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Comparative techno economical evaluation of mechanical dewatering of sludges in the dairy industry

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In general, the dairy industry produces a huge amount of dairy processing wastewater treated sludge (DPWTS). The DPWTS can be classified mainly in primary, activated and digested, each type has a different dewatering performance and properties. In Uruguay, the disposal pathways include land spreading as a soil improver, composting, landfill and valorization as a combustible. The different final destinies share the use of means of transport as a requirement which cost is directly proportional to the volume of the material. In order to reduce the transport cost there are a variety of processes that decrease the volume of sludge by eliminating water, including mechanical dewatering and drying.

Drying is known as one of the most energetic consuming processes, so to minimize operational costs is critical to choose a dewatering method that allows the maximization of the water extracted.

Mechanical dewatering performance depends on different factors such as the equipment used, the type of sludge and the moisture of the initial DPWTS. The economics aspects involved include the costs of the flocculant, the labor-related operation, the maintenance and the transport among other costs involved. In order to decrease the operation cost is significant to select the equipment that increases ratio costs/m3 of extracted water for the specific sludge produced.

The general objective of this research is to study the impact of different operation conditions in mechanical dewatering equipment on the techno-economic evaluation of the disposal of dairy processing wastewater treated sludge (DPWTS). The specific objective is to create a tool that collaborates with decision-making regarding the equipment selection dehydration process focusing on the economics aspects involved.

Based on information provided by one of the most important Uruguayan dairy companies, bibliographic data and experimental results obtained by the group (moisture, characterization), we modeled the dehydration process so we can predict the mass balance of each type of equipment. To achieve easy access and a better understanding we used Microsoft® Excel to develop the model. This simulator allows the user to compare between different options by only using as input variables: properties of the sludge, equipment specifications and mode of operation. The technologies studied were geotextile dewatering tubes, screw press and belt filter press.

As a result, we present a dynamic tool developed in Microsoft® Excel. The interface guides the user and provides a list of questions to be asked to the machinery supplier, in order to compare different types of equipment and the cost associated with each one. Producing information about the costs involved using graphics and indicators relevant to the company interest.This simulator is the first step toward a more general informatic tool of process synthesis for the wastewater sludge management.