

# DESIGN AND CONSTRUCTION OF A BENTONITES RECYCLING LINE FOR THE PRODUCTION OF A HEAVY METAL ADSORBENT “BENTOMET”

---

## *Overview of the Project*

---



Contract n°: ECO/13/630345



Kick-off meeting

Los Arcos, Navarra (Spain)

10/09/2014



# Objective and scope



ECO-INNOVATION 

BENTOMET

Los Arcos (Spain)

10/09/2014

## □ **PROJECT OBJECTIVE**

Design and construction of an industrial line for the recycling of bentonites.

## □ **SCOPE OF THE PROJECT**

To design and to develop a continuous and automated recycling line with capacity of 50kg/day.



# Interest



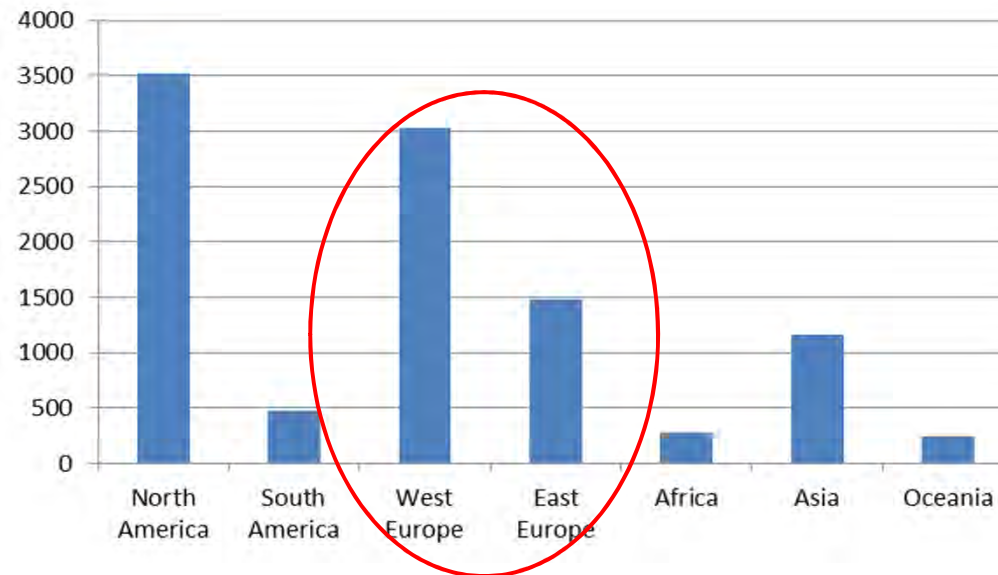
ECO-innovation

BENTOMET

Los Arcos (Spain)

10/09/2014

- 15 million tons of bentonites are extracted from Earth annually.
- Distribution of the consumption of bentonites:





# Interest



BENTOMET

Los Arcos (Spain)

10/09/2014

- 5.000 tons of bentonites are used annually in clarification processes in wineries.





# Raw material



ECO-INNOVATION

BENTOMET

Los Arcos (Spain)

10/09/2014





# Raw material



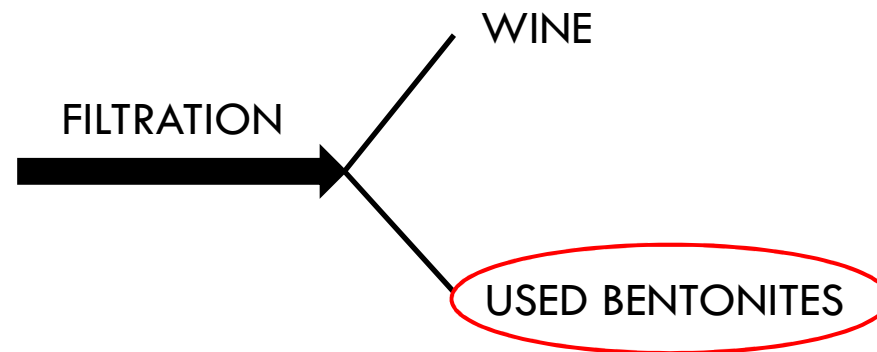
ECO-INNOVATION  
WATER POLLUTION CONTROL TREATMENT

BENTOMET

Los Arcos (Spain)

10/09/2014

- **Clarification process:** the wine is stirred with an agent able to adsorb and remove (by coagulation) different undesirable solid particles





