INNOVATIVE ODOUR IMPACT ASSESMENT FOR WWTP USING EXPERIMENTAL AND DISPERSION MODELLING TECHNIQUES

ÍNDICE

01. Background

- During the last years, there is a need to plan strategical investments to **reduce Wastewater Treatment Plant (WWTP) odour impact**, which it is **generally carried out by covering and deodourizing** the main process units involved.

- The standard technique consists of using **modelling software** combined to **dynamic olfactometry.**
  (Strongly depend on the emission sources set in the software)

NEW!

Study based on "**What if" scenarios.** Exhaustive olfactometric campaign measuring separately **different parts of the primary settling process**:

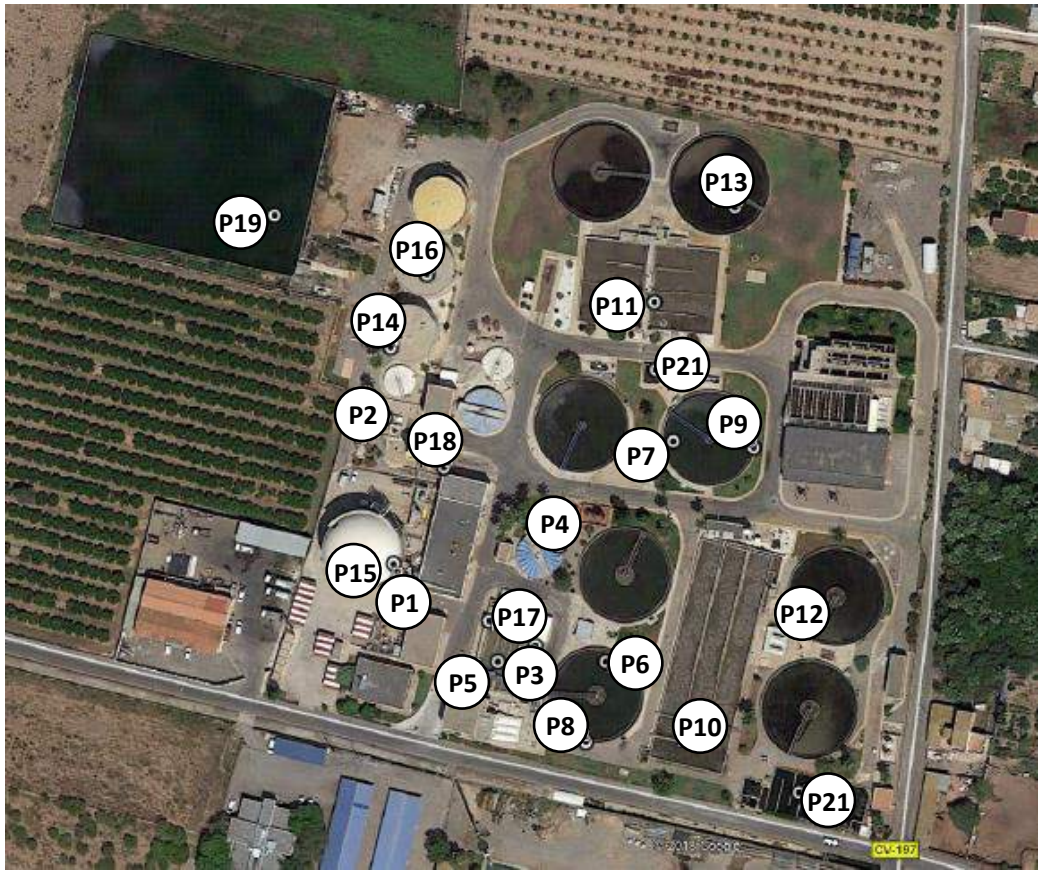
Passive areas (low emission, low turbulence)

Active areas (high emission, high desorption)

