NEWFERT: “Nutrient recovery from biobased wastes for fertiliser production” is a H2020 European Project which started the 1st July of 2015 and it will finish the 31st December of 2018. NEWFERT focus on a feasible and cost-effective industrial nutrient recycling scheme, developing new biorefining technologies aimed at increasing nutrient recovery ratios and mitigating environmental and socio-economic impact of the current fertilizers by replacing non renewable and fossil nutrients with biobased materials in their composition. Projected benefits also include substantial energy savings and CO2 emissions reduction.

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1. PURPOSE OF THE WORK

The principal activities of this project are:

- Identifying, collecting and analyzing biobased waste materials.
- There are many wastes that could be possibly used in the fertilizer industry, although depending on many special factors, specially their composition and supplier capacity and also requirements for any existing fertilizer plant.
- Some preliminary analyses of 26 European waste sources have been carried out.
- Study of possible risks while their handling.
- Physical properties testing: moisture content, granulometry, hardness, water solubility, etc.
- Chemical composition: main nutrients (N, P and K) composition, secondary nutrients (Ca, Mg and S) composition, microelements (Fe, Mn, Zn, B, Cu, Mo, etc.) composition, COT, heavy metals composition, etc.
- Supplier capacity (tones per year), distance, homogeneity, etc.

2. 2 - NUTRIENTS RECOVERY FROM SOLID WASTE

- Defining acceptability parameters for the fertilizer industry.
- Ranges of every analyzed point are defined and justified and also a numerical scale is established in order to select the best waste resources that could be more suitable for the project goals (ranking of waste analyzed).
- Evaluation of identified chemical NPK-extraction processes.
- Evaluates different technical and chemical point of view the different identified chemical NPK-extraction processes. Include the laboratory scale testing of such processes to test performance, constraints, control feasibility, optimal raw materials feed and reactor configuration.

3. 3 - MATERIAL AND METHODS

- Design of a new process to recover nutrients from ashes: sewage, manure, household waste, etc.
- Design a chemical NPK-extraction process test bench (assembly, commissioning and optimization) to simulate and obtained conclusions to be used to prepare basic engineering of final industrial solution applicable to a real fertilizer industrial plant.
- Quality assessment of the obtained products.
- Product obtained from test bench facility will be tested adding such product to a simulated blend of raw materials in same proportion of NPK-fertilizer to obtain slurry with similar chemical composition than NPK-fertilizer slurry. Quality assessment will be done to compare properties (physical and chemical) of slurry with the industrial current slurry properties.

4. 4 - RESULTS AND DISCUSSION

The new process designed DMPHOS allows to improve the existing industrial processes to date incorporating a new raw material as a source of nutrients (phosphorus, nitrogen and potassium) present in waste from the incineration of different industrial wastes (ashes). The main advantages of this process are the following:

1. Low energy consumption: the design of the reactor improve the thermal heat transfer features to reduce or eliminate the need of heating. Uses separation operations in continuous like decantation, concentration and dehydration.
2. Low cost of raw materials: sulfuric acid and calcium hydroxide are both more cheaper than other acids and bases.
3. Availability of raw materials
4. High agronomic compatibility.
5. Elimination of heavy metals.
6. Minimization of waste generated (gypsum), because the obtained product is mostly di-calcium phosphate and monocalcium phosphate.
7. Respectful with the environment.
8. The process requirements are not extrem (temperature, pH, concentration of acid, etc.).
9. DMPHOS is a sustainable closed circuit process.

The process conditions are not extrem (temperature, pH, concentration of acid, etc.).

5. 5 - CONCLUSIONS

REFERENCES

4. Thoron C. Large scale P recovery in the phosphorus industry - Experiences from practice. Third sustainable phosphorus summit; 2012 February 29 - March 2, Sydney, Australia.

The CDM is concerned with structuring and solving decision and planning problems involving multiple criteria. We use the concept of outranking for final decision.

After the evaluation by CDM methodology of the existing industrial processes for the extraction of nutrients from ashes, it was concluded that none of them fulfilled the requirements established by the fertilizer industry, so it was necessary to develop a new process that these characteristics. This new process is DMPHOS.

Is the scheme of DMPHOS, the new developed process for recovery solid nutrients from ashes. This process consist in a lixiviation with a strong acid (sulfuric acid) for to extract the nutrients of ashes and a neutralization with a base (calcium hydroxide) for to precipitate the phosphates present in the solution. Also includes a step to remove the heavy metals. The reaction are the following:

Neutralization to monocalcium phosphate:

\[
2 \text{H}_3\text{PO}_4 + \text{Ca(OH)}_2 \rightarrow \text{Ca(H}_2\text{PO}_4)_2 + 2 \text{H}_2\text{O}
\]

Neutralization to di-calcium phosphate:

\[
\text{H}_3\text{PO}_4 + \text{Ca(OH)}_2 \rightarrow \text{Ca(H}_2\text{PO}_4)_2 + 2 \text{H}_2\text{O}
\]

The process conditions are not extrem (temperature, pH, concentration of acid, etc.).

4. RESULTS AND DISCUSSION

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5. CONCLUSIONS

NUTRIENT RECOVERY FROM BIOBASED WASTE FOR FERTILIZER PRODUCTION

NEWFERT is a European project for the recovery of nutrients (phosphorus, nitrogen and potassium) from solid and liquid wastes from different sources. These nutrients will subsequently be incorporated into the fertilizer manufacturing processes to replace some of the usual raw materials. Bio-waste valorisation is an attractive approach in the framework of the EU Waste Management policies and the development of a circular economy. Waste from biostreams and different biobased sources are being under-utilized as potential resource of valuable compounds. Main objective of the proposal is to build up a breakthrough concept of Fertilizer Industry, strengthening European competitiveness and boosting the biobased economy potential, through the development of high recovery, industrial valorization.

Theme: fertilizer, bio-waste, biobased, circular economy, nutrient recovery, industrial valorization.

THEME:

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- DMPHOS is a sustainable closed circuit process.

The principal activities of this project are:

- Defining acceptability parameters for the fertilizer industry.

- Evaluation of identified chemical NPK-extraction processes.

- Design of a new process to recover nutrients from ashes: sewage, manure, household waste, etc.

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