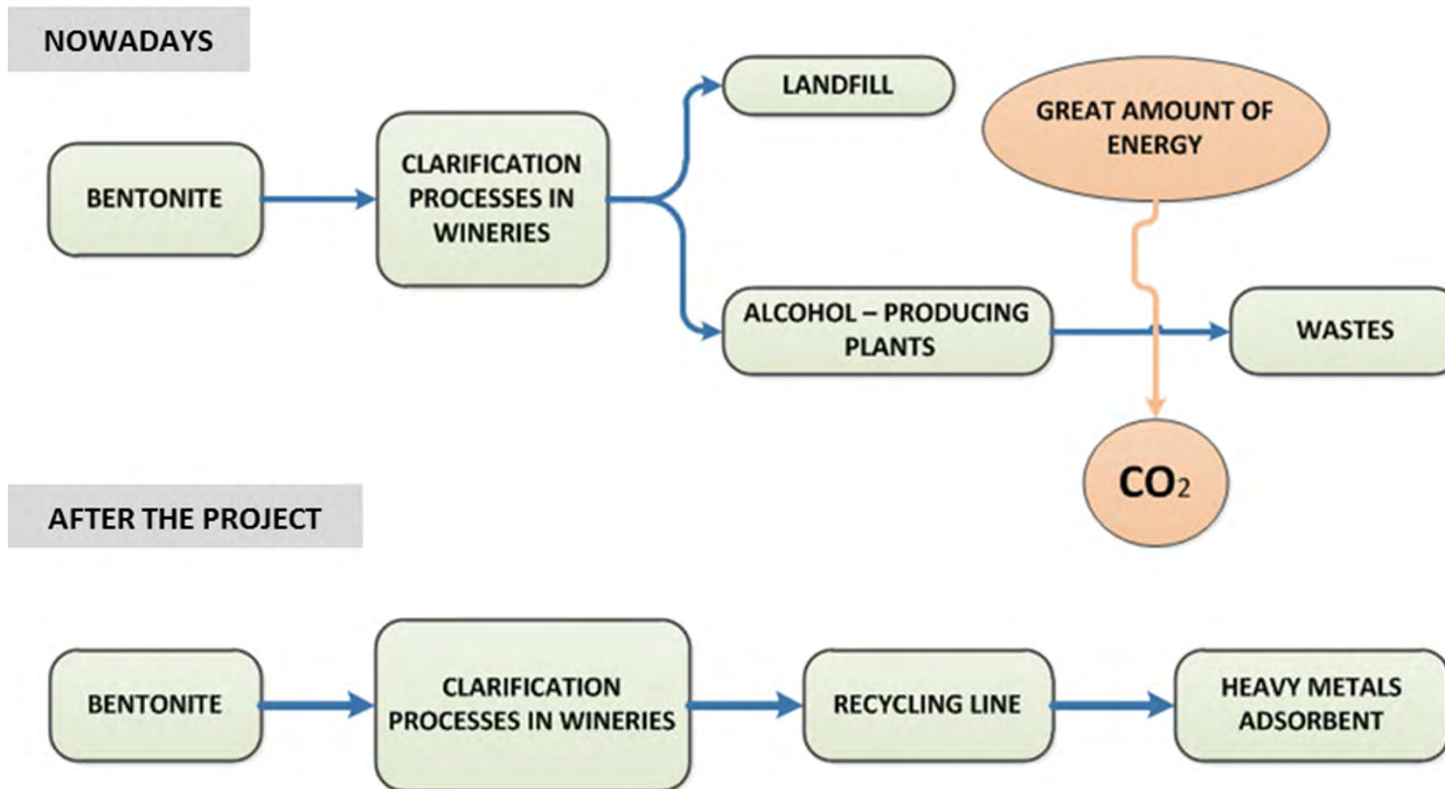
# Solutions



BENTOMET

Los Arcos (Spain)

10/09/2014





# Eco-indicators



ECO-INNOVATION  
WATER POLLUTION CONTROL TECHNOLOGIES

BENTOMET

Los Arcos (Spain)

10/09/2014

## - Main environmental advantages:

- Reduction of the CO<sub>2</sub> generated in alcohol-producing plants during the treatment of waste bentonites (around 10%)
- Reduction of the amount of bentonites discharged in landfills (around 20% considering European consumption of bentonites for clarification processes in wineries)
- Obtaining of a range of heavy metal remover systems very affordable from an economic point of view (average reduction of 37% compared to current solutions)





# Processes



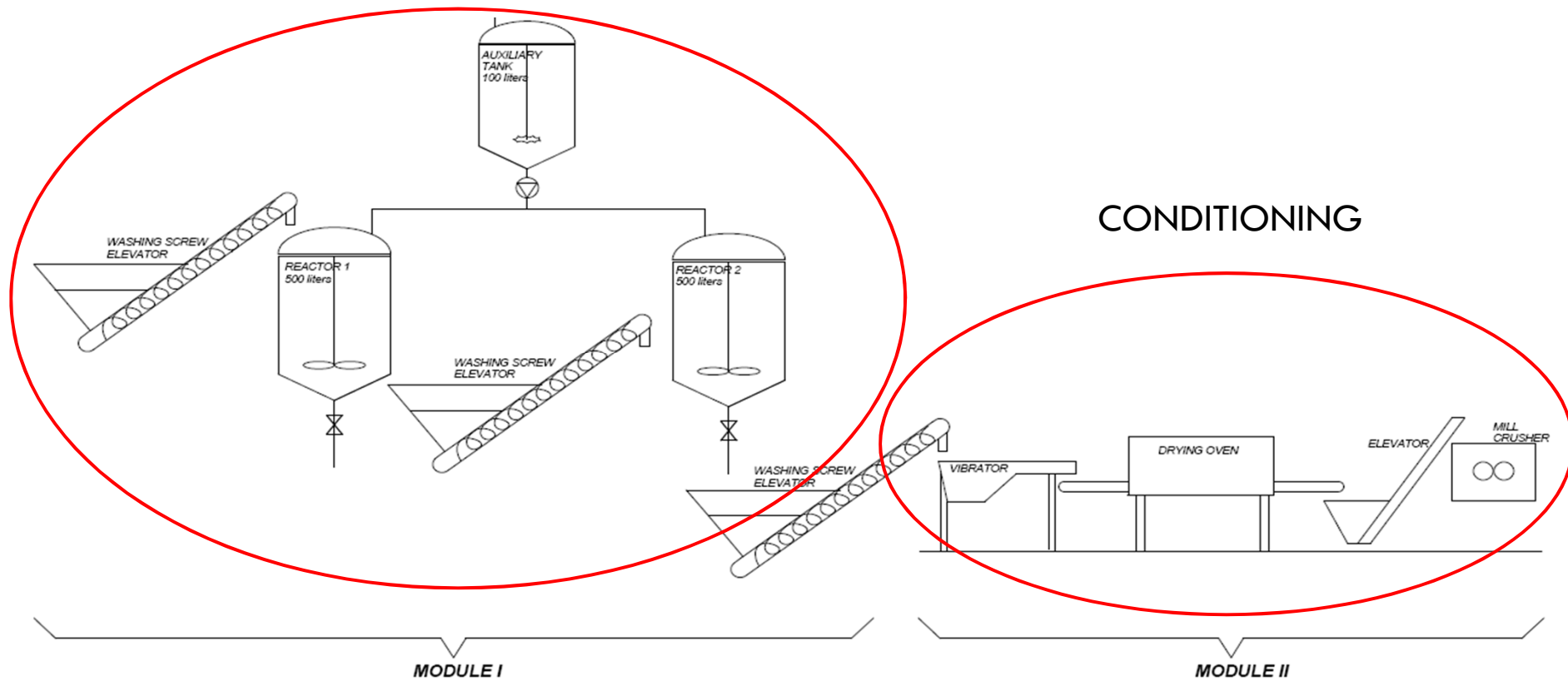
ECO-INNOVATION  
GREEN POLYMER RESEARCH & DEVELOPMENT

BENTOMET

Los Arcos (Spain)

