



Our industry,  
our world.  
Be sustainable ●

# The Problem

Pellets are the raw material for creating plastic solutions. However, due to their small size, if they are not properly managed, there might be leaks along all stages of their life cycle; from production all the way through to transformation or in later recycling stages.

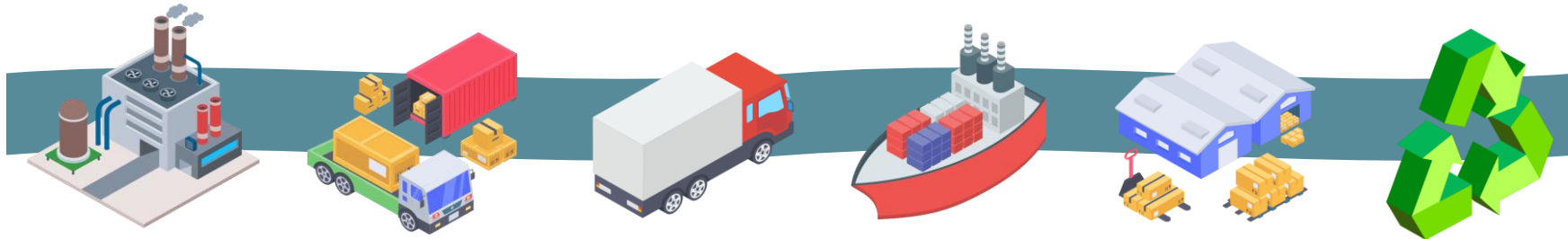


# The Commitment

Operation Clean Sweep® is a worldwide initiative whose main goal is to **tackle the problem of resin loss** to the environment.

Companies which sign the OCS pledge are committed to implementing sustainable practices aimed towards **zero pellet loss**.

It is vital that **companies across the entire plastics supply chain** (production, handling, transportation, storage, conversion and recycling) act consciously to reduce their negative impact on the environment.



***We are the stakeholders who can lead this change.***  
*Our industry. Our world. Our responsibility.*



# Problems at an Industrial Complex

At their industrial complex in Tarragona, Spain (the first polyolefin production site to receive the OCS certification in Europe), Repsol identified different issues that they wanted to control:

- 24/7 surveillance of battery limits
- Uncontrolled presence of plastic pellets within the installation
- Control of larger areas
- Data governance, data storage and data analysis

By combining their expertise, **REPSOL** and **MERASYS**, with the partnership of **FIELDDEAS**, have developed an innovative solution to tackle each of these problems and to aid Repsol advance in their commitment to the Operation Clean Sweep program.



That solution is **Pelltinel**•

Pelltinel covers all the use cases identified in a polyolefin manufacturer, such as Repsol, and its developed solutions are scalable to any other role within the plastics industry value chain.

We are currently part of a Working Group at a European level in Plastics Europe in which we are working to extend Pelltinel across the entire value chain.

# Collaboration, the key of PELLTINEL

As a strong, multi-energy company, **REPSOL** often search for **agile solutions**, with a **quick turnaround** and at a **low cost**. By collaborating with SMEs, REPSOL are able to develop solutions of the highest quality with experts in their respective fields.



After connecting via social media, **MERASYS**, a company leader in artificial intelligence applied to industrial processes, offered solutions based on computer vision for the detection of plastic pellets, which would help REPSOL in their commitment to OCS. In the space of one month, tests were already being carried out in their own installations.



The incorporation of **FIELDEAS**, a company focused on the development and implementation of multisectoral technological solutions, came with the idea of being able to accurately localise each plastic pellet detection event. This would aid in the prevention and prediction of future incidents at complexes.



After extensive testing, deep learning and development, Pelltinel has come to life. A pioneering solution which will aid companies in their digitalisation and shaping the future of the plastics industry, demonstrating once more the value of our digital ecosystem.



**REPSOL**



**MERASYS**

Itera T • Itera Maroc • Enxenia



**FIELDEAS®**

# The Solution

**Pelltinel** is an intelligent digital product whose main objective is to **detect, monitor and measure the presence of plastic pellets** at different sites **along the plastics value chain**; whether that be in petrochemical compounds, logistics centres or transformation companies. It is a global system, **working 24/7** with **a time to first value of approximately one month**.