IMPROVE DIAGNOSIS

02. Odour Sources Identification

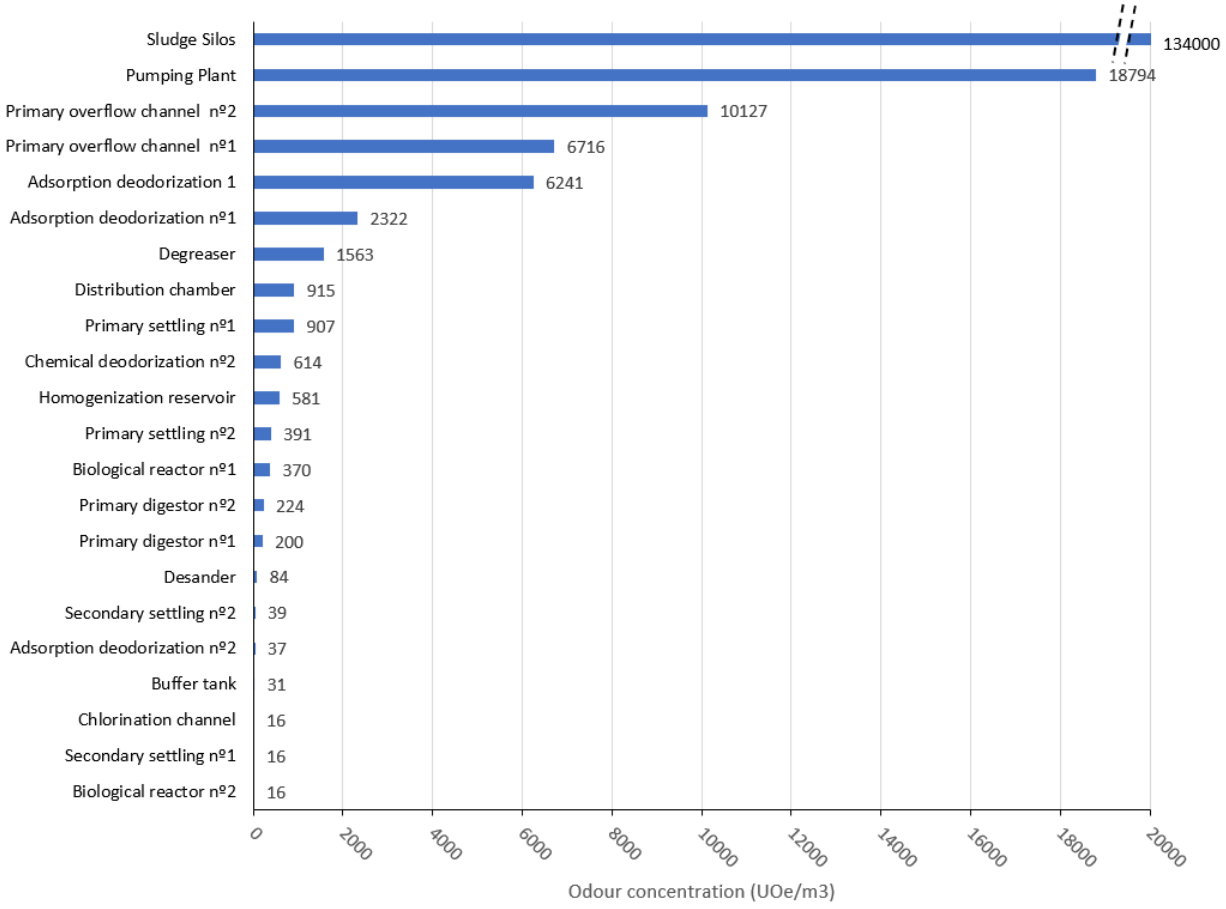
All the potential **odour sources in the WWTP** have been identified. In all the selected points, **air samples** have been taken in order to be analyzed via **Olfactometry method**.