10/09/2014

## PURIFICATION AND CHEMICAL MODIFICATION





# Activities

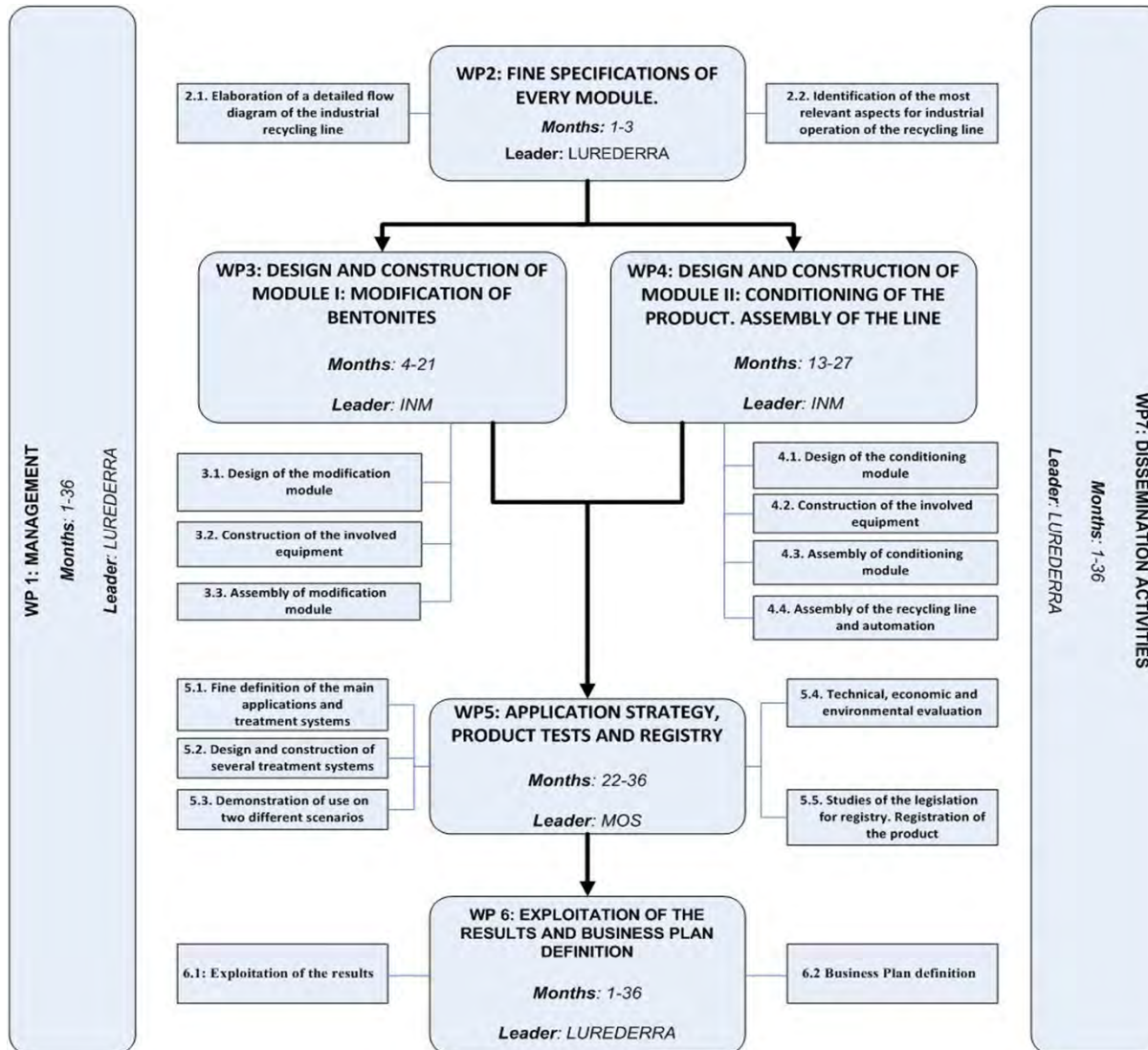


ECO-innovation  
WITH POLYMER MATERIALS TREATMENT

BENTOMET

Los Arcos (Spain)

10/09/2014





# Timing



ECO-innovation

**BENTOMET**

**Los Arcos (Spain)**

**10/09/2014**

Project phase / Duration of the project	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
WP 1:																																				MANAGEMENT		
WP 2:			DEFINITION																																			
WP 3:																																					DESIGN AND CONSTRUCTION MODULE I	
WP 4:																																					DESIGN AND CONSTRUCTION MODULE II. ASSEMBLY	
WP 5:																																					APPLICATION STRATEGY, TESTING	
WP 6:																																					EXPLOITATION, BUSINESS PLAN	
WP 7:																																					DISSEMINATION	
Project meetings	x					x						x						x						x						x							x	
Project reports to EASME a)												P	R						IR					P	R							L	R			FR		
Project Information Sheet to EASME		x										x							x					x													x	
Project Webpage/site creation and update						x																																
Project deliverables			1.1, 1.2, 2.1, 2.2			3.1, 7.6				6.3		1.3, 6.3			4.1, 4.2	6.3		7.7	1.6		3.2, 3.3, 4.3, 4.4	6.3	5.1	1.4	5.2		4.5, 4.6, 4.7	6.3		5.3, 5.4			7.4	5.5		1.5,5.6, 5.7,6.1, 6.2,6.3, 7.8,7.7		



# Partnership



BENTOMET

Los Arcos (Spain)

10/09/2014

## COOLREC



- Definition of technical requirements for application of the product in WEEEs recycling lines
- Testing of the efficiency for waste water from this field
- Assessment for the marketing

- Definition of technical requirements for application of the product in machinery construction lines
- Testing of the efficiency for waste water from this field
- Assessment for the marketing
- Design and construction of retention systems incorporating the product
- Design and construction of a simple line including a system

## MOS



Machinefabriek Otto Schouten B.V.

Lurederra  
centro tecnológico

## Lurederra

- Coordination and management
- Definition of requirements for industrial line
- Upscaling of the involved processes
- Optimization of the processes parameters
- Evaluation of the obtained products

## INM



INGENIERÍA  
NAVARRA  
C.A.