By using Computer Vision and RTRM (Real Time Remote Monitoring) technologies, Pelltinel aims to:

## DETECT

Detect uncontrolled pellet spillages at an early stage, allowing for the implementation of any necessary mitigation actions.

## PROTECT

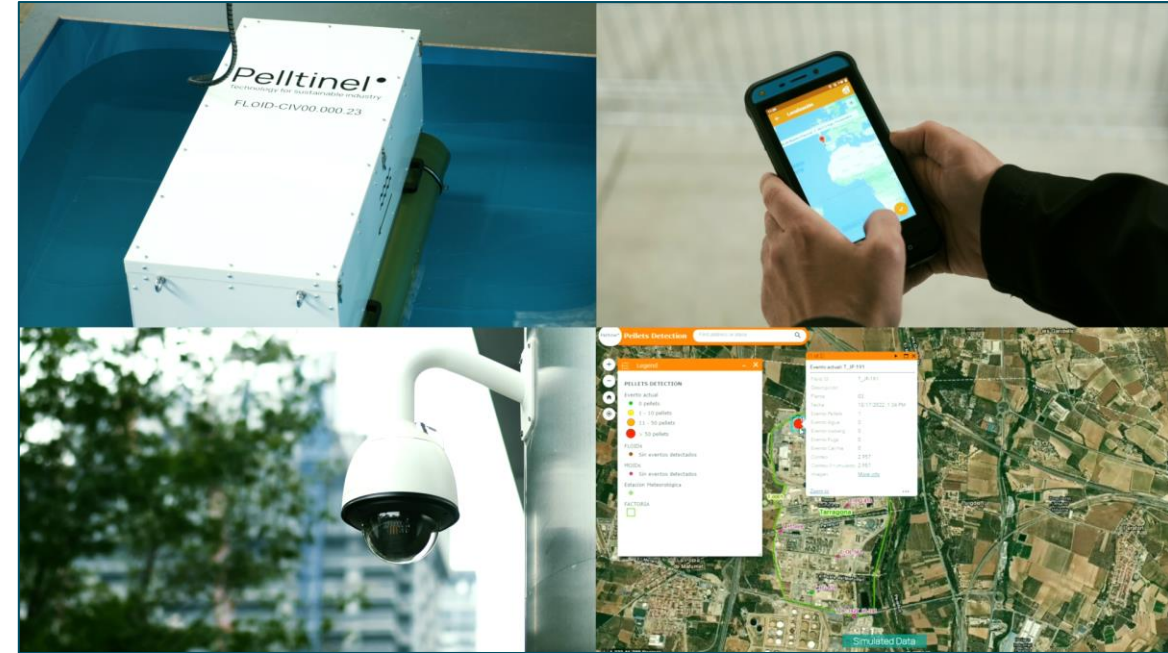
Protect the environment by reducing the number of pellets lost.

## ANALYSE

Analyse data history to form predictions and to identify any recurring problems.

## MINIMISE

Minimise cleaning and maintenance costs and encourage overall more efficient operations.



### Pelltinel consists of the following components:

- **FLOID** - **FLO**ating **I**nspection **D**evice
- **CABID** – **CA**tch **B**asin **I**nspection **D**evice
- **MOID** - **MO**bile **I**nspection **D**evice
- **FCID** - **Fi**xed **C**amera **I**nspection **D**evice
- **GIS** - **Ge**ographic **I**nformation **S**ystem

