



**Quelles solutions de dépollution et de traitement à l'interface Eau et Sédiments ?**

**AN INNOVATIVE TECHNOLOGY FOR SEDIMENTS**

**DEHYDRATION, TREATMENT AND VALORIZATION**

**WITH ROLL-OUT POTENTIAL FOR SANDS WASHDOWN WATERS**

# BIRTH OF THE IDEA: SURICATES

Sediment Uses as Resources In Circular And Territorial Economies



## Problem to solve

- significant quantities of sediment dredged in Europe: canals, rivers and ports
  - Status of sediments is different from one country to another
  - Sediment treatment problems
  - Valorisation of sediments
- lack of materials for protection of cities against flooding, protection and reservation of arable soils, protection of canal banks or maritime coasts

# BIRTH OF THE IDEA: SURICATES

Sediment Uses as Resources In Circular And Territorial Economies

## SURICATES project objectives

New solutions to increase fine sediment reuse in coastal & erosion protection markets implemented and experimented for roll-out:

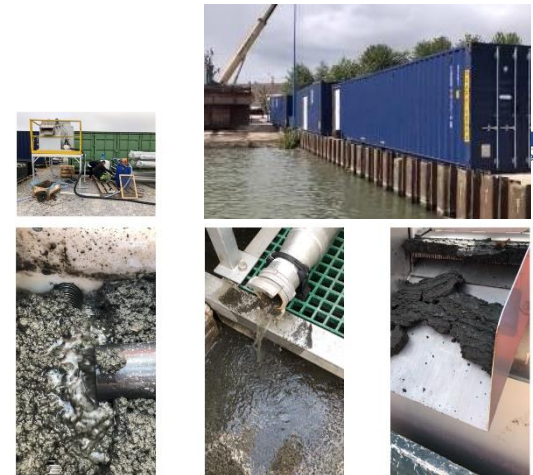
- Sediment reallocation within the system
- Bio-engineering with sediment
- Sediment as a pozzolanic material to strength sediment
- Sediment in concrete

Territorial global cost and benefits optimisation focused

Interreg NWE project : 2017 - 2022

## IXSANE contribution

Innovative dehydration equipment reducing space and time needed for dehydration to ease sediment reuse in a circular economy strategy

