



Project Information Sheet

Design and construction of a bentonites recycling line for the production of a heavy metal adsorbent (BENTOMET)

Programme area:	CIP-EIP-2013.10.06-Recycling
Coordinator:	Technological Centre Lurederra Research Organisation, Spain E-mail: lurederra@lurederra.es Tel: +34 948640318
Partners:	Ingeniería Navarra Mecánica (Spain) Coolrec BV (Netherlands) Machinefabriek Otto Schouten (Netherlands)
Website:	http://bentomet.eu/
Benefits (max. 150 characters incl. space):	Production of an added value product line, consisting of the modification and conditioning of bentonites giving rise to a heavy metal adsorbent
Keywords:	Recycling, bentonites, heavy metals removal
Sector:	Recycling
Type of solution	Product and process
Duration:	01/07/2014 – 30/06/2017
Budget:	€ 948.529 (EU contribution: 50%)
Contract number:	ECO/13/630345-BENTOMET

Summary

The main objective of the Project BENTOMET is the design and construction of a recycling line for waste bentonites used during clarification processes in wineries, with a production capacity of 50kg/day, in order to be used as adsorbent of heavy metals in wastewater treatments.

The designed treatment line is constituted by two modules: the first one for the purification and chemical modification of the raw material (bentonites coming from wineries), and the second one for the conditioning of the product through drying and milling processes. The final product is a bentonite-Fe₃O₄ complex which removes heavy metals from waste water. The efficiency of the product is around 95% and, in addition, saturated adsorbent can be removed from the treated water using a magnetic device, due to its magnetic properties.

The project supposes a new solution for a waste generated in wineries that nowadays is discharged in landfills or collected by alcohol-producing plants, thus being a great advantage in particular taking into account the area where the recycling line has been installed: in Navarra and very close to La Rioja, one of the European regions with greater production of wine.

Furthermore, the developed solution is applied to remove heavy metals from wastewaters from industrial processes, therefore reducing a very important environmental problem. During the last stage of the project, a wastewater treatment system incorporating the developed adsorbent has been designed and constructed, and demonstrative tests have been carried out implementing it in a real wastewater treatment line. After optimization, a very efficient system has been achieved, both in terms of heavy metals removal and regarding withdrawal of the adsorbent once the removal of toxic elements has finished, process performed using a magnet strategically located into the system.



Expected and/or achieved results

Three different marketable products have been obtained during the project execution: an industrial plant for the recycling of waste bentonites, a new adsorbent resulting from such recycling line and a wastewater treatment system incorporating this adsorbent and which can be implemented in different industrial lines with the aim of reducing the content of heavy metals.

As a summary, during the first stage of project implementation, a deep effort was accomplished with the aim of getting the best design and equipment selection for the recycling line, in order to obtain the best conditions for the involved processes: purification of waste bentonites, modification, drying and milling. Then, the recycling line was designed, constructed and assembled; each one of the modules was started-up and their correct operation was demonstrated.

In parallel, activities related to the definition of applications of recycled bentonites were tackled, including identification of key industrial sectors and evaluation of different wastewater treatment systems which enable the incorporation of the developed adsorbent into them.

During the last stage of the project, the selected wastewater treatment system was designed and constructed. The finally chosen system consists mainly of a stirring tank where bentonites react with the water and a magnetic drum able to retain the used adsorbent on its surface, separating it from the treated water. Several tests were performed to optimize both the configuration and the parameters of the system as well as to define the recommendations of use for the bentonites (dosage, reaction time, etc.).

As last stage of the project, the constructed system was implemented in a real industrial line generating water polluted with heavy metals; in particular, it was installed in Coolrec as an additional step of the current water treatment line. Demonstrative tests were carried out to check the efficiency of the product, considering not only the removal of heavy metals but also the magnetic requirements of the system. Results were very successful.

To complete the evaluation of the products developed during the project, techno-economic analysis and environmental study of processes and products involved was carried out. It was found that technical characteristics of the product are very good and comparison with competitors is really positive, as modified bentonites show really high efficiency as heavy metal remover and offers the possibility of being separated from the water using a magnet, which is a very important additional advantage. The price of the product is within the range of other similar products in the market, both considering the kg of solid adsorbent and also the price of treating a specific volume of wastewater. This will be a key point when trying to introduce the product in the market. Finally, Life Cycle Analysis was performed and results were also good: recycling process of bentonites reduces the consumption of energy and the generation of CO₂ when compared to current process used to treat waste bentonites. Furthermore, the estimation of Eco-points related to the new solution shows that the proposed process is more environmentally friendly than current alternatives.

Presentation of the project results and achieved products to potentially interested clients has been done by means of workshops, conferences and in-situ demonstrations of the final wastewater treatment system. Different kinds of potential clients have been identified, companies having problems with the treatment of their wastewaters rich in heavy metals being the most remarkable ones.

Regarding dissemination activities, the website of the project has been regularly updated, posters and brochures have prepared and distributed in all the events organized to present the results, several workshops have been organized and attended both in Lurederra facilities (Spain) and in Coolrec facilities (Netherlands) and results of the project have been presented in public events such as the one organized by AEAS (Asociación Española de Abastecimientos de Agua y Saneamientos - Spanish association of water supply and sanitation).

To sum up, the project BENTOMET has been successfully developed during the planned time, giving rise to a bentonites recycling line able to produce 50kg/day of adsorbent showing very good technical properties in terms of efficiency and magnetism. Such adsorbent can be incorporated in a wastewater treatment system especially designed and constructed for this purpose, which has been successfully demonstrated in a real industrial process.

The information sheet will be published in the [Eco-Innovation website](#). The EASME reserves the right to edit the information sheet for content and length