INCORPORATION OF MELTON BIOSOLIDS INTO AN ENERGY CROPPING SYSTEM

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RMIT University & Western Water - A Smart Water Fund Research

Topics:

- *Biosolids*
- *Agricultural Applications*
- *Biodiesel - Energy Crops*
- *Smart Water Fund*

Experimental site at Surbiton Park, Melton VIC. (Photo by F. Beshah).

BIOSOLIDS

A wastewater treatment plant consists of a primary, secondary and tertiary treatment units that have the purpose of water reclamation by physical and chemical reduction of impurities. Hence, a wastewater treatment removes suspended solids, reduces the biological oxygen demand (BOD), removal of pathogens among other to ensure that the water that is reclaimed will not have an adverse impact on the receiving water way or as in many cases can be used to water parks or agricultural fields.

During this process a mixture of solids and wastes are accumulated and physically removed. This mixture of process residual is commonly known as 'sludge'. The complexity remains in the management of the sludge which can be as high as 2% of the total water volume treated at a plant (This can vary depending on the treatment process and plant efficiency). The sludge still contains a high water concentration that needs to be removed to reduce its volume and further treatment is required. During the dewatering process, the sludge can be dried by various methods such as drying beds, centrifuges, pressure filtration or incineration. Once the dewatering process is finished the dried sludge can be composted or treated in different way to ensure the stabilization of microorganisms.

The treated sludge is now a Biosolid and can be applied to land as a soil ameliorant. This Biosolid contains a significant concentration of nutrients, micro nutrients and organic matter that provides a major benefit for soil properties. Biosolids are usually applied by direct injection or by plowing. However, the application and the condition of the Biosolids do have to comply with local State and Federal legislation. Attention must be given to the soil characteristics on which the Biosolids will be applied.

Source: Spellman, F. R., *Handbook of Water and Wastewater Treatment Plant Operation (Chapter 18)*. CRC Press LLC (2003).

More information:
Environmental Protection Agency - EPA, VIC
Guideline for Environmental Management: Biosolids Land Application.

By Alan Bull
alan.bull@rmit.edu.au

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AGRICULTURAL APPLICATIONS

Experimental field plot. (Photo by F. Beshah)

Sewage sludge, a by-product of sewage treatment processes, is composed of organic compounds, macro and micronutrients and trace elements. The Macro and micronutrients serve as a source of plant nutrients, whereas organic constituents serve as soil conditioner.

Biosolid amendment to soil improves soil properties such as porosity, bulk density, aggregate stability and soil water holding capacity. Land application of Biosolids is becoming more popular due to the possibility of recycling valuable components such as organic matter, Nitrogen, Phosphorus, and other plant nutrients. Biosolid applications to cropland enable the recycling of nutrients and may eliminate the need for commercial fertilizers. It also reduces environmental and economic considerations that limit disposal in landfills or incineration. As an alternative to disposal by land filling or incineration, land application seeks to beneficially recycle the soil property-enhancing constituents in biosolids, which are ultimately . . . (*Continues on pg. 2*)

BIODIESEL - ENERGY CROPS

Biodiesel is a serious alternative energy source to fossil fuel. Biodiesel is an ester-based oxygenated fuel, extractable from seed oil such as, sunflower, soybean, canola/rapeseed and peanut oil, and also from animal fats. The current diesel oil, extracted from fossil fuels, causes significant and detrimental environmental impacts through extraction, processing and once combustion takes place, generates significant amounts of pollutants. It is also a finite non-renewable energy source. However, biodiesel is renewable through agricultural production, does not emit compounds such as carbon dioxide and sulphur dioxide, and has significant reduction of other compounds such as, soot (60%), carbon monoxide (50%) and oxides of nitrogen - NO_x (10%). Biodiesel biodegrades much faster than petroleum diesel; an important factor, given the propensity for spillage accidents.

The first diesel engine was introduced at the World Exhibition in Paris in 1900 by Rudolf Diesel. At the exhibition, Dr. Diesel explained that the fuel source was 'peanut oil'. Biodiesel can be used as 100% fuel source or added to fossil fuel diesel as a blend in 5% or 10% concentration. Biodiesel production provides many benefits. Farmers can diversify their agricultural production and biodiesel processing wastes (such as press cake/meal) can be used for animal feed or compost. Biodiesel is economically viable and can be produced in a sustainable way.

More information:

Comparison of Transport Fuels
www.greenhouse.gov.au/transport/comparison/index.html

Tickell, J. (2003); *From the Fryer to the Fuel Tank; The Complete Guide to Using Vegetable oil as an Alternative Fuel*, 3rd Edition, Ed. Kaia Roman. New Orleans, LA:

Joshua Tickell Media Productions

By Alan Bull
alan.bull@rmit.edu.au

Oat (above) and Canola seeds harvested from the first field trials (Photo by F. Beshah).

AGRICULTURAL APPLICATIONS

. . .derived from crops grown in agricultural land.

Farmers can benefit from biosolid application by reducing fertilizer costs. The main fertilizer benefits are through the supply of Nitrogen, Phosphorus and lime. Biosolids also ensure against unforeseen nutrient shortage by supplying essential plant nutrients that are rarely purchased by farmers because crop response to their application are unpredictable. These include elements such as Sulfur, Maganese Zinc, Cupper, Iron, Molybdenum and Boron. Land application of Biosolids replenishes valuable organic matter to the soil which helps: increase water filtration to the soil moisture-holding capacity, reduce soil compaction, increase the ability of soil to retain and provide nutrients, reduces soil acidification and provide an energy source (Carbon) for beneficial soil micro-organisms.

Sources: Singh,R.P., Agrawal, M., *Potential benefits and risks of land application of sewage sludge*, Waste Management (2007) doi:10.1016/j.wasman.2006.12.010

Evanylo, G. K., *Agricultural land Application of Biosolids in Virginia.* Crop and Soil Environmental Sciences. Publication 452-301 (1999)

By Firew Beshah
S3114578@student.rmit.edu.au

For more information, visit

http://www.rmit.edu.au/applied-sciences/biosolids

SMART WATER FUND

The Smart Water Fund encourages and supports innovative development of water-saving, water-recycling and sustainable biosolids management projects throughout urban Victoria. This project is a perfect example of the work the Fund supports, and it was pleased to award RMIT a $130,000 grant over the next three years.

An initiative of City West Water, South East Water, Yarra Valley Water, Melbourne Water and the Victorian government, the Fund has provided $20 million to nearly 120 innovative projects since it was established in 2002.

Learn more at
www.smartwater.com.au

RMIT University

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Contact:
Nichola Porter
nichola.porter@rmit.edu.au

Barry Meehan
barry.meehan@rmit.edu.au

Smart Water Fund
http://www.smartwater.com.au

Smart Water Fund
PO Box 8520, Heatherton
Victoria 3202 Australia

Our Water Our Future

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Contact:
William Rajendram
william.rajendram@westernwater.com.au