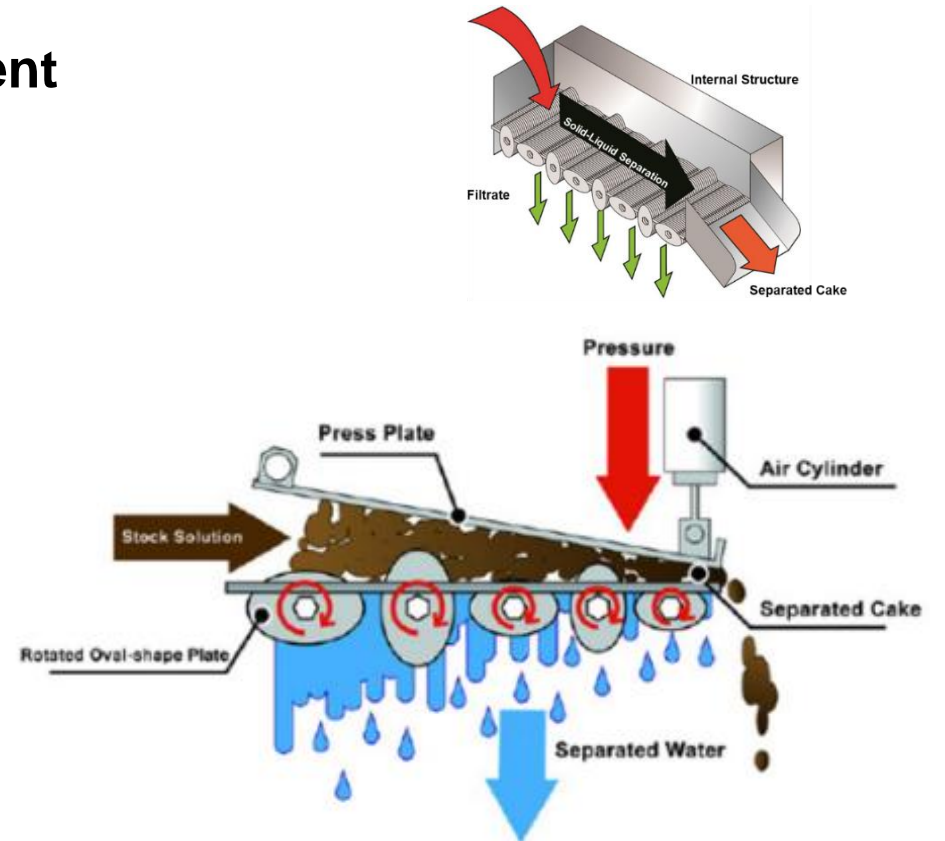


# DEVELOPMENT CRITERIA FOR THE SEDIMENT DEHYDRATION PILOT

- Easy movement for its use
- Energy autonomy
- Land or barge use
- Developing and testing compact machine
- Continuous dehydration
- Adapts easily for treatment of others materials
- **Particle size classification of sediments**
- **After dehydration, the water content of the fine particles does not exceed 50%**

# CONTINUOUS DEHYDRATION PILOT EQUIPMENT

- **Sediment requirement : Sediment with high water content**  
(sediment have to be pumped)
- **Mobile equipment**
- **Autonomous process in 3 containers**
- **Combination of mechanic process and polymers**
- **Pilot capacity : < 50m<sup>3</sup>/h**





# THE BASICS OF OUR TECHNOLOGY

## 3 Independents modules :

### – Module 1

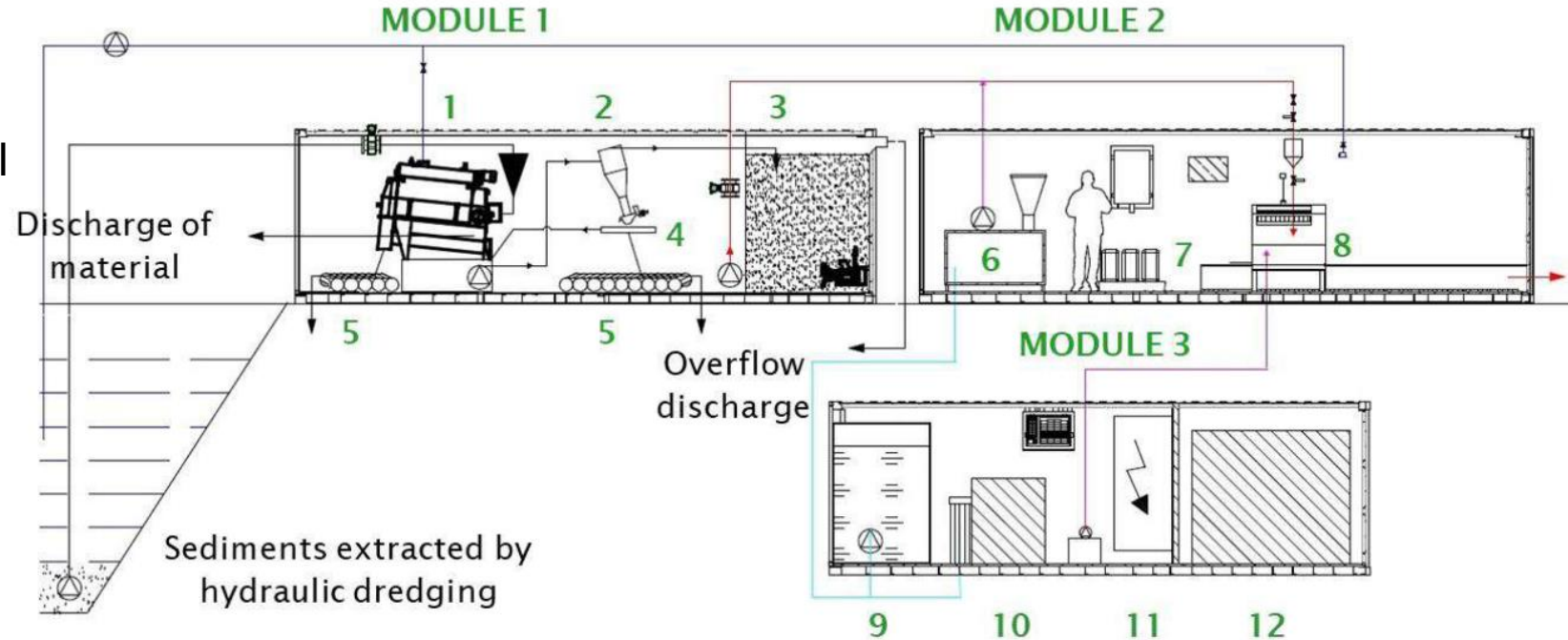
Granular classification of the material into several categories