# Pellet Detection on Aqueous Surfaces

## FLOID

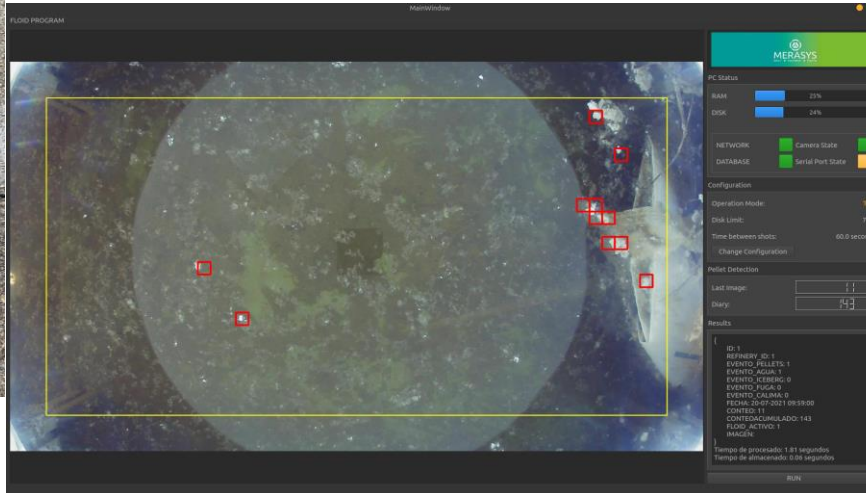
### Floating Inspection Device

A device designed to be installed in waterways, which floats in the liquid and constantly measures any pellets within the control zone.

## CABID

### Catch Basin Inspection Device

A device designed to be installed in catch basins. Sensors measure the liquid's level, allowing the illumination and camera zoom to adjust themselves accordingly to maintain a constant image for the neural networks detect accurately.



### How do they work?

- High-resolution cameras with computer vision technology capture images of a liquid's surface.
- Convolutional neural networks have been trained to detect the presence of liquid and then the system will begin its monitoring of plastic pellets and pellet powder.
- The images are processed in real time, identifying and quantifying any present pellets and pellet powder within the control zone.
- All registered data is sent to a platform via GPRS where results can be analysed and the device can be accessed remotely. From this platform, notifications can be sent to any device or software.
- The devices can function outdoors and under adverse weather conditions – ensuring 24/7 operation.
- Any lost pellets within liquid flows are detected instantly. Workers are therefore able to react quickly and make decisions for their control.

#### *FLOID and CABID generate weekly reports to show the following:*

- |                                       |   |
|---------------------------------------|---|
| • No. of images captured              | • No. of images with water                          |
| • No. of images with pellets          | • Pellets detected                                  |
| • No. of images with pellets detected | • Quantity of pellet powder detected                |
| • No of alerts generated              | • Highest no. of pellets detected in a single image |



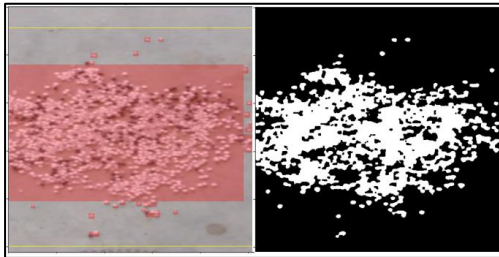
# Pellet Detection on Ground Surfaces

## MOID

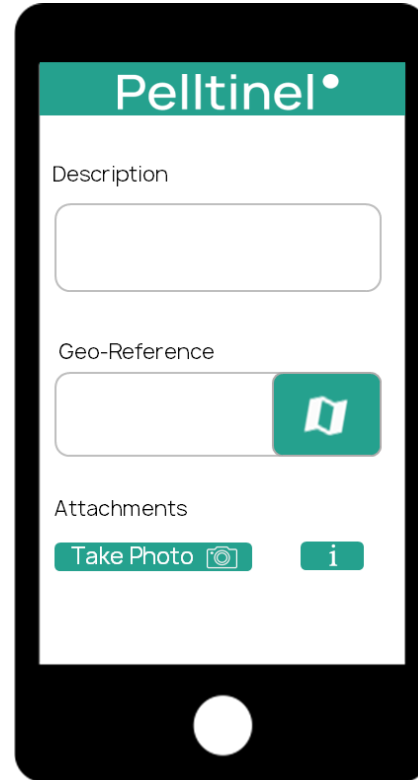
### Mobile Inspection Device

**A multi-device and multi-platform solution based on a smart application.**

Staff can use this application to capture images at almost any point within a complex. The images are sent to a platform where they are processed in order to identify and quantify any pellets detected.



All of the images collected across Pelltinel are geo-referenced. This means pellets can be accurately localised which can aid in identifying common sources of spillages. As a result, decisions can be made on how to control these points and reduce pellet loss.



## FCID

### Fixed Camera Inspection Device

**A high-resolution fixed camera for the monitoring of plastic pellets across large areas.**

Images are taken of large areas within industrial sites, such as at internal loading and unloading zones, roads and parking areas. These images are then processed in order to detect any pellet spills and are geo-referenced for their accurate localisation.