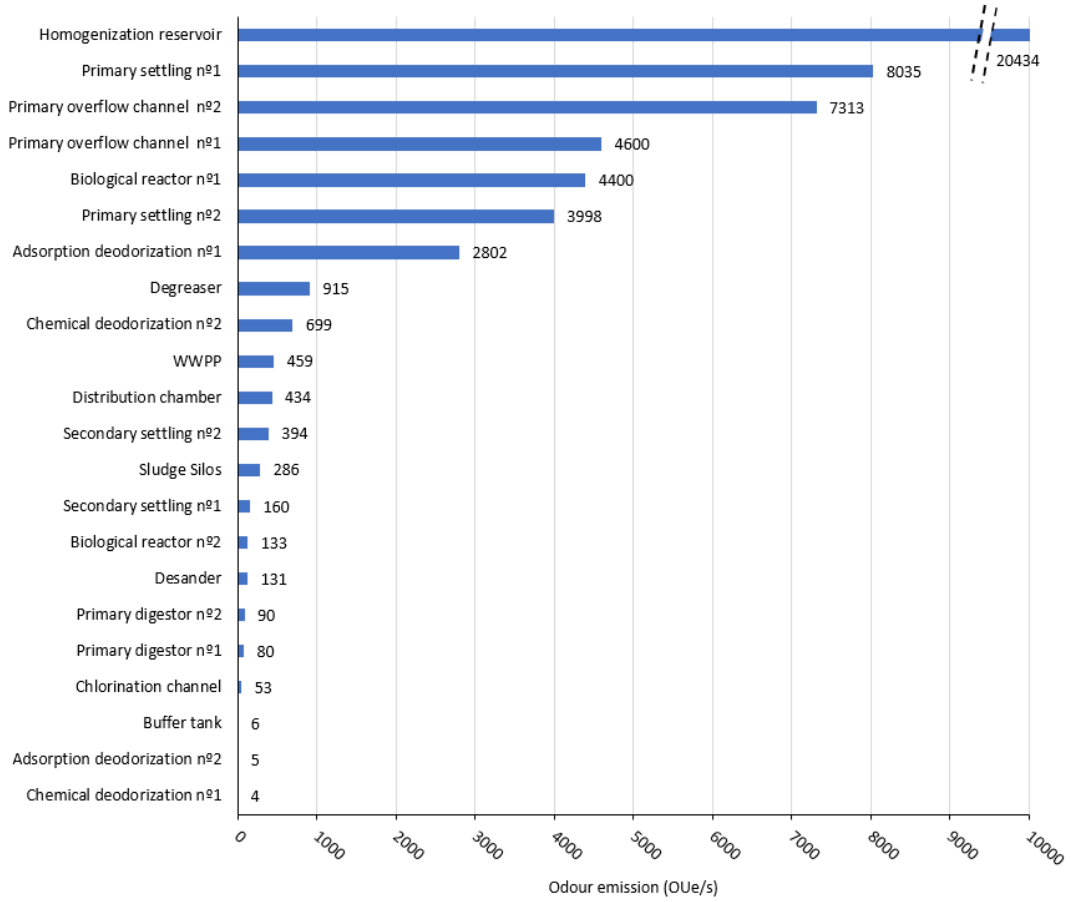


P1- Chemical Deodorization 1
P2- Chemical Deodorization 2
P3- Deodorization Adsorption 1
P4- Deodorization Adsorption 2
P5- Desander
P6- Primary Settling Tank L1
P7- Primary Settling Tank L2
P8- Primary Overflow Channels L1
P9- Primary Overflow Channels L2
P10- Biological Reactor L1
P11- Biological Reactor L2
P12- Secondary Settling Tank L1
P13- Secondary Settling Tank L2
P14- Primary Digestor L1
P15- Primary Digestor L2
P16- Buffer Tank
P17- Degreaser
P18- Sludge Storage Silos
P19- Homogenization Reservoir
P20- Pumping Plant
P21- Chlorination Channel
P22- Distribution Chamber

02. Odour Emission Values

Olfactometries have been developed by a **certified laboratory** that has provided the odour concentration values and **odour emission values** of each source in the WWTP.





02. Odour Emission Values

The main conclusions after analyzing the Odour emission values are:

The Sources with the **maximum odour concentration** are:

- Sludge Silos = **134000 ou_E/m^3**
- Pumping Plant = **18794 ou_E/m^3**

→ Small Emission Area (grooves) → **Reduced Odour emission**

286 ou_E/s

459 ou_E/s

LOW IMPACT

The Sludge Silo Source has a **moderate odour concentration** with **581 ou_E/m^3**

→ Big Emission Area → **Great Odour emission**

20434 ou_E/s

HIGH IMPACT

The Primary Settling L1 & L2 (Passive area + Overflow Channels) odour emission is **23945 uo_E/s.**

The Primary Overflow Channels Odour emission is **11913 uo_E/s**.

