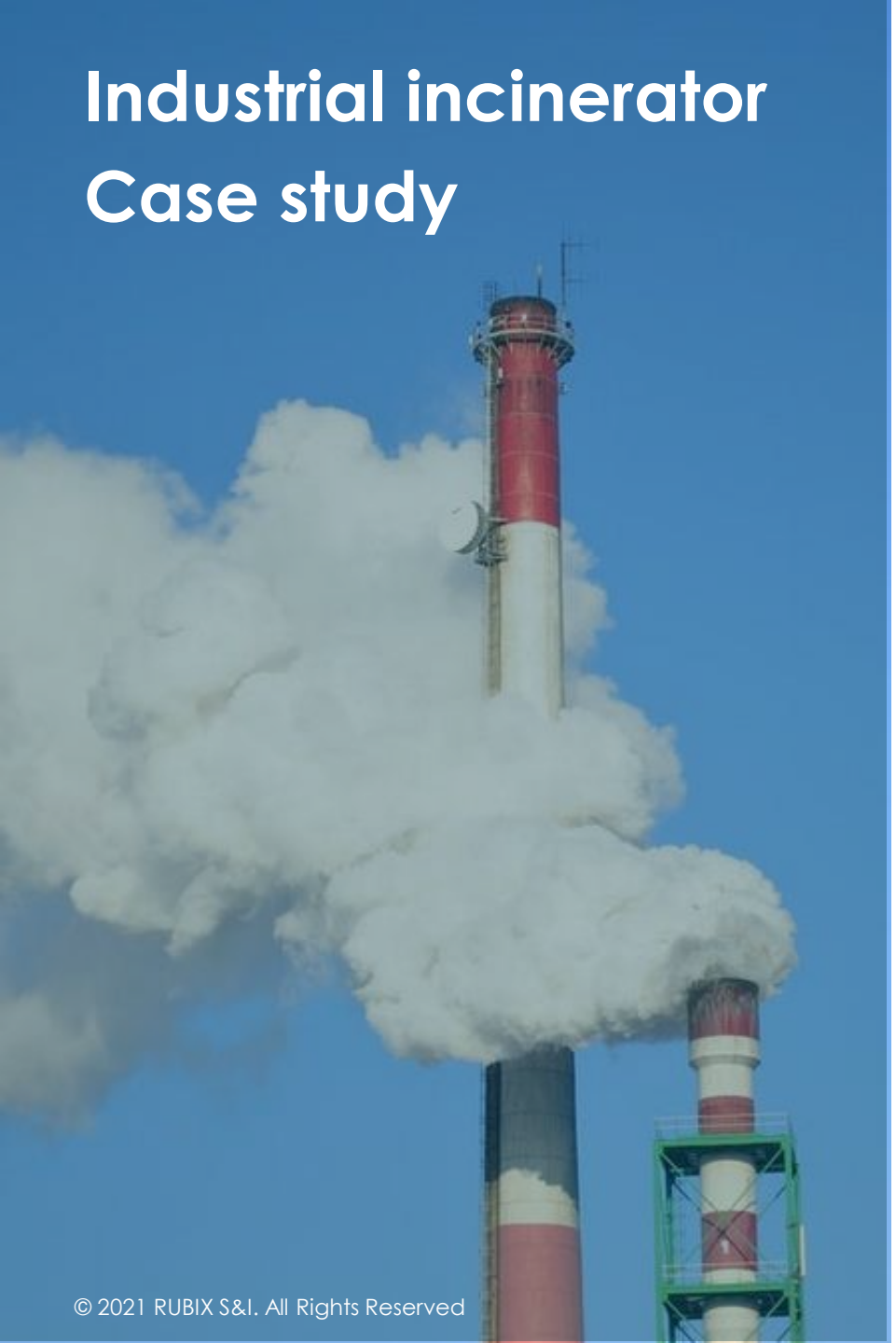
Customer testimony: Béziers Municipality

Thanks to ELLONA solutions, we were able to identify the actual sources of pollution

The odor differentiation approach through "fingerprinting" proved to be of a great value for our operations

This unquestionable data-driven approach contributed to the necessary dialogue between stakeholders. It enabled everyone's engagement in a continuous improvement approach

Industrial incinerator Case study



Context:
- Odor emissions affecting the site and its vicinity
- Regular reporting to stakeholders: air quality public agencies, local governments & neighborhood