The camera is also capable of reading number plates, meaning vehicles can be controlled before exiting the site thus reducing the risk of pellet loss during transportation.

As well as being able to reduce the environmental risk of pellet loss, the static camera can also help with general safety and security, by preventing any potential accidents caused by unidentified spillages.



*MOID and FCID generate weekly reports to show the following:*

- No. of images captured
- Quantity of pellet powder detected
- No. of images with pellets detected
- Highest no. of pellets detected in a single image
- No. of images with pellets
- Pellets detected
- No of alerts generated

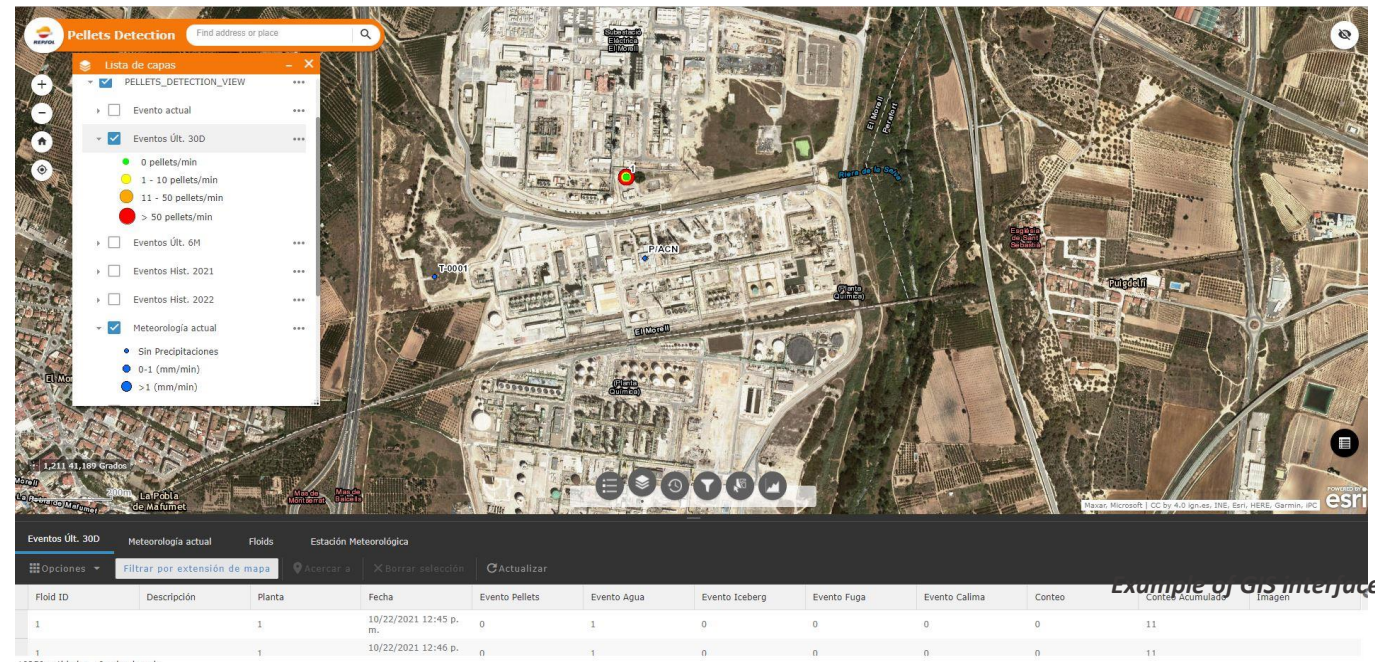


# GIS – Geographic Information System

Pelltinel relies on a Geographic Information System (GIS). It combines all information collected across the various components to form a more visual, geographic analysis of each pellet detection event.

## The principal functions of the GIS are to:

- Manage alerts and incident resolution, so that spillages can be detected at an early stage and any specific plans can be established for their mitigation
- Represent each pellet detection event in a visual way
- Generate heat maps to show areas with a high concentration of spills to tackle the problem at its source
- Carry out geo-processing to determine the upstream origin, expected runoff levels, potential points of spillage etc



All data is stored, which allows for both access in **real time** as well as subsequent viewing and analysis. The data represented can be used to **create reports** and **form predictions** of future incidents.

