

Mersey Valley Processing Centre [MVPC] Shell Green SHARON Process advanced Stable High rate Ammonia Removal Over Nitrite system for removal of ammonia

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The Mersey Valley Processing Centre (Shell Green) is a strategic digested sludge incineration scheme facility in Widnes on the north bank of the River Mersey. The centre is critical to the safe and efficient disposal of waste water sludge from the Manchester and Liverpool conurbations and was originally constructed in the 1990's. The new Shell Green (Stream 3) extension provides United Utilities with additional capacity by the construction of a new sludge dewatering facility and a third sludge incineration stream. The existing facility receives approximately 65,000 tDS per year of sludge. The Stream 3 extension increases capacity to nearly 90,000 tDS per year serving a population of approximately 4 million.



General view of completed plant within concrete bund to meet IPPC requirements (May 2010)

Courtesy of Grontmij

United Utilities has now implemented Grontmij's advanced SHARON (Stable High rate Ammonia Removal Over Nitrite) system for removal of ammonia in sewage treatment at the Mersey Valley Processing Centre. The process was developed by Grontmij, in partnership with Delft University of Technology in Holland nearly 15 years ago. It was created in a bid to reduce nitrogen pollution in watercourses. The main aim of the process is to provide a more energy efficient way of breaking down the ammonia present in liquors from sludge treatment plants.

The Shell Green facility operates under an IPPC (Integrated Pollution Prevention and Control) permit with a wide range of regulatory constraints covering all emissions from the plant. Centrate liquors from the sludge dewatering plant are high in ammonia pollution and this must be reduced before discharge to the local sewerage system.

As there is no existing wastewater treatment plant at the site the liquors must be treated in a dedicated liquor treatment plant. The liquor treatment plant treats flows up to 1.4 Ml/d (16.2 l/s) in a Centrate Nitrogen Removal Plant (CNRP) with higher flows being treated in a Centrate Solids Removal Plant (CSR). The CNRP uses the SHARON process technology.

The fundamental efficiencies of the SHARON process are achieved by removing ammonia via the nitrite route rather than the conventional nitrate route.

The SHARON process takes advantage of the difference in growth rates between ammonia oxidisers and nitrite oxidisers in liquors at warm temperatures. The process is exothermic and at Shell Green is supplemented by low grade heat from the new sludge incineration

SHARON

(Stable High Ammonia Removal over Nitrite)

– Grontmij’s patented high performance wastewater treatment process for the removal of nitrogen

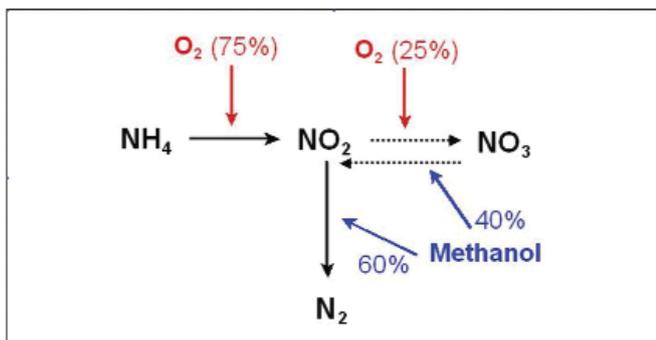
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– 7 elementary reasons to invest in SHARON:

- 01 – 5% saving on energy, due to lower oxygen demand
- 02 – 40% saving on carbon source for denitrification
- 03 – 30% reduction on sludge production
- 04 – Proven high performance sludge treatment system
- 05 – Easily incorporated into existing treatment plants
- 06 – Sustainably designed low cost option
- 07 – Reduces impact on the environment

N

– Nitrogen // Atomic Number. 7 // Atomic Weight. 14.0067



The Nitrite Route vs. the Nitrate Route

Courtesy of Grontmij

stream. At higher temperatures the ammonia oxidisers have a significantly higher growth rate. By controlling the aerated retention time to approximately one day the nitrite oxidisers are washed out of the system and the nitrification is limited to nitrite formation. Incorporating a SHARON plant reduces energy usage by 25% and carbon dioxide emissions by 20%, while converting to nitrite uses 40% less methanol in the process than conversion to nitrate as shown in the above diagram.

The process is also a very robust process which takes place in a completely mixed tank and it is not dependent upon sludge loading rate. Therefore it can easily cope with varying inputs from, for example, the start up of dewatering plant. Furthermore, the process plant is generally constructed from units which are often encountered in wastewater treatment enabling framework suppliers to be used and an easy familiarity to be obtained by operational staff.

The SHARON process was selected by United Utilities after extensive testing using Grontmij's container mounted trial plant.

The completed centrate nitrogen removal plant treats 1,650kg/d of ammoniacal nitrogen with a guaranteed removal rate above 95%. The plant has been constructed by the Stream 3 JV consisting of Costain and Veolia Water Solutions & Technologies with process design and

support provided by Grontmij under a design services sub-contract. Commissioning has been completed in early 2010.

This is the first SHARON plant completed in the UK and it is expected that further similar plants will follow as the advantages of efficient sidestream treatment become apparent. The realisation that sludge can be a source of energy and not just a waste product is leading to improvements in sludge treatment including advanced digestion systems that produce liquors with high concentrations of ammonia. It is frequently more economical to treat these liquors in an efficient dedicated liquor treatment plant rather than by imposing a high ammonia load on the receiving wastewater treatment plant. Anglian Water has also selected a SHARON liquor treatment plant for their Whitlingham (Norwich) thermal hydrolysis anaerobic digestion plant.

Several SHARON plants are already operational in Holland and a large facility in New York with a capacity of 5,000 kgN/day was completed in 2009. Plants are also being implemented in Geneva, Paris and Linköping, Sweden.

The process was developed in Holland, where in 1993, advanced nutrient removal became compulsory following a strict interpretation of the EU Urban Wastewater Treatment Directive. The SHARON process was selected from a number of available technologies as the most efficient process on a whole life cost basis and construction of six full size plants for cities in the Netherlands then followed. With many years of operational experience the process is considered proven technology in the Netherlands. SHARON has a number of applications such as treatment of liquors from digestion plants, drying plants and for treatment of landfill leachate and wastewater from digestion of organic municipal solid waste or manures. Grontmij owns the patent rights for the European Union and North America for the SHARON process.

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Containerised trial plant on site (2005)

Courtesy of Grontmij