Challenge:
- Map odor nuisances: determine sources, typologies (intensity & quality), frequencies & possible link with the site's activities
- Monitor odor emissions coming from stacks

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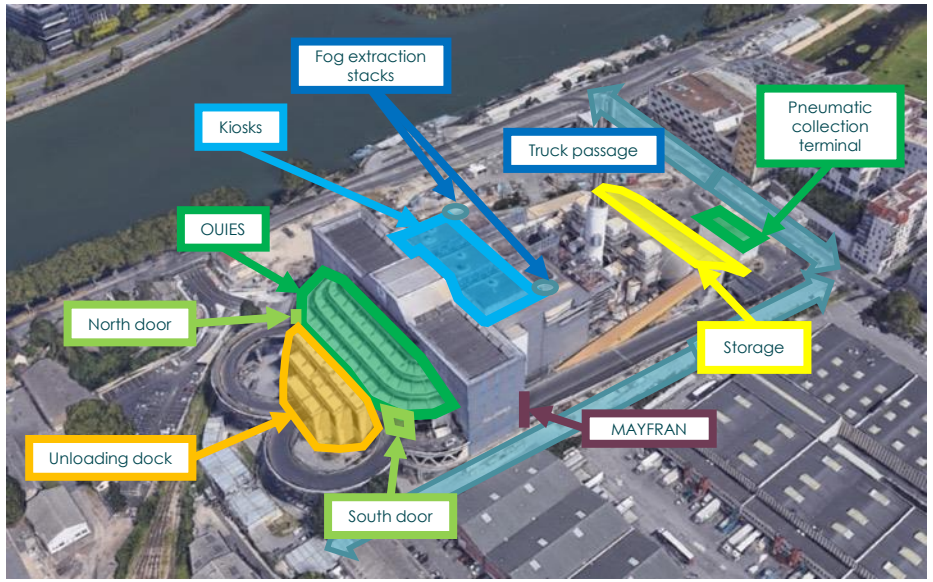
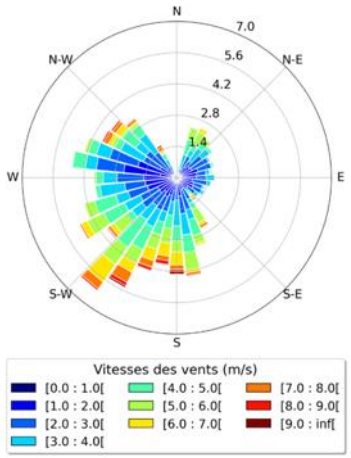
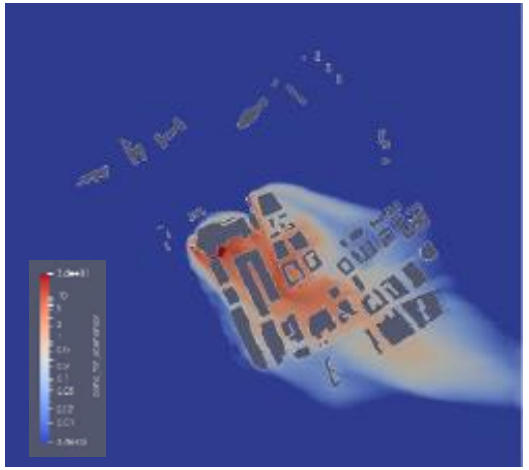
Industrial incinerator

Emission sources of site & passage routes





Wind rose of the site



3D air modeling

Solution: WT1 + Dryer

- Identify main sources of nuisances; considering metereological data, odor dispersion & local complaints mapping
- Observe odor nuisances: odor triangulization
- Dryer plugged to stacks with probe for odor dispersion

Impact:

- Identification of odor nuisance's sources outside the site
- Implementation of odor mitigation measures
- Enhanced communication with stakeholders with detailed reports
- Better characterization based on dynamic 3D odor dispersion

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6.

Key takeaways

Key Takeaways

Outdoor environments:
Understand the risks & be in control of your environment

A complete ecosystem:
Real-time monitoring, visualization & management of indoor environments

Solution-based offer:
Focused on solving business problems, with use-case-adapted environment measurements

Better decision making:
Improve operations while proposing a healthy & secured environment

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Unlock your environmental intelligence

Get a ELLONASoft demo!

- TVOC
- Temperature
- Fine particles
- Humidity
- Gas
- Atmospheric pressure
- Odors
- Noise

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Thank you

www.ellona.io

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