# Computer Vision Technology

Pelltinel stems from **neural networks and image processing**. Each device captures images and the trained neural networks analyse each image, identifying and quantifying any pellets and pellet powder detected.

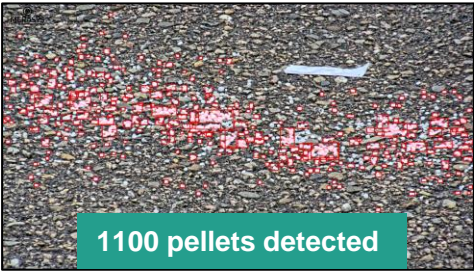
These neural networks have been developed based on agile methodologies. Firstly, some very reliable neural network models were developed at MERASYS installations for the different use cases, before taking them to operation in an industrial site where they only had to be adjusted according to the location of the hardware. This method allows us to develop the neural networks in controlled environments, where we can carry out a multitude of tests and training, so that they require minimal set-up times at the final location.

**Our neural networks have been trained using hundreds of thousands of images to detect pellets of different colours, sizes and on different interior and exterior surfaces;**

- **Surfaces** – industrial process flows, rain water, asphalt, concrete, cement & soil
- **Colours** – white, transparent, grey, black, pink, green, blue...
- **Volume** – From one single pellet to thousands
- **Size of powder accumulation** – from 7mm<sup>2</sup> to larger areas like 15m<sup>2</sup>

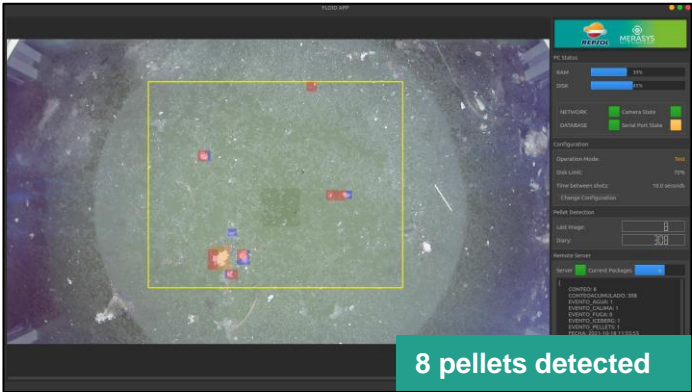
Training the neural networks is pellet-specific to each production plant (specific recognition and accuracy %)

In order to be considered operational, neural networks must have a reliability of more than 95-97% so that they can work autonomously.



