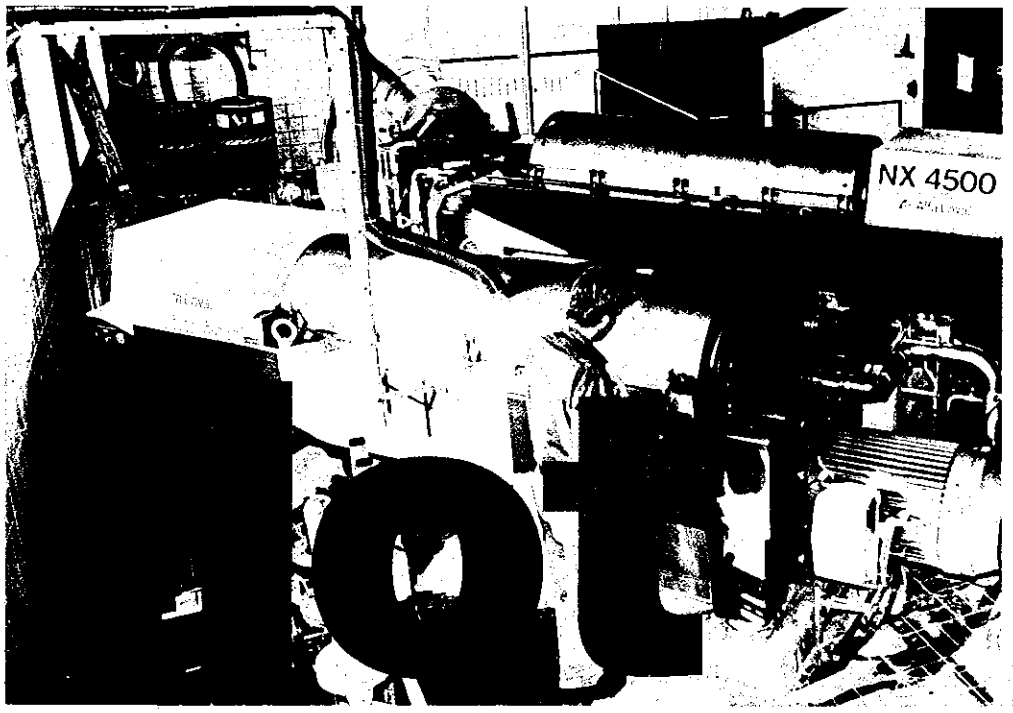

Thermal hydrolysis is not a new concept as a means of treating sludge but it is still early days in terms of the availability of technology to make it a practical viability. This, however, is changing, and the processes detailed in this and the following article show how new options are opening up for operators facing the prospect of dealing with ever-increasing volumes of sludge.

Prospects

Development of a Swedish sludge treatment process based on thermal hydrolysis has included life-cycle analysis to evaluate the overall environmental impact of using the technology.

In the late 1980s, a project called Hypro was carried out under the European Union's Eureka programme, a programme that aims to stimulate development of solutions to problems faced throughout member states.

Hypro, whose name was derived from 'hydrolyse project', looked at the hydrolysis of sludge as a means of producing organic matter which would be used in the preceding sewage treatment process as a carbon source in denitrification.

The thermal treatment finally used in Hypro was carried out at 160°C, 6bar, with a pH of less than 2. This gave a sludge which was easy to dewater and dissolved many of the heavy metals, iron coagulant and phosphorus in the sludge, allowing them to be separated out.

Hypro therefore presented a process with the potential to produce a carbon source that could be digested to give biogas or be used in denitrification. The resulting sludge also became more attractive since it had a reduced metal content, was pasteurised, could be used as a biofuel, and could even be used as a raw material for production of activated carbon.

In a drive to move on from the Hypro project, Swedish company Kemira Kemwater as been carrying out a further project, Krepro.

The first part of Krepro is half funded by the Swedish Environ mental Protection Board and half by the participants, giving a total equivalent to around $3M. The aim of the first part of the project has been to try to combine enhanced phosphorus removal, nitrogen removal and BOD removal with the production of a sludge where high dewaterability can be achieved.

The second part of Krepro has a budget equivalent to around $2.5M and aims to recycle coagulant, phosphorus and separate heavy metals as well as carrying out the life-cycle analysis of the Krepro process.

Following trials on a half-scale plant, a larger plant has been built at Helsingborg treatment works in Sweden. The new plant features energy recovery and modern dewatering equipment and 500m³ of sludge can be treated daily in two 8m³ reactors. This allows evaluation of the total economy of the process and the impact on the sewage treatment plant.

Evaluation of use of the carbon source in denitrification has been carried out mainly in the full scale plant and shows that denitrification rates are lower when compared to acetate but are higher than sugar. No increase in COD levels have been measured after four hours of denitrification.

Use of the carbon source for digester gas production is also being evaluated in Krepro, but this is mainly being carried out at laboratory scale.

Testing on the dewaterability of the sludge has shown that following hydrolysis all inorganic salts and about 40% of the organic matter are dissolved. The remaining organic matter is dewatered easily to 50% dry solids. Following further precipitation at a higher pH, inorganic sludge, containing the phosphorus, coagulant and heavy metals can be dewatered to about 30%, and the heavy metals and metal phosphate can be separated in a chemical/physical process.

The Krepro project also involves carrying out a life-cycle analysis of the process, a technique which Kemira Kemwater has demonstrated by assessing the environmental impact of different sewage treatment processes.

Important points in the analysis are the creation of process flows to include all of the factors involved. This includes extraction and production of raw materials through to the impact of emissions. Construction of the treatment plant must also be considered.

Life-cycle analysis leads to a series of comparative scores for a range of environmental impacts, such as energy use, eutrophication, ozone production and greenhouse gas production, and these scores can be aggregated to give overall comparative scores based on 'ecopoints'.

The results coming from the Helsingborg plant give Kemira Kemwater the confidence that it will be bringing the Krepro process to the market, but the company wants the plant to provide further operational data to ensure it can give full guarantee of the process. ■