



### Reasons for digesting sludge

In wastewater treatment considerable quantities of sludge are constantly being produced. In their raw state the sludge are putrescible and rapidly develop strong and obnoxious odours. Sludge also contain pathogenic (disease-causing) organisms harmful to man. It is, therefore, necessary to contain and treat these wastes.

Anaerobic digestion is the most common method in use today for treating wastewater sludge. Its attractiveness comes from it being a relatively stable process if properly controlled, with low operating costs and the production of a useful by-product (a combustible gas), which can be used as a source of energy.

### Advantages:

- The organic content of sludge is significantly reduced by conversion into gaseous end products. This means the sludge becomes stabilized after digestion.
- The obnoxious odour of the sludge is removed. The final digested sludge has a characteristic “tarry” odour.
- Fats and grease are broken down by the process.
- There is significant reduction in the numbers of pathogenic bacteria.
- There is a marked physical change after digestion due to a significant reduction of the mass and volume of the sludge.
- There is a marked chemical change after digestion. The liquid fraction (supernatant) contains increased levels of ammonia as a result of the breakdown of organic nitrogen (proteins). This makes the digested sludge liquor potentially suitable for agricultural use.
- The digested sludge can be readily dewatered and dried.
- The biogas, which is evolved, is a mixture of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>), which can be used for digester heating or to generate power.

### Disadvantages:

- A relatively high initial capital cost is involved, which tends to limit the process to medium and large size works.
- The slow rate of bacterial growth requires long periods of time to start-up and limits the flexibility of the process to adjust to changing feed loads, temperatures and other environmental conditions.
- The process is prone to upsets if not regularly monitored and if corrective action is not taken timeously.

### Microbiology of the process

Anaerobic digestion is a multistage biological process whereby bacteria, in the absence of oxygen, decompose organic matter to carbon dioxide, methane and water. In this way the sludge is stabilised and the obnoxious odour is removed. The process can, however, be described adequately and simply as occurring in two stages, involving two different types of bacteria.

**Stage 1** The organic material present in the feed sludge is converted into organic acids (also called volatile fatty acids) by acid forming bacteria.

**Stage 2** These organic acids serve as the substrate (food) for the strictly anaerobic methane-producing bacteria, which convert the acids into methane and carbon dioxide.