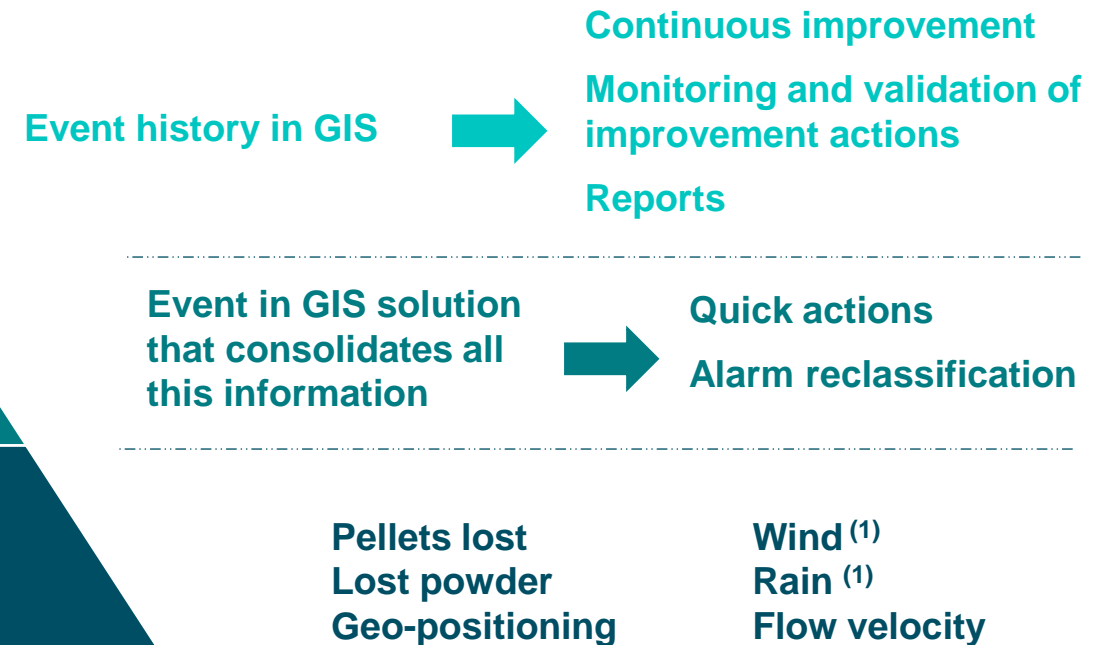
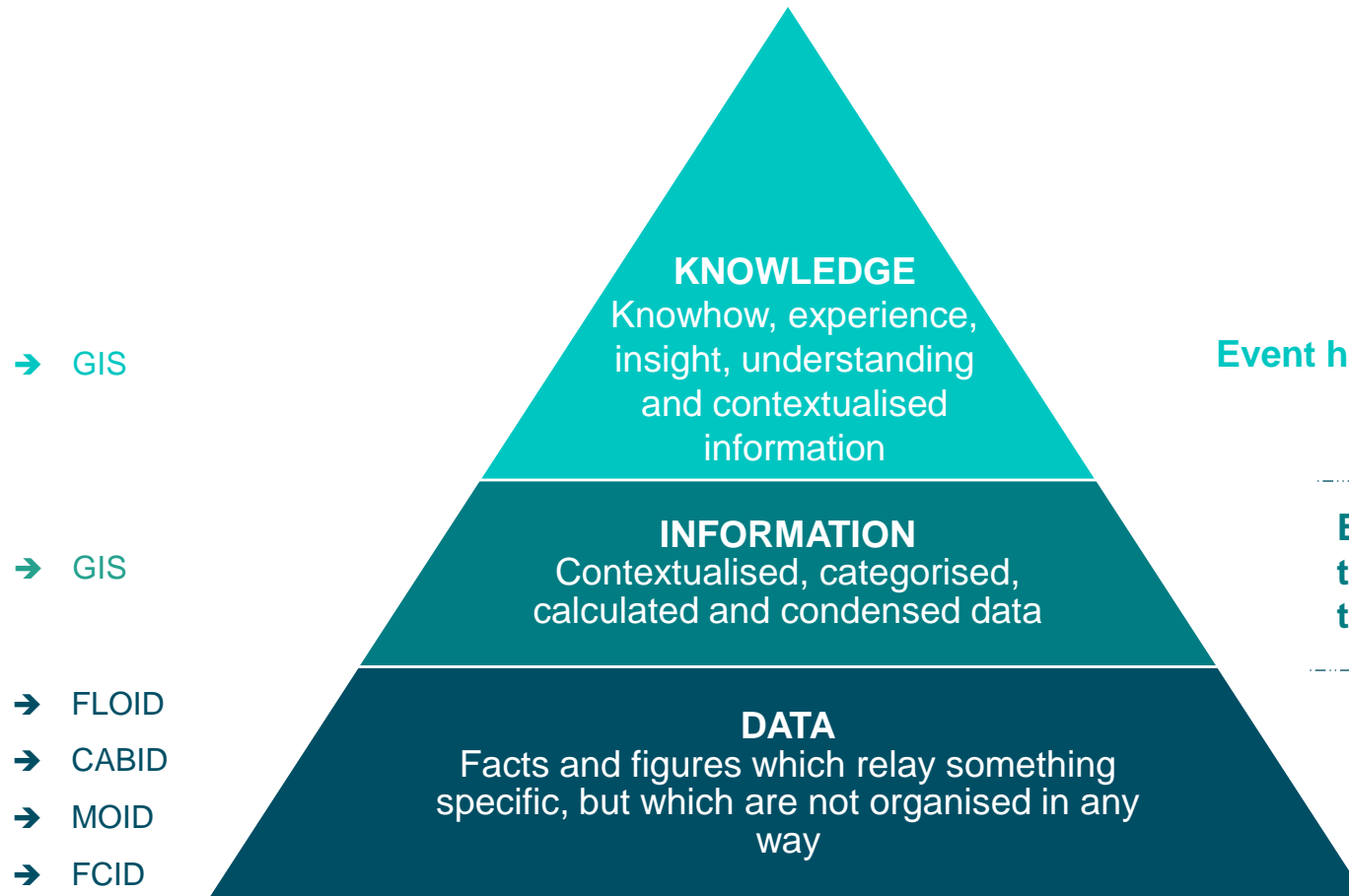
*Pellet detection on various ground surfaces*

Artificial vision over surfaces is the best technical solution for detecting pellet spills at its source and is also a valid solution for pellet detection in an installation's outgoing liquid flows.