### – Module 2

Treatment of the fine part of the material below the threshold predefined in module 1 (Dehydration)

### – Module 3

Independent operation of the entire machine: energy generation, water storage, spare parts, pipes, toilets,....



# HOW IT WORKS?

Hydraulically dredged sediments are pumped into a

## Rotary sieve

Sediments with  $\leq 2.5$  mm →

## Hydrocyclone

Sediments with  $D > 80-40$   $\mu\text{m}$  are stored for reuse →

Sediments with  $\leq 80-40$   $\mu\text{m}$

Optimal dosage of flocculant is introduced into the flocculation tank

Sediments are dewatered using a combination of shear and compression forces, gravity and filtration

Transfer tank

Press

MODULE 1

MODULE 2

## Preparation Step

$>2,5$ mm material extraction



## Step 1

Sand extraction



## Step 2

Fine fraction dehydration

Wastewater is collected in a tank

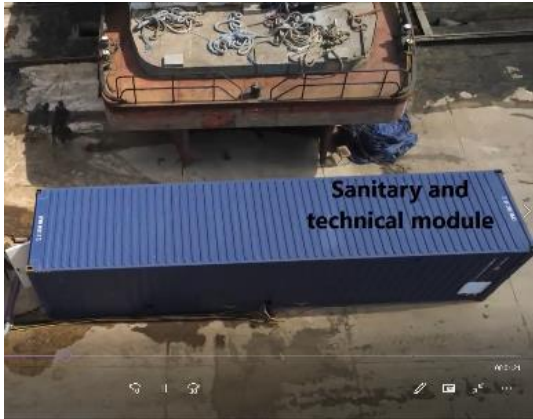
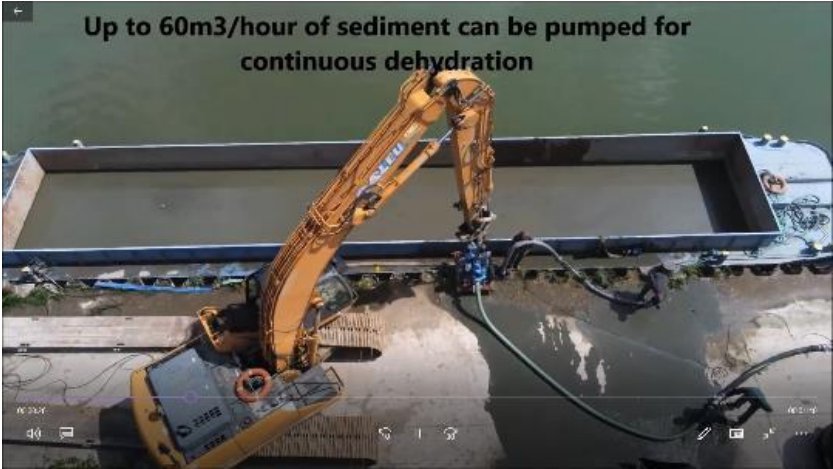
Dewatered sediments are stored in tank for re-use