- Design of the industrial line
- Construction of the modules
- Assembly of the modules
- Optimization of the modules



# Collaborations











ECO-innovation  
WASTE POLYMER RECYCLING TECHNOLOGIES

BENTOMET

Los Arcos (Spain)

10/09/2014

 <p>BARON DE LEY RIOJA</p> <p>To whom it may concern</p> <p>Ref: Letter of intent on the participation as supplier to the "BENTOMET" project.</p> <p>The project consists of "DESIGN AND CONSTRUCTION OF A BENTONITES RECYCLING LINE FOR THE PRODUCTION OF A HEAVY METAL ADSORBENT".</p> <p>We got in touch with the "BENTOMET" proposal and found the project quite interesting and in line with our current activity and objectives.</p> <p>For this reason we declare here our interest to assist the partnership by supplying bentonites used in our productive process to be employed as raw materials for the new products to be developed during the project.</p> <p>Kind regards,</p>  <p>Jose Maria del Rio – Winery Director</p>	 <p>Bodegas Fernández de Arcaya</p> <p>To whom it may concern</p> <p>For this reason we declare here our interest to assist the partnership by supplying bentonites used in our productive process to be employed as raw materials for the new products to be developed during the project.</p> <p>Kind regards,</p>   <p>Miguel Fernández de Arcaya – General Manager</p>	<p>NAVARRSOTILLO</p>  <p>Organic Rioja Wines</p> <p>Calahorra, 2014/03/28</p> <p>participation as supplier to the "BENTOMET" project.</p> <p>The project consists of "DESIGN AND CONSTRUCTION OF A BENTONITES RECYCLING LINE FOR THE PRODUCTION OF A HEAVY METAL ADSORBENT".</p> <p>We got in touch with the "BENTOMET" proposal and found the project quite interesting and in line with our current activity and objectives.</p> <p>For this reason we declare here our interest to assist the partnership by supplying bentonites used in our productive process to be employed as raw materials for the new products to be developed during the project.</p> <p>Kind regards,</p>  <p>JOSE RAMON SERRANO ARRIEZU S.C. SERRANO ARRIEZU, A.M. y J.R. NAVARRSOTILLO</p> 
--	--	--

- Select the most suitable batches of waste bentonites to be treated during the project
- Supply of waste bentonites batches
- Collect the organic fraction resulting from the purification stage



# WP description

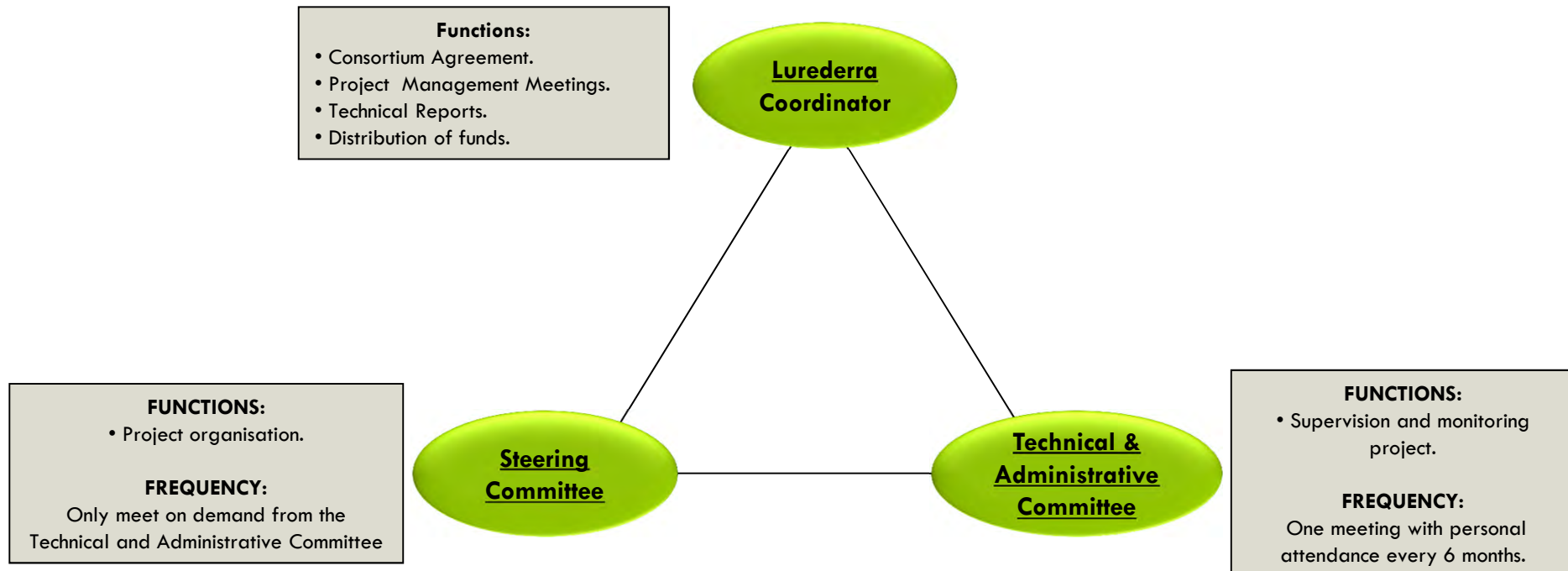


Los Arcos (Spain)

## WP1: MANAGEMENT

- Duration: month 1 to month 36
- Coordinator: Lurederra

## Management Structure





# WP description



Los Arcos (Spain)

## □ WP2: FINE SPECIFICATIONS OF EVERY MODULE

- Duration: month 1 to month 3
- Coordinator: Lurederra

### Objectives

- To elaborate a draft where the main activities to be developed are defined. The draft will include a flow-diagram where aspects such as quality of the streams, mass balances or energy balances will be included.
- To elaborate a draft where the critical points that might appear during the upscaling from semi-industrial level to an industrial line will be identified. The draft will include a contingency plan to solve these critical points.
- To elaborate a draft plan where the activities related to safety, maintenance, hygiene, training, etc. are defined.