*Pellet detection on liquid surface*

# From DATA to KNOWLEDGE



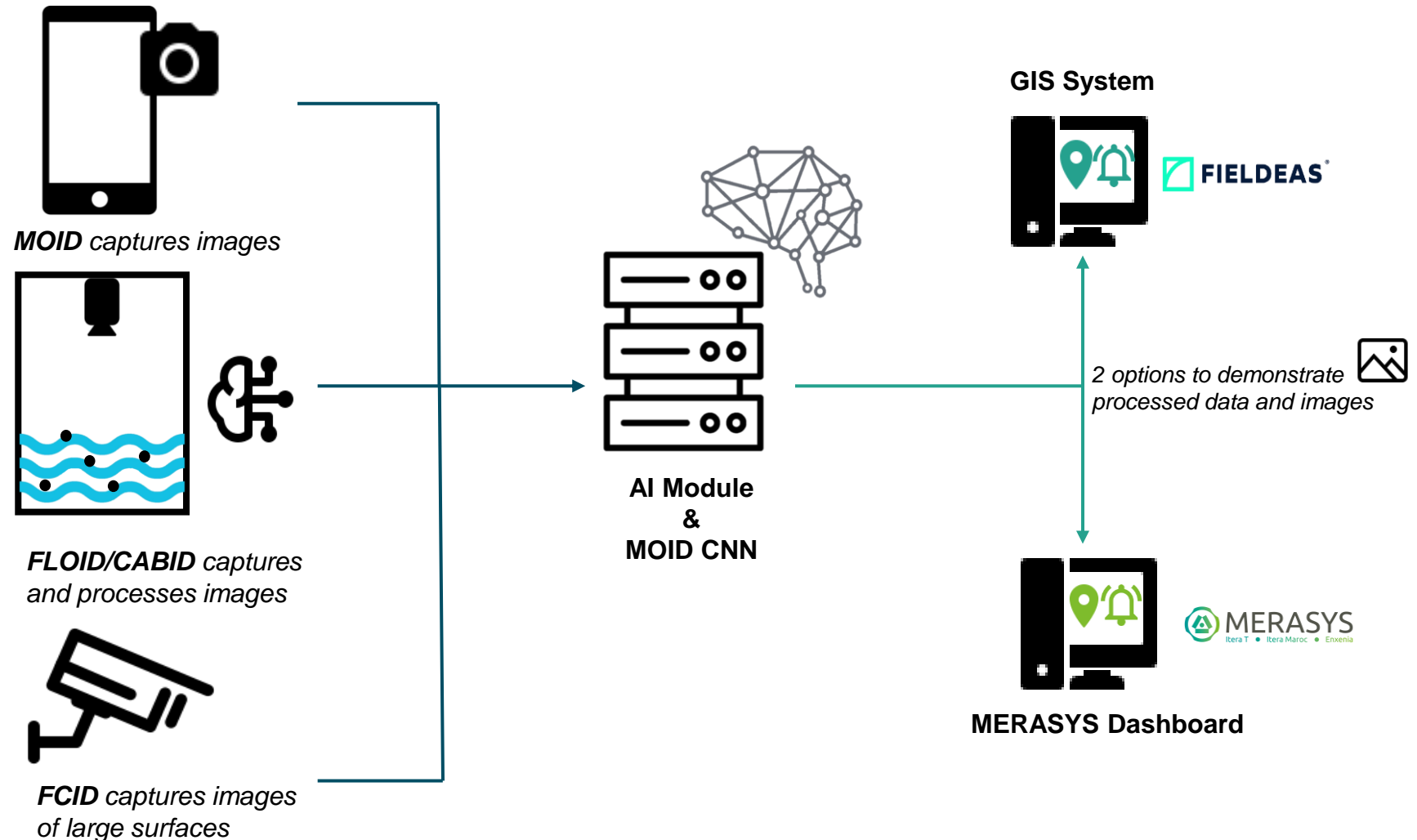


# Pelltinel System Architecture

**Pelltinel is a fully developed digital solution.**

Due to its architecture, the system offers **flexibility** and **scalability** depending on the needs of each client/industrial site and it can be implemented **On-Premise or SaaS**, ensuring industrial property through an NDA signed with MERASYS.