# LAB-PILOT SCALE TESTS



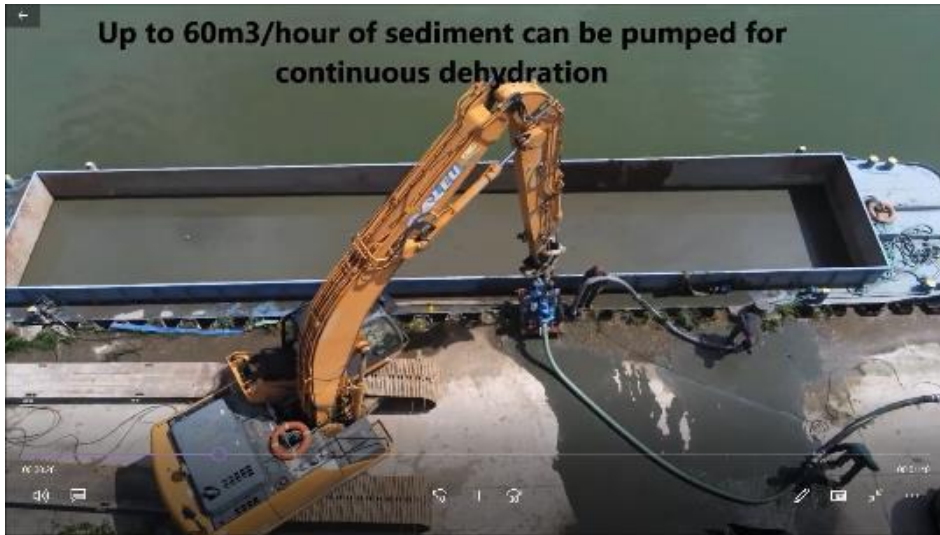


# ON-SITE DEMONSTRATION



## Module 1

### Granular classification of the material into several categories





## Module 2

**Treatment the fine part of the material below the threshold predefined in second module: Dehydration**



# FIRST TEST: TREATMENT OF RIVER SEDIMENT

**New on-site dehydration process**  
to speed dehydration to increase  
sediment reuse opportunities

Video on youtube

<https://www.youtube.com/watch?v=rshImpD7EyQ>



**First validation test for a new on-site  
dehydration process**

**Addressing space, timing and economic  
issues for sediment reuse with  
innovative continuous dehydration  
equipment**





# CHARACTERIZATION OF SEDIMENTS TREATED WITH IXSANE DEHYDRATION EQUIPMENT

IXSANE/ IMT Douai

## Reuse sediments as pozzolanic mineral addition in mortar formulation

### Physical analysis

- Specific area
- Grain size distribution
- Organic matter
- TGA

### Mineral analysis

- Mineralogical composition
- Carbon content
- XRF
- XRD
- SEM

### Chemical analysis

- pH
- Dosage organic Pollutants :  
inorganics Pollutants : Minerals
- Concentration and threshold

