Advanced techniques of natural dewatering of sewage sludge

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Waste Water Treatment Plants

Concept

The aim of the research project is to develop efficient drying systems in order to achieve dewatering aimed at increasing the dry content and reducing the amount of water in the sludge exiting sewage treatment plants with a consequent decrease in transportation and disposal burdens.
Wastewater treatment involves the production of large quantities of sewage sludge, which requires a significant economic burden for sustainable and thus environmentally sound management. The cost of treatment and disposal is a value that is bound to increase in the near future mainly due to the growth of urban population, improved quality of human life (higher and higher levels of treatment required), and the development of agriculture and industry.
As part of this research project, different prototypes of solar greenhouses have been planned to achieve enhanced sludge drying powered by hot air panels.
The greenhouses will have different plant configuration in order to maximize the sludge drying performance and define design criteria for project scale-up.

Scientific approach

The solar greenhouses covered by the research project are prototypes that harness green and renewable energy. The research project will consist of several phases:

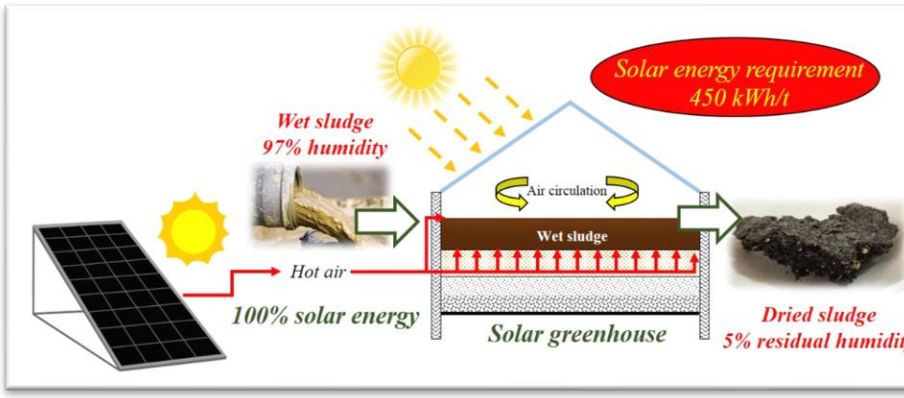
- Literature research aimed at identifying case studies of solar greenhouses installed in sewage treatment plants such as to improve knowledge on some critical points in defining different process parameters, including air flow rate and sludge layer thickness;
- Design, implementation and testing of a bench-top plant for studying the effect of sludge thickness on drying kinetics;
- Construction of prototype solar greenhouses and initiation of several experimental campaigns. Organization of experimental campaigns and set-up of equipment;
- Project scale-up at the Caltanissetta civil sewage treatment plant;
- Analysis and processing of results of all tests initiated. Processing of drainage curves, temperature curves and incident solar radiation.
- Calibration and modelling of a model required for optimization of operational and construction parameters.

Research objectives

The objective of the research project is to define optimal parameter values for the sizing of this type of system such that the amount of sludge destined for disposal is reduced and the costs associated with transportation and final disposal are minimized.

Wastewater Treatment Plant Layout

Solar Greenhouse



Schematic view of the static solar greenhouse