How Chicago turns its sewage into topsoil

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Greater Chicago has been converting its sewage sludge into biosolids for use as soil enhancer on farmers' fields, golf courses and parks for more than 30 years. It cleared a major hurdle last month when Illinois passed a bill allowing the city's biosolids to be sold to the public to use on lawns and vegetable gardens.

Scientists at the Metropolitan Water Reclamation District of Greater Chicago (MWRD), a government entity separate from the city of Chicago that manages the regions waste water, say the converted sludge improves the sustainability of ground soils, stimulates plant growth and lasts three to five years longer than regular chemical fertilizers, at a fraction of the cost. The MWRD gives it away to farmers and more than 50 parks in the Chicago area used it in 2015. Stringent testing to make sure it lives up to the United States' Environment Protection Agency standards ensures it's safe, even if children eat it.

To produce it, the MWRD removes the solids from waste water, then deposits them in dozens of underground "digesters" for 25 to 50 days. The heat is kept at 30C to destroy pathogens, making them into biosolids. The greyish-black biosolids are dried either in centrifuges or by sitting in lagoons for 18 months, and then air-dried on paved surfaces for another few months. Air-dried biosolids look like topsoil, composted biosolids look like standard compost, and by this time in the production process, there is no more human excrement in the product, scientists say.

Even municipalities with biosolids experience can falter, however. Chicago's foray into creating a giant, 60-foot tall sewage-cooking machine run by a private corporation that would speed up the drying process and allow the sale of fertilizer to private markets ended up being 10 years late and 40-per-cent over its projected operating budget due to increased energy costs. It is projected to cost taxpayers $264 million in construction and operating costs over 20 years. But Manju Sharma, director of maintenance and operations for the MWRD, said the plant has become successful, transforming 40 per cent of the city's biosolids into marketable fertilizer pellets.

"It turned out to be an okay contract for us," she said.

Sources: Metropolitan Water Reclamation District of Greater Chicago, Medill Reports Chicago, Chicago Tribune

1 Waste water from the toilets, sinks and drains of homes and businesses in Chicago and 125 of its suburbs travels to one of seven waste water treatment plants via the sewer system. The solids are separated from the water. At this stage the solids are called **sludge**. POTOLIA

5 The biosolids are then air-dried on **paved pads** to achieve a total solids content of approximately 60 per cent. Fecal coliform tests are then taken to verify Class A EPA standards prior to shipment. MWRD

2 The sludge is sent to temperature-controlled digesters where microorganisms break them down in a process similar to composting. The substance that emerges from this stage is called **biosolids**. MWRD

6 Biosolids can be distributed almost anywhere chemical fertilizers would be employed and are used extensively in **public spaces** in the Chicago area, such as on golf courses, athletic fields, parks and recreational facilities. MWRD

3 After digesting, the biosolids are piped to **centrifuges** that work like a washing machine, spinning at high speeds to de-water the biosolids. Those biosolids are then transported by train or truck to outdoor holding areas, while biosolids that are not de-watered by centrifuges are piped into lagoons. MWRD

7 The soil at Chicago's new 10-hectare **Maggie Daley Park** is mixed with biosolids. As a result the park's turf grass is healthier, more durable, and requires less maintenance. MWRD

4 Biosolids piped into **lagoons** are aged for additional thickening and stabilization, before being transported to drying pads. MWRD

8 Biosolids are also used in **non-public spaces** such as farm lands and former mine sites that are converted into agricultural land. POTOLIA