New Sludge Treatment Technology Benefits Environment and Saves Millions

"Reduce, Reuse, Recycle" – that's the slogan of the War on Waste campaign, and the City of Cape Town has gone to great lengths to put it into practice, even applying it to human waste. Sue Matthews tells the story.

A state-of-the-art sludge dewatering and drying plant, which cost R60 million and took two years to build, has recently come on line at the Cape Flats Wastewater Treatment Works, the largest sewage works in the Cape Metropolitan Area. The new technology not only *reduces* the amount of treated sludge requiring disposal, but also incorporates innovative *recycling* methods to reduce fuel consumption, and allows the sludge to be *reused* as an economically valuable product.

The Cape Flats Wastewater Treatment Works, which lies alongside Zeekoevlei, close to the False Bay coastline, was commissioned in 1980. It was designed for a maximum incoming flow of 200 million litres of wastewater per day, and today it runs at about 80% capacity. Initially most of the sludge was discharged into hollows in the surrounding dunes, but as space

The Cape Flats Wastewater Treatment Works

became limiting it became necessary to dispose of it at more distant landfill sites. Apart from increasingly prohibitive transport costs, it wasn't long before concerns were raised about the pressure on the city's landfills, as well as potential health risks and groundwater contamination.

"Clearly, this was not a sustainable or environmentally acceptable way of dealing with the sludge," says Kevin Fawcett, Head of Wastewater Operations (South) at the City of Cape Town, "so we started investigating the latest treatment technology."

A team of municipal engineers embarked on a fact-finding tour of wastewater sludge handling and drying installations in Europe, and soon realised that South Africa was lagging behind other countries in implementing good sludge management practices.

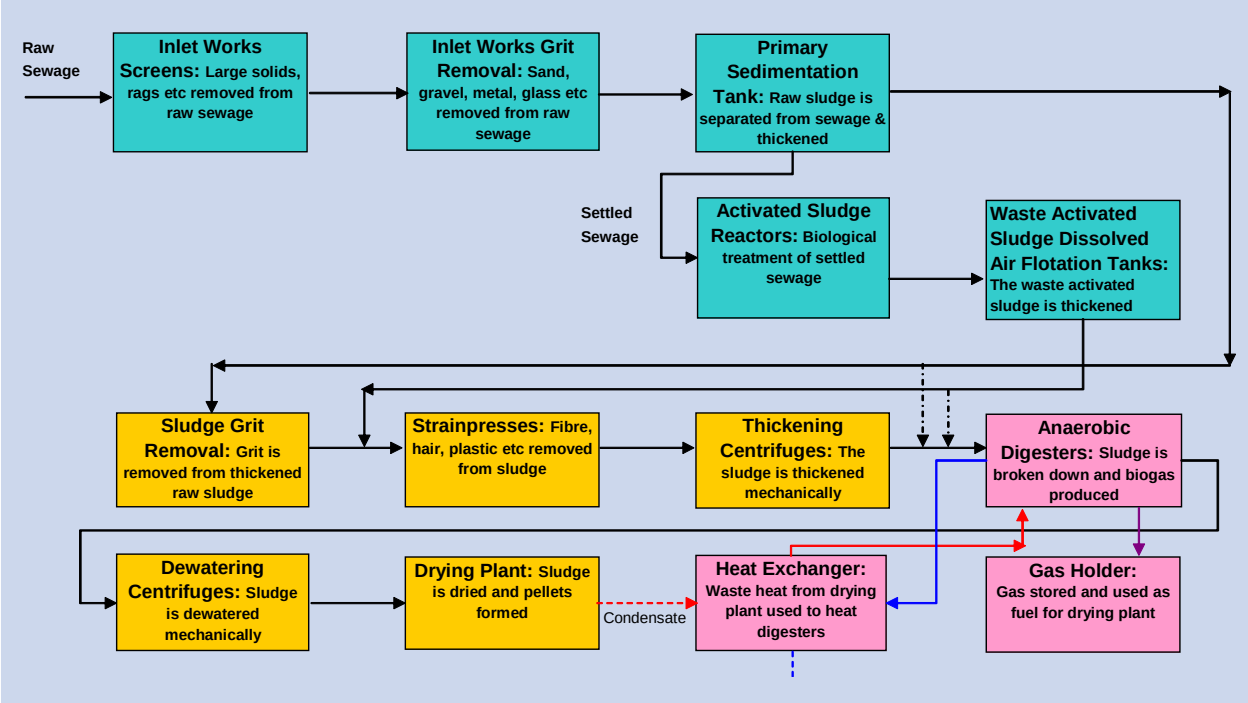
"The technology we eventually decided upon has been around for 15 years, but we're the first to bring it into this country for sludge treatment – although something similar is already being used in the fishmeal industry here," says Mr Fawcett.