### Task involved

- Task 2.1: Elaboration of a detailed flow diagram of the industrial recycling line
- Task 2.2: Identification of the most relevant aspects for industrial operation of the recycling line

### Results

- Detailed flow diagram with functionality design of the whole recycling line.
- Report where main relevant problems are identified and draft of the contingency plan.
- Report where aspects such as safety, maintenance, hygiene, training, etc are predefined.



# WP description



BENTOMET

Los Arcos (Spain)

10/09/2014

- **WP3: DESIGN AND CONSTRUCTION OF MODULE I: Modification of bentonites**
  - Duration: month 4 to month 21
  - Coordinator: INM

## Objectives

- To design an industrial line for the modification of waste bentonites in order to obtain an adsorbent for the removal of heavy metals from waste water, studying different machinery options and selecting the most suitable ones
- To manufacture all the equipment and components necessary for the construction of the industrial Module I
- To assemble all the manufactured parts, giving rise to the proposed industrial module
- To check the efficiency of the process both in terms of machinery and obtained products

## Task involved

- Task 3.1: Design of the modification module
- Task 3.2: Construction of the involved equipment
- Task 3.3: Assembly of modification module

## Results

- Equipment devoted to the modification of bentonites, fulfilling the requirements specified in WP2
- A modification line satisfying the requirements defined in WP2





# WP description

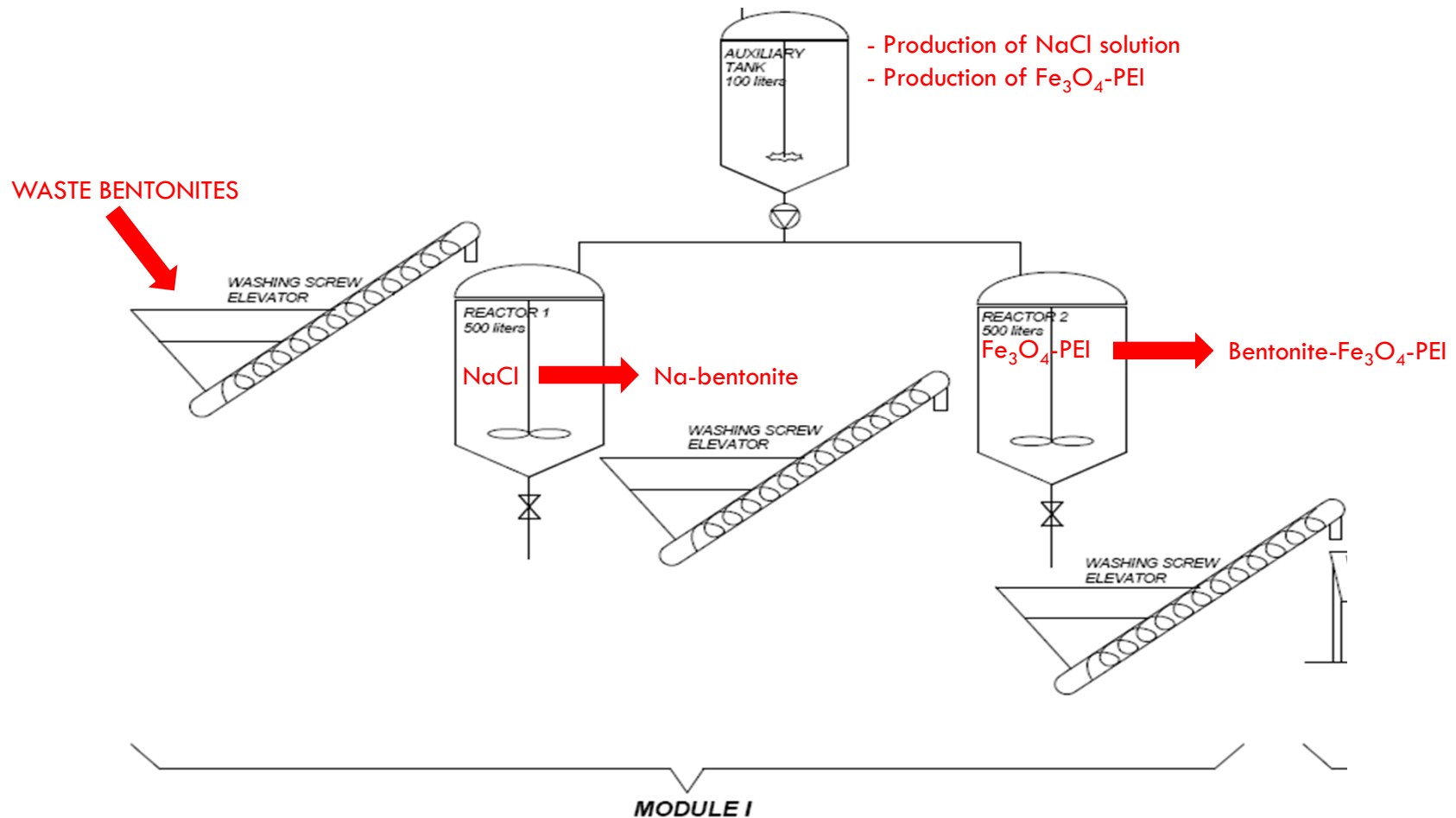


ECO-innovation  
WATER POLLUTION CONTROL TREATMENT

BENTOMET

Los Arcos (Spain)

10/09/2014





# WP description



**BENTOMET**

**Los Arcos (Spain)**

**10/09/2014**

- **WP4: DESIGN AND CONSTRUCTION OF MODULE II: Conditioning of the product. ASSEMBLY OF THE LINE**
  - Duration: month 13 to month 27
  - Coordinator: INM

## **Objectives**

- To design an industrial line for the conditioning of the product resultant from Module I with the aim of maximizing its efficiency as heavy metal remover, studying different machinery options and selecting the most suitable ones
- To manufacture all the equipment and components necessary for the construction of the industrial Module II
- To assemble all the manufactured parts, giving rise to the proposed industrial module
- To check the efficiency of the process both in terms of machinery and obtained products
- To assemble the individual modules constructed in WP2 and WP3 into a fully operative recycling line, placing also special regard on waste production as well as energy consumption
- To automate the whole recycling line in order to enable the recycling in a continuous phase
- To apply for the required permissions to develop the industrial activity related to the constructed line