→ **Primary Overflow Channels are 50%** of the total Primary Settling Process Odour

Lindvall alternative to measure overflow channels emission

04. Immission Points

In order to determine the odour reduction, it is necessary to stablish emission points where the odour concentration will be analyzed with the CALPUFF simulations. This points are selected attending to:

- **Sensitivity** (p.e. hospitals, restaurants, educational centers…)
- **Crowded areas** (urbanizations near WWTP)
- **Previous odour complaints**

04. “What if” Scenarios

OC1 = Overflow Channel L1 (Primary Decanter)
OC2 = Overflow Channel L2 (Primary Decanter)

Current Scenario: No Actions

Scenario #1: OC2

Scenario #2: OC1 + OC2

Scenario #3: OC1 + OC2 + Degreaser + Sludge Silos + Distribution Chamber

Scenario #4: OC1 + OC2 + Homogenization Reservoir

Scenario #5: OC1 + OC2 + Homogenization Reservoir + Degreaser + Sludge Silos

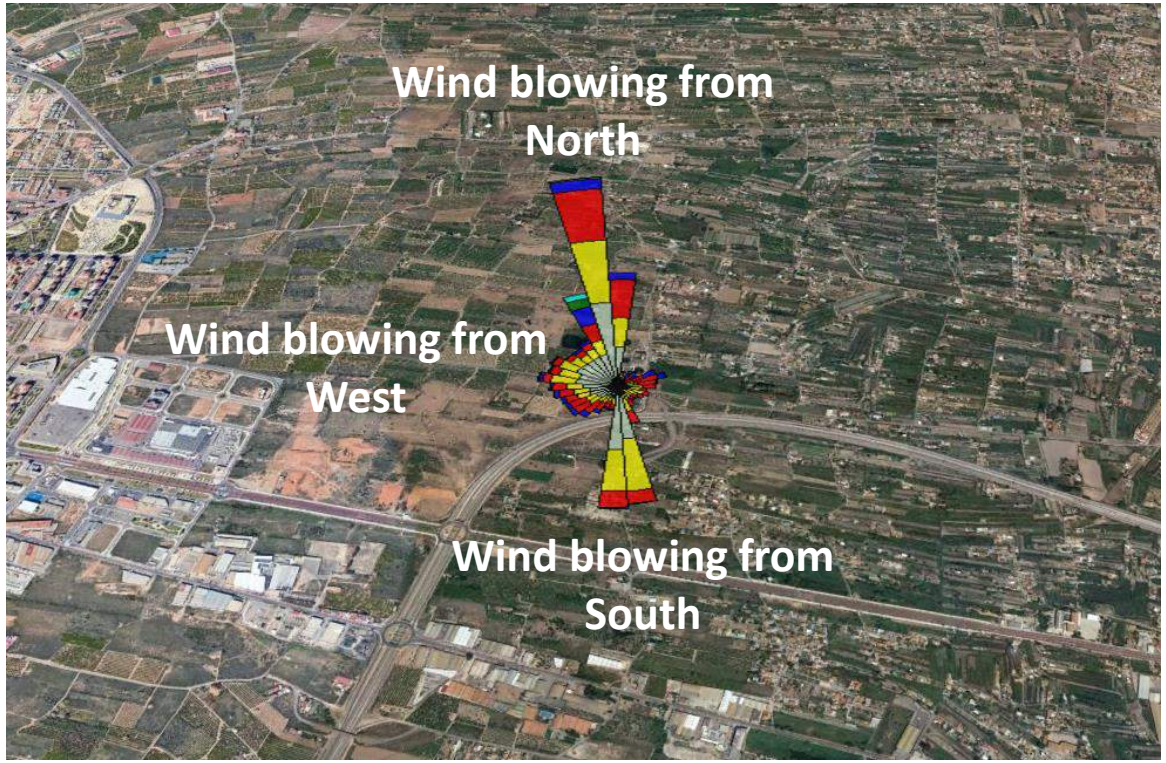
Scenario #6: OC1 + OC2 + Homogenization Reservoir + Degreaser + Sludge Silos + Distribution Chamber

