

# Worksop STW – new sludge dryer £3 million ‘Centridry’ plant is first in the UK

by

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**W**ith the introduction of ADAS Safe Sludge Matrix and proposed changes to the Sludge (Use in Agriculture) Regulations 1989, Severn Trent Water has recently completed an evaluation of a ‘Centridry’ enhanced sludge dewatering/drying process. Microbiological analysis was carried out on feed sludges and dried product and in all cases the microbiological content of the dried product was below levels of detection. Following the evaluation, it was decided to build a ‘Centridry’ Sludge Drying Plant at Worksop Sewage Treatment Works.



Worksop: New sludge dryer plant

courtesy Severn Trent Water

## Worksop STW

Worksop Sewage Treatment Works is located to the East of the town of Worksop in North Nottinghamshire. The sewage treatment works was commissioned in 1976 and consists of preliminary treatment by screens and grit removal, primary sedimentation, biological filtration and final settlement. The works is designed to cater for a population equivalent of 50,800.

Sludge treatment consisted of a sludge press plant to dewater sludges and sludge cake that was removed off site periodically in lorries, sheeted to reduce smells. The off-site sludge disposal route was through a sensitive area and local pressure was brought to bear on Severn Trent Water to limit vehicle movements.

Worksop was originally included in the AMP3 programme for a new-build sludge digestion plant, but to alleviate planning concerns, it was decided that the site would be better suited to a new ‘Centridry’ sludge drying plant – a combined mechanical and thermal dewatering plant – which would convert approximately 2,400 tonnes of bio-solids per annum to pellet form at 85% dry solids. The new plant would be located in the existing Press House once the ageing presses had been removed.

## This £3 million plant is the first of its kind in the UK

*Mowlem Johnston* was responsible for the sludge treatment improvements for the scheme prior to the drying stage and

civil/building elements of the building conversion, whilst Euroby Ltd procured and installed the 'Centridry'.

**Treatment of sludge prior to drying**

Primary sludge is pumped through a 6mm sludge screen from where it is thickened in batch thickening tanks. A new glass coated steel tank was built and the two existing concrete holding tanks were converted into batch thickening tanks, to ensure that the feed sludge to the new drying plant is of the correct concentration. Homogenisation of the liquid sludge is an important precondition of a trouble free drying operation. Sludge in these tanks is completely mixed ready for feeding to the new drying plant. Water is removed from the tanks using new decanting pipework and returned through the treatment works.