## **Task involved**

- Task 4.1: Design of the conditioning module
- Task 4.2: Construction of the involved equipment
- Task 4.3: Assembly of conditioning module
- Task 4.4: Assembly of the recycling line and automation

## **Results**

- Equipment devoted to the conditioned of the product resultant from Module I, fulfilling the requirements specified in WP2
- A conditioning line satisfying the requirements defined in WP2
- A continuous and automated industrial line for the recycling of bentonites
- Permissions to industrially carry out the recycling of bentonites



# WP description

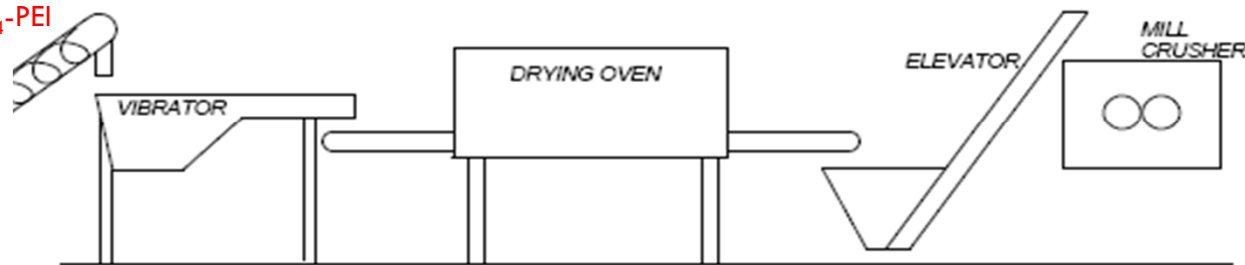


BENTOMET

Los Arcos (Spain)

10/09/2014

Bentonite-Fe<sub>3</sub>O<sub>4</sub>-PEI



Conditioned  
Bentonite-Fe<sub>3</sub>O<sub>4</sub>-PEI

MODULE II



# WP description



BENTOMET

Los Arcos (Spain)

10/09/2014

## □ WP5: APPLICATION STRATEGY, PRODUCT TESTS AND REGISTRY

- Duration: month 22 to month 36
- Coordinator: MOS

### Objectives

- To define the main industrial sectors to which the developed adsorbent can be applied, as well as the complete treatment systems where it must be incorporated, defining the requirements in each case
- To manufacture several systems incorporating the developed modified bentonites, suitable to be applied to the treatment of industrial waste water from different industries
- To test the efficiency of the developed systems in two real industrial processes
- To evaluate the developed solutions from a technical, economic and environmental approach
- To analyse the alternatives and requirements for products registering. To register the selected products

### Task involved

- Task 5.1: Fine definition of the main applications and treatment systems
- Task 5.2: Design and construction of several treatment systems
- Task 5.3: Demonstration of use on two different scenarios
- Task 5.4: Technical, economic and environmental evaluation
- Task 5.5: Studies of the legislation for registry. Registration of the product

### Results

- Several systems where the developed product is incorporated, able to be used for the industrial waste water treatment
- Successful demonstration of the efficiency of the systems developed to remove heavy metals. Construction of a simple industrial line incorporating these systems
- Positive assessment of the developed products from technical, economic and environmental points of view
- Registered products



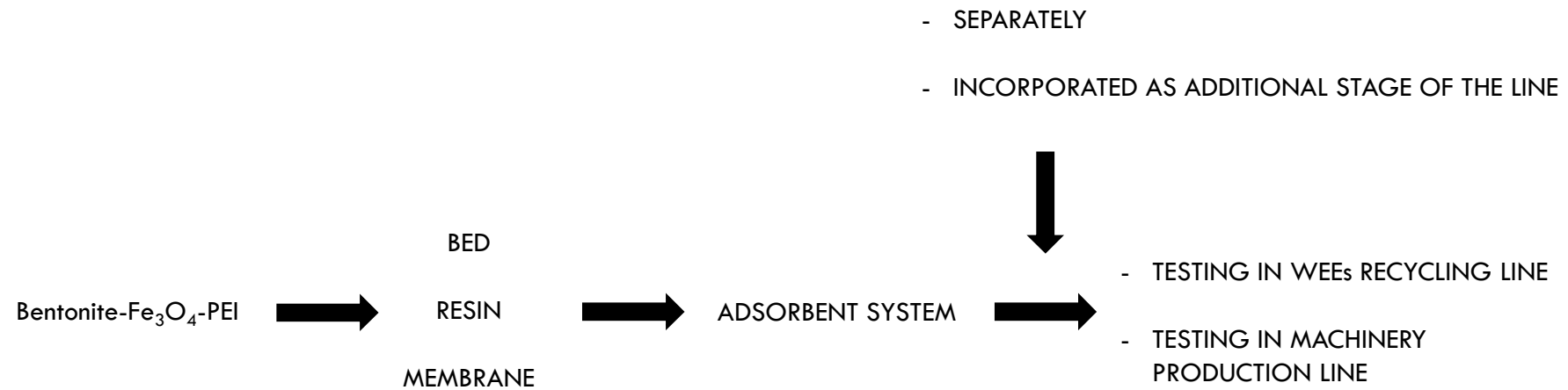
# WP description



BENTOMET

Los Arcos (Spain)

10/09/2014





# WP description



ECO-INNOVATION 

BENTOMET

Los Arcos (Spain)

10/09/2014

- **WP6: EXPLOITATION OF THE RESULTS AND BUSINESS PLAN DEFINITION**
  - Duration: month 1 to month 36
  - Coordinator: Lurederra

## **Tasks involved**

- Task 6.1: Exploitation of the results
- Task 6.2: Business Plan Design

## **Results**

- A Exploitation Agreement
- A Business Plan



# WP description



ECO-INNOVATION 

BENTOMET

Los Arcos (Spain)

10/09/2014

## □ WP7: DISSEMINATION ACTIVITIES

- Duration: month 1 to month 36
- Coordinator: Lurederra

### Some envisaged activities

- Participation in leading trade shows and workshops
- Publication of results in relevant journals
- Set-up and maintenance of a project website
- Creation of accounts in different networks
- Presentations to small groups of interested parties
- Disclosure of information through brochures