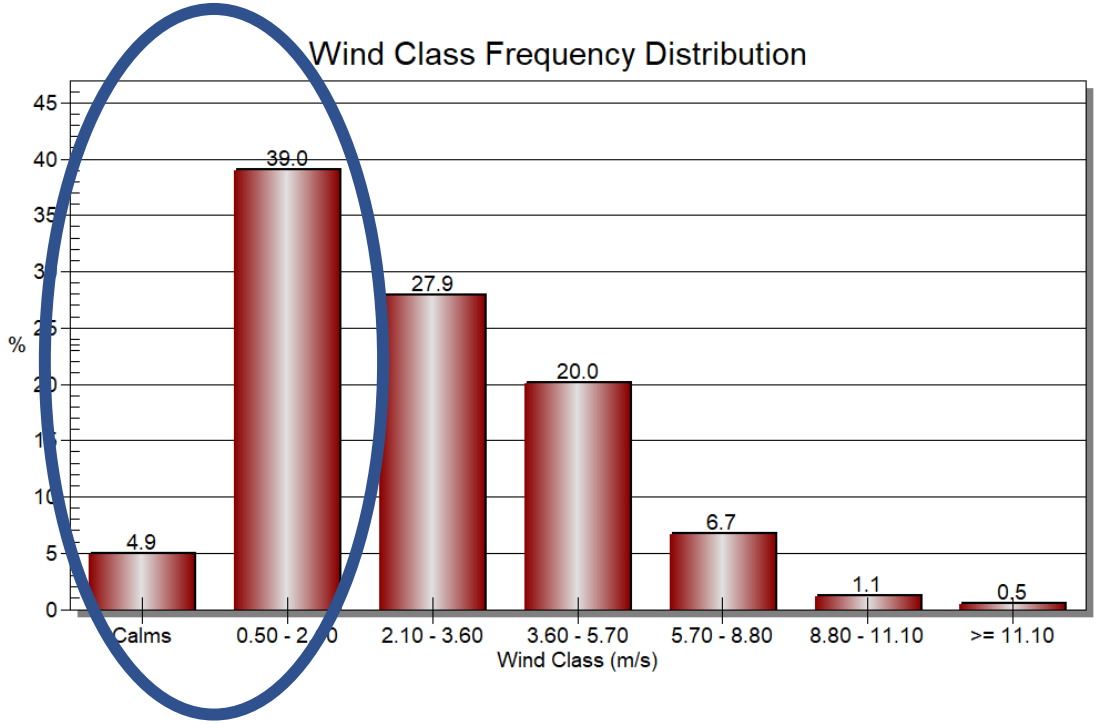
Scenarios are proposed according to highest odour emission processes. However…

The opinion of WWTP technicians is very important!!

05. Meteorological Analysis (Winds)

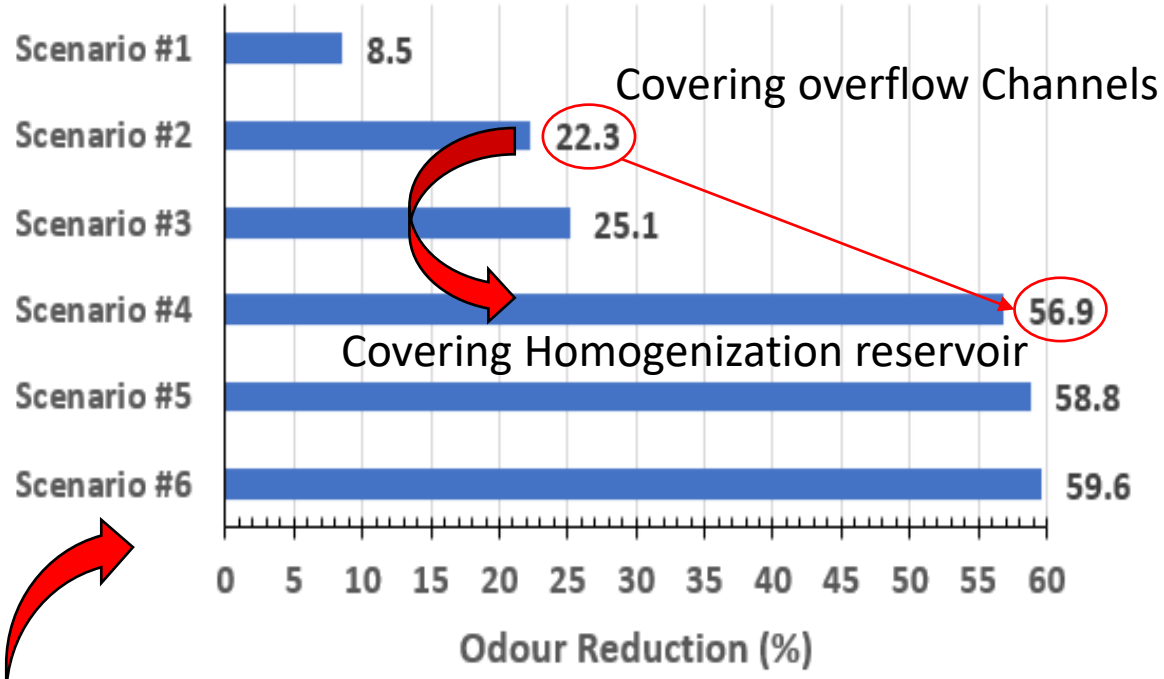
The wind rose chart has been obtained for the whole year analysis.