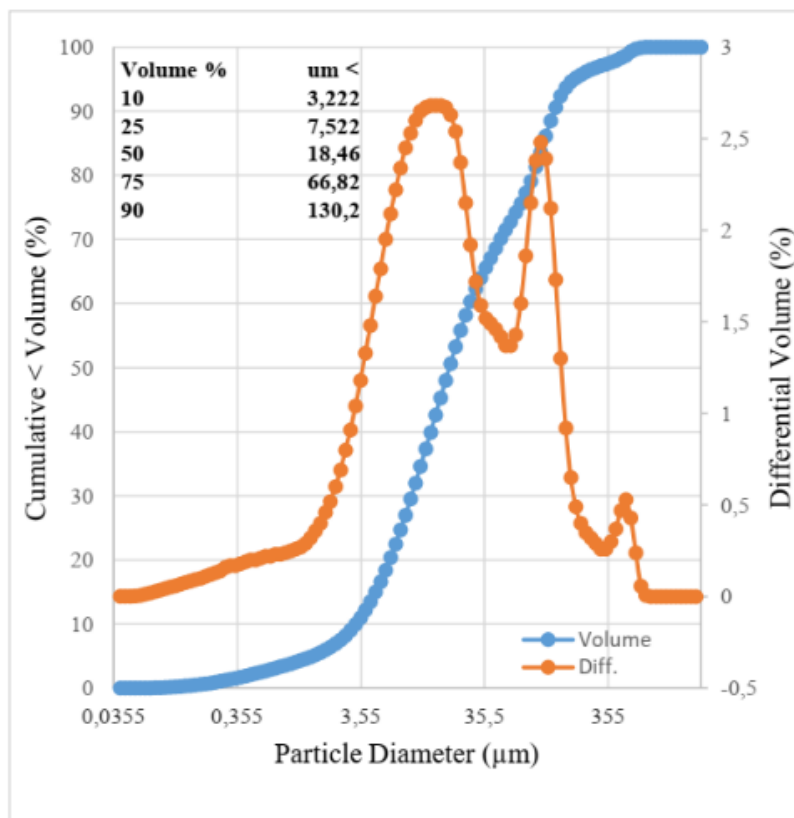
### Environmental analysis

- Leaching test
- Toxicity characterisation
- Potential of valorisation

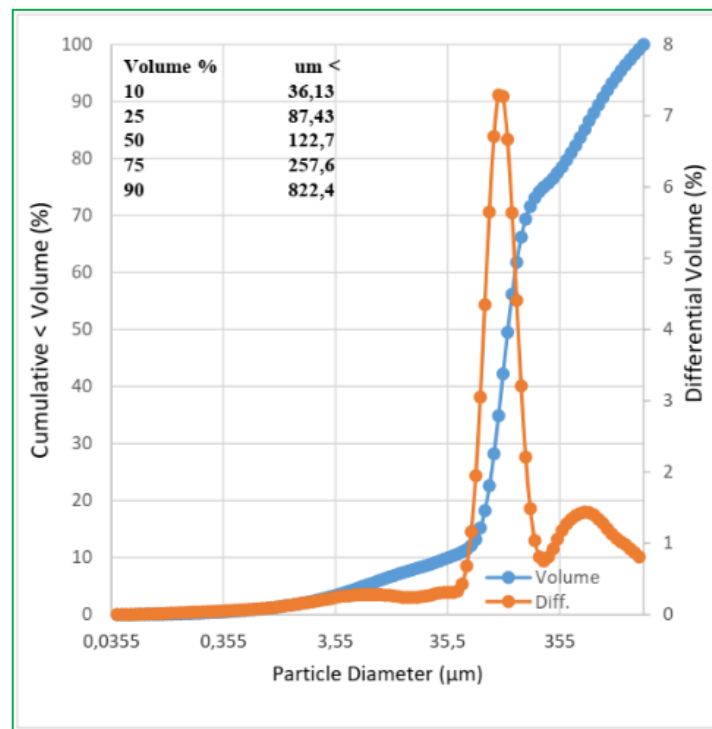


# PERFORMANCE OF SEPARATION PROCESS EVALUATION

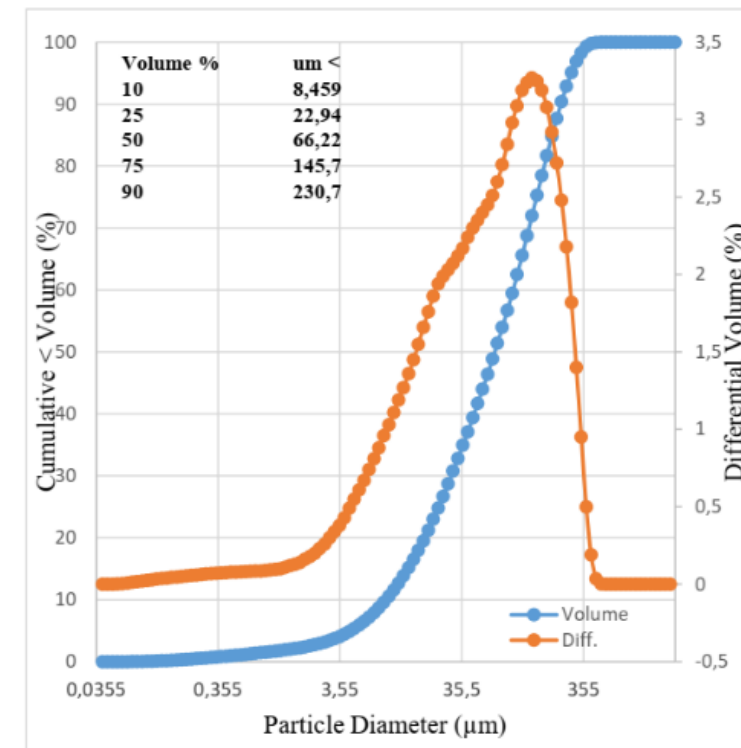
## Granulometry analysis



raw sediment



Extracted sand



Fine fraction

# REUSE POTENTIAL EVALUATION

Sediments	LOI_450°C	LOI_550°C	Gas Pycnometer	Clay-loam fraction (%)	Sand fraction (%)	Gravel fraction (%)	Substitute for sand/pozzolanic addition : hypotheses at this stage
raw sediment	6,72	7,88	2,54	49,97	34,92	15,09	Substitute for sand/ Pozzolanic addition
Extracted sand	4,17	3,90	2,71	4,34	94,95	0,69	Definetly substitute for sand