The option chosen as the most suitable and cost-effective for the Cape Flats Wastewater Treatment Works was the Swiss Combi system of direct thermal sludge drying after centrifugal thickening and dewatering, as this could be used in conjunction with the existing waste-activated sludge dissolved air-flotation plant, primary sedimentation tanks and anaerobic digesters. Local consortium, Biwater-Murray and Roberts JV, was awarded the tender to build the plant, and will also operate and maintain it for the first five years.

In short, the new plant's process is as follows: sludge is thickened in two centrifuges before being fed into three 6 000 m^3 digesters to reduce the solids concentration, after which it passes through another two centrifuges for dewatering. This dewatered, digested sludge is then conveyed to the drying plant, where hot air evaporates the water content. Finally, the dried sludge is screened to separate it into fine and coarse grain sizes, producing two size classes of pellets. The small pellets are fed back into the system as seed material for pellet formation (they serve as a dry core that becomes coated with wet sludge), while the large pellets are bagged as the end-product.

Centrifuges for sludge thickening and dewatering

Final product - the sludge pellets are pathogen-free



Simplified diagram of the wastewater and sludge treatment process in Cape Town

Implementation of the new technology has reduced the volume of sludge requiring disposal from 2 000 m^3 to about 50 m^3 of bagged pellets per day.

"Apart from being beneficial from an environmental standpoint, this has a huge economic pay-off, because disposal costs and transport to landfills amounts to about R1 800 per 10 m^3 of sludge," says Mr Fawcett.

The plant will also save R10-15 million per year on fuel costs, thanks to a novel recycling system. The methane "biogas" produced in the anaerobic digesters is stored on site in a 2 000 m^3 gas holder, and used to fuel a combustion chamber that generates the heat required for drying purposes. Although the combustion chamber can also run on diesel, the biogas is enough to meet all the drying plant's fuel requirements. An added bonus is that waste heat from the drying plant is in turn used to heat the anaerobic digesters to the 38°C required for optimal biogas production.

"……it's fair to say that the Cape Flats Wastewater Treatment Works are producing the cleanest, safest sludge in the country"

This ingenious feedback loop ensures that the overall thermal efficiency of the works is maximised. But the real beauty of the new technology is that the sludge pellets have a number of practical uses. Indeed, in terms of the new DWAF Sludge Disposal Guidelines, they qualify for Type D classification, allowing unrestricted use.

The City of Cape Town intends calling for tenders for the utilisation and/or disposal of the pellets soon, but two potential applications are in the brick and cement manufacturing industries. The pellets have a high calorific value, so can be used as a fuel source in place of the normal low-grade coal.

More noteworthy, perhaps, is that they could also be used as a fertiliser or soil supplement, and it was for this reason that a pellet size of 2-4 mm was chosen – to facilitate their use in standard agricultural spreaders. The pellets retain all of the beneficial, nutrient-rich properties of human manure, but bear none of the aesthetic and health concerns normally associated with sewage sludge.

"The pellets are 100% pathogen-free," says Biwater's Adrian Cooney, "and I think it's fair to say that the Cape Flats Wastewater Treatment Works are producing the cleanest, safest sludge in the country."