# DESIGN AND CONSTRUCTION OF A BENTONITES RECYCLING LINE FOR THE PRODUCTION OF A HEAVY METAL ADSORBENT “BENTOMET”

---

## *Overview of the Project*

---



Contract n°: ECO/13/630345



Kick-off meeting

Los Arcos, Navarra (Spain)

10/09/2014



# DESIGN AND CONSTRUCTION OF A BENTONITES RECYCLING LINE FOR THE PRODUCTION OF A HEAVY METAL ADSORBENT “BENTOMET”

*Activities for the next 6 months*



Contract n°: ECO/13/630345



Kick-off meeting

Los Arcos, Navarra (Spain)

10/09/2014



# — Work schedule for 6 months —



BENTOMET

Los Arcos (Spain)

10/09/2014

July 2014

January 2015

Project phase / Duration of the project	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP 1:	[Green shaded bar]																																			
WP 2:	[Green shaded bar]			[White]																																
WP 3:	[Green shaded bar]			[Green shaded bar]			[Blue shaded bar]																													
WP 4:	[White]												[Blue shaded bar]												[White]											
WP 5:	[White]												[Blue shaded bar]												[Blue shaded bar]											
WP 6:	[Yellow shaded bar]																																			
WP 7:	[Green shaded bar]																																			



# — Work schedule for 6 months —



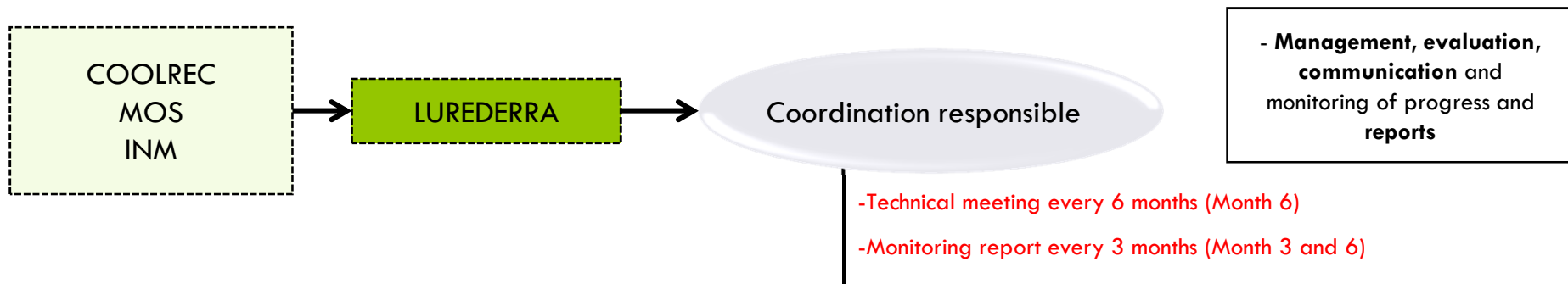
**BENTOMET**

**Los Arcos (Spain)**

**10/09/2014**

## □ **WP1: MANAGEMENT**

- Duration: month 1 to month 36
- Coordinator: Lurederra



### **-Preparation of reports:**

- D1.1. Project Presentation Report (30/09/2014)
- D1.2. Consortium Agreement (30/09/2014)



# Work schedule for 6 months



BENTOMET

Los Arcos (Spain)

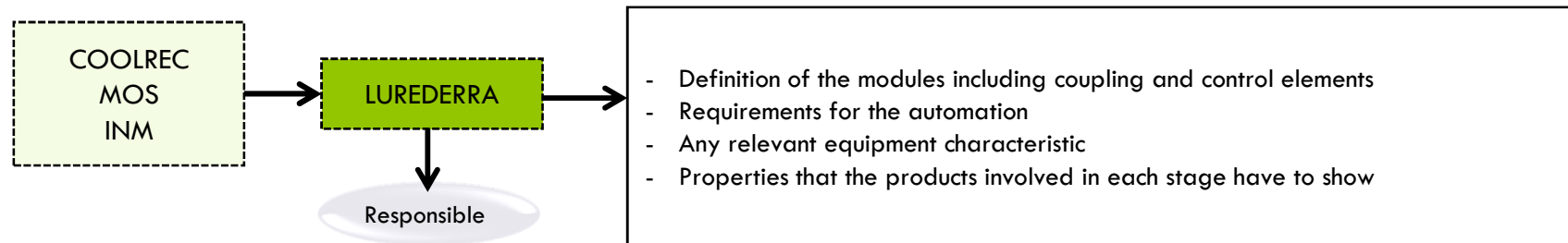
10/09/2014

## WP2: FINE SPECIFICATIONS OF EVERY MODULE

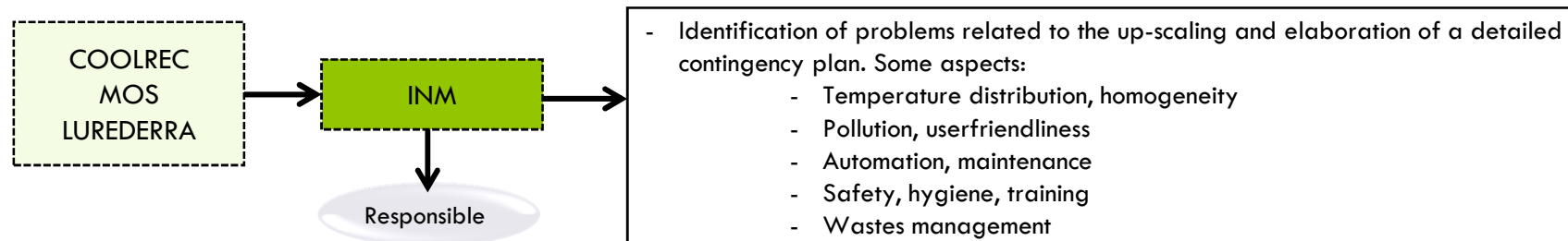
Duration: month 1 to month 3

Coordinator: Lurederra

### Task 2.1: Elaboration of a detailed flow diagram of the industrial recycling line.



### Task 2.2: Identification of the most relevant aspects for industrial operation of the recycling line



#### -Preparation of reports:

- D2.1. Detailed flow diagram with functionality design of the whole recycling line (30/09/2014)
- D2.2. Report including the identification of the main problems during upscaling as well as a contingency plan (30/09/2014)