Fine fraction	8,60	9,96	2,42	25,8	73,50	0,59	Substitute for sand/ Pozzolanic addition



# SECOND TEST: SAND TREATMENT IN VENDÉE REGION

*(April & Mai 2021)*

*Pavaldeau quarry*

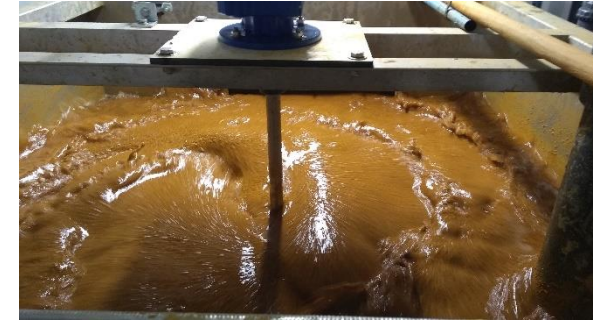


*La Sablière des Landes quarry*





# REAL SCALE DEMONSTRATIONS



Video on YouTube  
<https://youtu.be/NJ-iuAgOu1Q>





# SAND TREATMENT IN VENDÉE REGION

**Raw water**



**Granular classification**

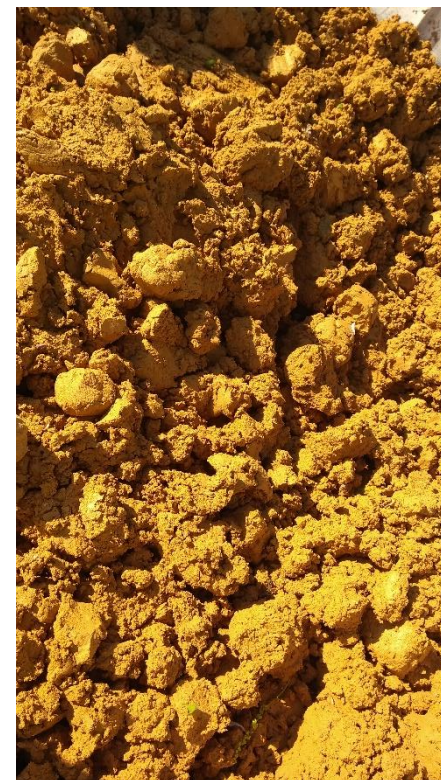


**Fine parts Treatment**





# DEHYDRATED PRODUCTS READY FOR REUSE







# Environmental & Urban engineering Sustainable development Research and Technological Transfer



*Harmony in development*

*Ethics in innovation*

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