*Due to our expertise in engineering, we are also able to modify and develop the system's hardware to best suit the needs of each client, with the aim of creating the most effective solution possible.*



# How you can comply with the OCS Certification

OCS's Core Requirement states that: *The operator of the facility shall have instructions and systems in place to ensure that the potential loss of primary containment is minimised as far as reasonably possible with the objective to effectively prevent and manage any potential loss of pellets.*

Pelltinel aids with this certification and can be applied to various specific requirements.

**Producers, Converters and Transport/Logistics** should have a system in place for:

- Inspection & cleaning of trucks entering and leaving the site —————→ **FCID/MOID**
- Managing outgoing water facilities —————→ **FLOID/CABID**
- Inspection and management of fences on the perimeter of the facility that are in public areas when applicable —————→ **FCID/MOID**
- Evidence of OCS Monitoring measurement, analysis and evaluation. Estimation of yearly pellet loss of the previous calendar year based on the risk minimization methodology and internally developed KPIS. —————→ **GIS**  
*Number and volume of incidents resulting in any unrecovered release (loss) of plastic pellets, flakes, powders or granules, within the physical custody of a facility, to ground or water outside member-operated facilities and estimated to be greater than 0.5 liters or 0.5 kilograms per incident.*

**PELLTINEL**

The key objectives to achieve OCS certification:

- 1) **Make Zero Pellet Loss a priority**
- 2) **Evaluate the situation and needs of the company**, identifying the critical points of possible pellet loss in all stages of industrial activity.
- 3) **Assess and carry out any improvements to installations and equipment**, providing any necessary equipment for their correct implementation.
- 4) **Educate employees about the commitment of the company**, and create a sense of responsibility, by communicating to staff their key role in achieving the objective.
- 5) **Carry out monitoring** through measurable indicators, **assessing improvement by following new measures put in place.**

Thank You for your attention.

# Pelltinel® Our industry, our world. Be sustainable ●

In order to fulfill the Operation Clean Sweep program, our next step is to encourage all members across the plastics value chain to *join the change!*

Find out more information about Pelltinel from our socials below:



REPSOL



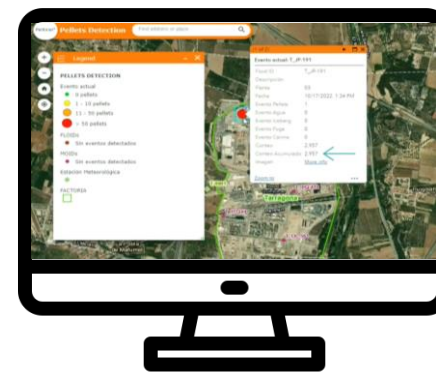
MERASYS



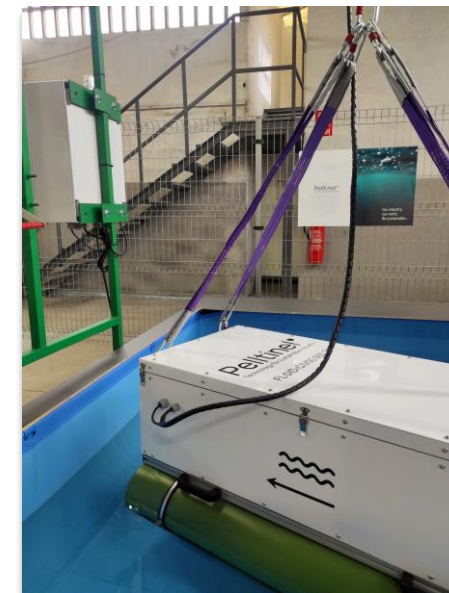
FIELDEAS

Pelltinel Demonstration Compound,  
MERASYS Site,  
Vigo, Spain

GIS



FLOID



FCID



MOID