Low wind velocity is expected which could difficult odour dispersion

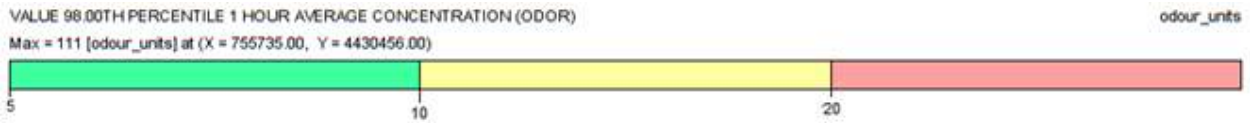
06. Results



	Immision Points	Percentile 50	Percentile 75	Percentile 80	Percentile 85	Percentile 90	Percentile 98	Percentile 100%
Current scenario	1	0.0	0.2	0.9	3.1	9.6	46.0	130.8
	2	0.0	0.0	0.0	0.0	0.2	2.8	21.7
	3	0.0	0.0	0.0	0.0	0.1	1.4	9.4
	4	0.0	0.0	0.0	0.1	0.4	3.5	17.8
	5	0.0	0.0	0.0	0.1	0.3	3.0	14.2
	6	0.0	0.0	0.0	0.0	0.1	1.4	8.3
	7	0.0	0.0	0.0	0.2	0.8	9.4	53.6
	8	0.0	0.0	0.0	0.1	0.4	3.7	17.0
	9	0.0	0.0	0.2	0.8	2.1	20.9	72.3
	10	0.0	0.0	0.1	0.4	1.2	6.2	23.9
	11	0.0	0.1	0.1	0.2	0.3	1.4	6.9
	12	0.0	0.0	0.0	0.0	0.0	0.4	2.9
	13	0.0	0.0	0.0	0.2	0.6	4.3	25.5
	14	0.0	0.4	1.0	2.5	5.3	28.6	103.6
	15	0.0	0.0	0.1	0.5	2.0	17.1	49.1
	16	0.0	0.0	0.1	0.9	3.0	18.4	50.7
	17	0.0	0.0	0.0	0.2	0.7	4.6	20.3
	18	0.0	0.0	0.0	0.2	0.7	6.9	27.1

Odour values for $C98_{1hour}$
Current scenario
(No actions)

Odour values for $C98_{1hour}$
Scenario #6
(All actions)



07. Conclusions

- A **new odour measurement methodology** has been presented using a “what if” scenario diagnosis.
- A **new technique** has been used to **measure the overflow channels** of the primary decanters.
- The results show that the **primary settling overflow channels odour emission**, varies among **36% and 65%** of the total process emission (50 % as an average).
- The **coverage of the primary settling overflow channels** represents a reduction of **22.3% . This is an affordable and cost-effective solution**
- The source that produces **the greatest impact is the homogenization reservoir**. Action on this focus raises the **reduction** achieved to values **close to 60%.**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