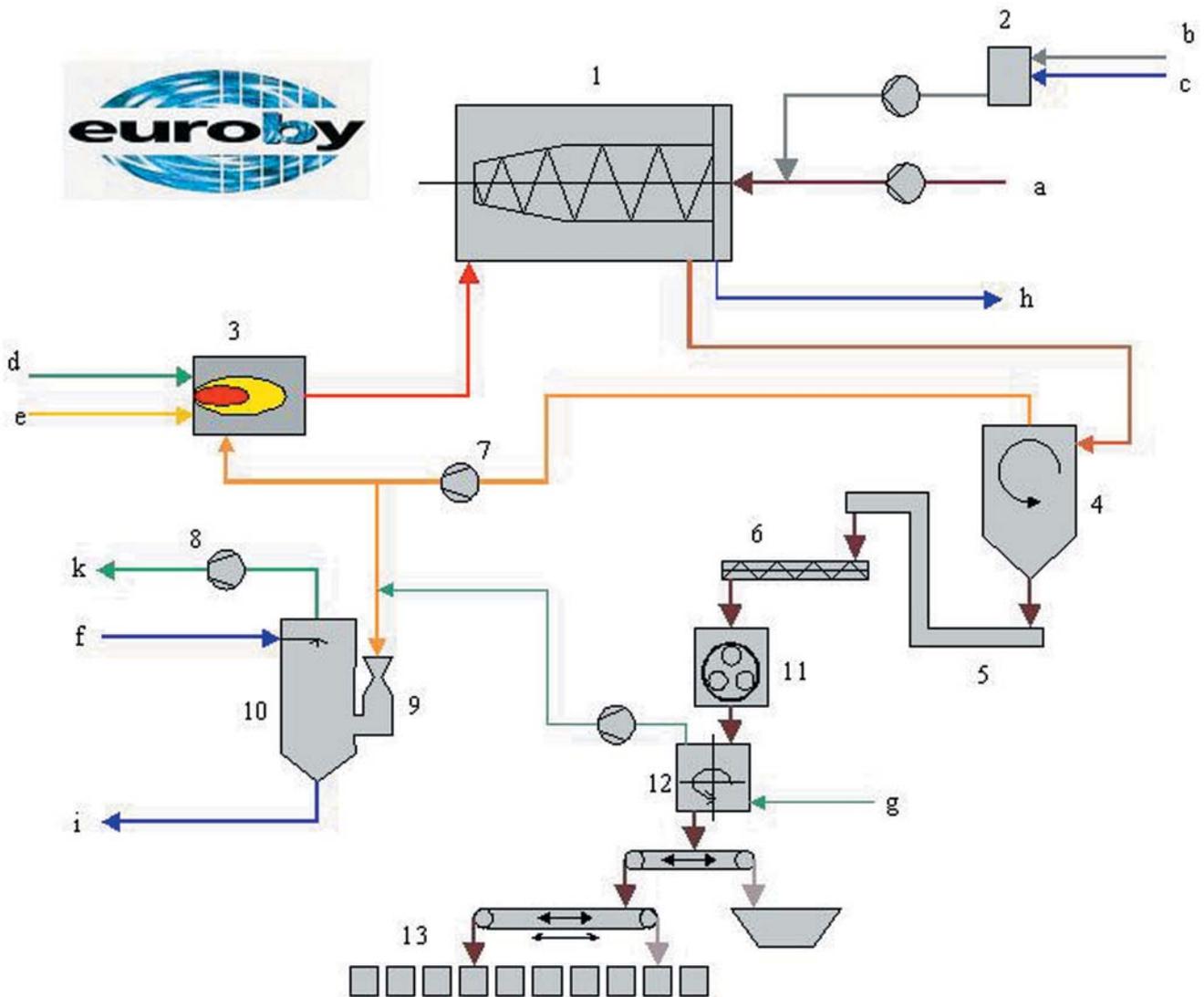
**Centridry Sludge Drying Plant**

The Worksop 'Centridry' dewatering and drying system, supplied, installed and commissioned by Bird Humboldt through their UK agents Euroby Ltd, is designed for a throughput of 2,340 tonnes dry solids per year. A test rig was set up in September 2002, where

Fig 1 below shows the 'Centridry' process. Liquid sludge combined with polymer is pumped from the holding tanks into the centrifuge dryer where it is dewatered. Dewatered sludge is discharged at high velocity into the plant's thermal stage. Hot gas is introduced into the thermal stage and the dry solids content of the sludge is increased to between 65% and 85% in a matter of seconds. The heat for the drying process is produced by burning gas in a hot gas generator from where it is introduced into the drying plant where it cools down due to the evaporation process.

Dried sludge is then discharged from the dryer to a highly efficient cyclone separator where product particles are separated from the vapour and discharged onto the elevating chain conveyor then onto the pelletiser. The pelletiser produces 6mm pellets which are cooled then discharged into either a bulk loading station or bags for transportation and disposal off site.

Centrate from the 'Centridry' is returned to the main sewage works for treatment. Vapour from the cyclone separator is drawn through the system and reheated in the hot gas generator before passing



Worksop sludge was processed. From these tests the following design criteria were established.:

- \* design feed concentration 5% dry solids;
- \* maximum feed concentration 6% dry solids;
- \* minimum feed concentration 4% dry solids;
- \* DS contents of dried product 85% by weight;
- \* Design evaporation content 1700 kg/hr

back into the drying loop. Recycling of the air in this way allows the oxygen concentration in the system to be controlled during the operation. Excess vapour is drawn off and passed through a venturi scrubber and condenser to remove volatile components and fine dust prior to discharge to the atmosphere.

The 'Centridry' plant was retrofitted into the existing sludge press building on site, with only the cyclone being external to the building.

**Health & Safety**

Sludge drying has been, historically, linked with health and safety concerns. The risk of fire or explosion has been reduced by:

- \* inerting;
- \* avoidance of the source of ignition.

Inerting is obtained by keeping the oxygen level in the system below 10% .

Oxygen levels are monitored and controlled using the recycled gas proportion and sludge is not fed into the system until the level is sufficiently low to limit the potential for explosion. A source of ignition could be present in the form of stones or metal debris remaining in the system during shut down and generating a spark when the plant is next started up. To reduce this risk, the dryer is purged of dried product during shut down. This is achieved by allowing the circulating fan to continue to run after the sludge feed has stopped, to purge the system prior to the next start-up and the application of heat, Debris is also removed prior to sludge entering the system.

Completion of the plant was scheduled for March 2004.

The benefits obtained from providing this sludge drying process at Workstop over conventional sludge treatment is that the daily sludge production of 320 cubic metres is reduced in volume to 17 cubic metres of dried product, making transportation and final disposal much easier. ■

*Note. Joanne Barnes, is Assistant Engineer and Chris Simpson, Engineer, both with Severn Trent Water.*

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