# — Work schedule for 6 months —



BENTOMET

Los Arcos (Spain)

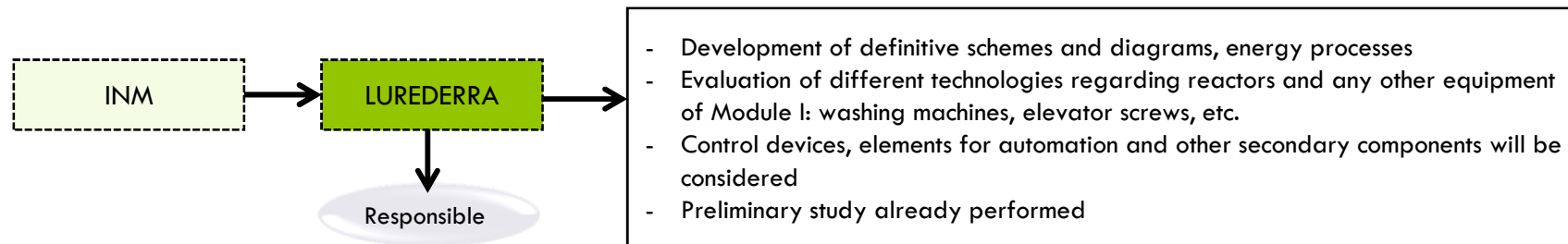
10/09/2014

## □ WP3: DESIGN AND CONSTRUCTION OF MODULE I

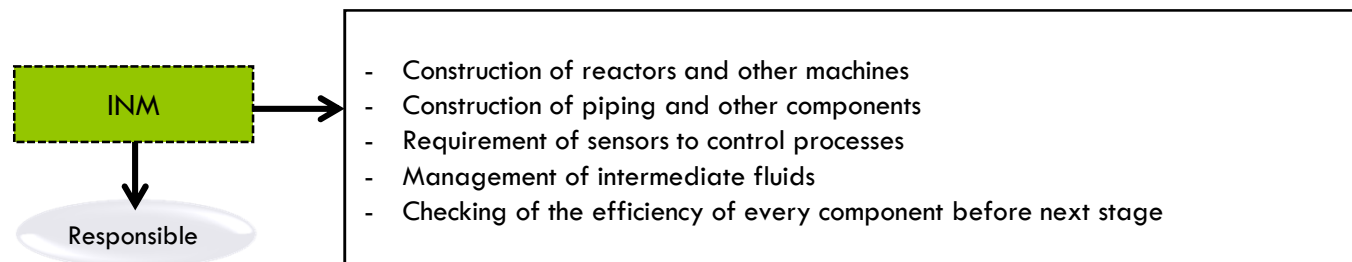
□ Duration: month 4 to month 21

Coordinator: INM

### ■ Task 3.1: Design of the modification module



### ■ Task 3.2: Construction of the involved equipment



#### -Preparation of reports:

- D3.1. Report including descriptions, schemes, pictures and diagrams showing the detailed characteristics and processes for the construction of modification module (31/12/2014)



# — Work schedule for 6 months —



BENTOMET

Los Arcos (Spain)

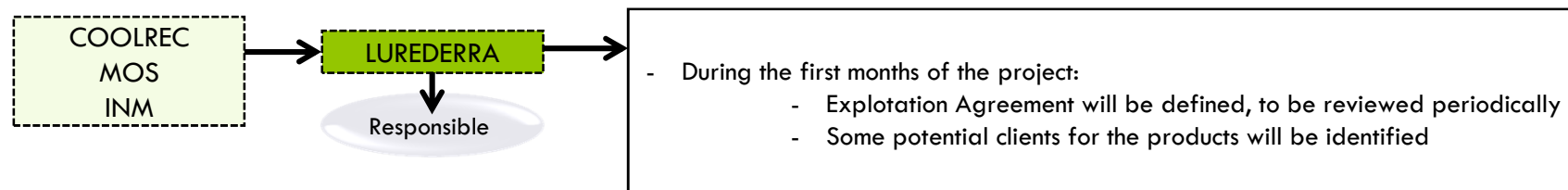
10/09/2014

## □ WP6: EXPLOITATION OF THE RESULTS AND BUSINESS PLAN DEFINITION

□ Duration: month 1 to month 36      Coordinator: Lurederra

■ Task 6.1: Exploitation of the results

■ Task 6.2: Business Plan Design





# — Work schedule for 6 months —



BENTOMET

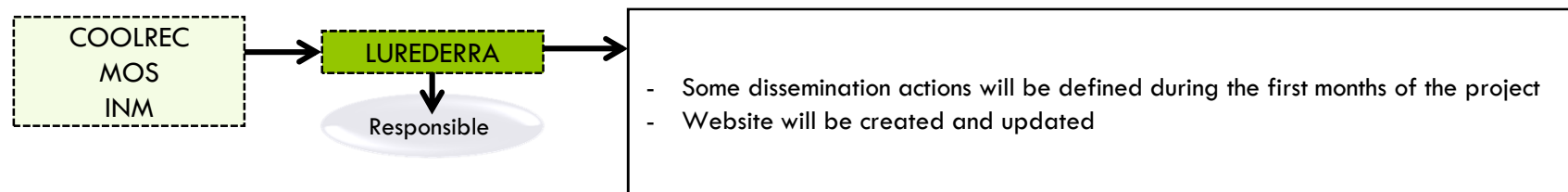
Los Arcos (Spain)

10/09/2014

## □ WP7: DISSEMINATION ACTIVITIES

□ Duration: month 1 to month 36

Coordinator: Lurederra



### -Preparation of reports:

- D7.6. Set up and maintenance of a project website with public areas and restricted areas (31/12/2014)

# DESIGN AND CONSTRUCTION OF A BENTONITES RECYCLING LINE FOR THE PRODUCTION OF A HEAVY METAL ADSORBENT “BENTOMET”

*Activities for the next 6 months*



Contract n°: ECO/13/630345



Kick-off meeting

Los Arcos, Navarra (Spain)

10/09/2014