NU-WAY

ENVIRONMENTAL ENGINEERING SOLUTIONS

# Anaerobic Digester Gas Mixing

The Utile continuous anaerobic gas mixing system is suitable for use in sealed digester tanks whether cylindrical, cylindrical spherical or egg shaped. Its design optimises the sludge digestion process and produces a more homogenous mix than other systems.

Utile have 20 years experience in the design, supply and installation of these systems worldwide, working with clients to install complete systems or simply to provide the gas mixing compressors to operate systems designed and installed by others. This flexibility, experience and quality make Utile a leader in this field.

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## Gas Mixing

### Primary Digesters

### Acid Phase Digesters

### Industrial Effluent

### Farm Slurry

- ATEX Compliant
- DSER Compliant
- Increased Operating Efficiency
- Low Capital Cost
- Simple Installation
- No Downtime
- Turnkey Packaging

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# The Utile Approach To Continuous Mixing

## Design concept

With no moving parts within the digester tank, the Utile system offers complete reliability of operation. Utilising duty and standby compressors or simply duty compressors with boxed spares, allows simple, cost effective routine maintenance to be carried out with no downtime in operation giving maximum gas production at all times. External control offers us the ability to "trim" the gas flow to obtain maximum efficiency within the tank, and check the flow of gas through each line, offering the client complete confidence in the operation.

## Capital and Operating Costs

Whether complete Utile gas mixing systems or gas mixing compressor packages only, capital cost is low, offering a cost effective solution to digester tank mixing.

The required installed and absorbed power for the Utile gas mixing compressors is lower than other gas compressors and other types of mixing system. Typically around 3 watt/$m^3$ are required to operate our system, dependant on the tank dimensions, giving considerably reduced running costs, coupled with minimal maintenance costs to provide overall, the most efficient type of mixing.

## Care for the Environment

With such low absorbed power and EEF1 drive motors the carbon footprint is reduced to a minimum on Utile continuous gas mixing systems. Gas generation and utilisation is optimised because we produce a homogenous mix with low input power in such short time periods. Gas venting and flaring is subsequently eliminated, required only in emergency, thus making an important contribution to the protection of the environment.

# Principle of Operation

## General

Sludge produced during the treatment process is pumped into digestion tanks. These tanks are sealed to exclude air, the sludge is maintained at a temperature of 35°C for about 11 to 13 days. Under these conditions the sludges are biologically decomposed and the methane gas is formed as a by-product of this decomposition.

A certain amount of the gas is used elsewhere in the treatment process, from the activated sludge plant to the boilers for heating the digesters. A combined heat and power unit (CHP) burns some of the gas to produce electricity, the waste heat is recovered and used to heat the digestion tanks.

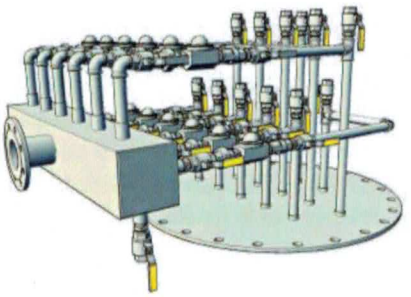
## Gas Compressor Package

The gas that is left in the digester is recirculated and drawn off through the splash trap at the top of the digestion tank (where it is split to go to the other processes). This gas is then fed to the gas compressors via the inlet condensate traps, which are there to remove some of the moisture in the gas. The gas then flows through a cone filter, which traps any debris, passes a low pressure cut out switch, which trips out if the pressure in the pipe falls below the set point and on to the compressors.

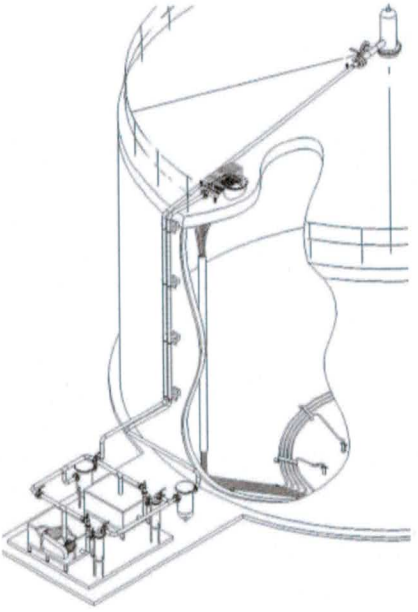
The gas is compressed to the required pressure, it then travels through an oil collection vessel, which collects oil used in the compressor. A pressure relief valve sits on the top of this vessel and will open and allow the gas back to the inlet line if the gas pressure is above the set point. After the oil collection vessel the gas goes through a non-return valve, which stops any gas returning into the low-pressure area when the compressors are shutting down. The gas then passes further protective devices such as a high temperature switch and high pressure cut out switch, these trip if the gas temperature and pressure rise above a set point. The gas then travels into a final condensate trap and returns up to the top of the digester.

## Digester Mixing System

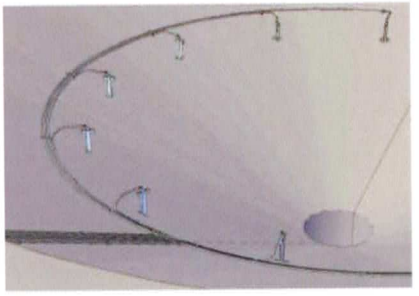
Once at the top of the digester the gas enters a flow manifold and is then split into several smaller pipes, through flow indicators which show whether there is a blockage in that particular gas line, and fed down into the inside of the tank and through the diffusers which are equally spaced around the digestion tank floor. These diffusers bubble the gas through the sludge preventing excessive solids settlement and help reduce any fat build up.



Typical Gas Mixing Manifold Assembly



Typical Gas Mixing Layout



Diffuser Ring and Gas Hoses

# Features

## Application

With an ever rising population throughout the world there is an increasing demand for the disposal of waste water and the consumption of clean water. Driven by environmental concerns and technological advancement, Authorities and Industries are forced to process sewage in a more efficient manner, hence the use of digester tank mixing.

This process allows sewage to be processed efficiently and returned to the land to fertilise or dried and compacted into brickettes for use as a fuel source.

The water is purified to be discharged into a water course.

By-products of the digestion process are an important factor in its efficiency and usefulness. The most important by product which is maximised by the Utile continuous gas mixing system is the generation of methane gas, this is often used to feed combined heat and power plant, thus ensuring quick repayment of capital costs.

## Design

The Utile anaerobic gas mixing system is designed to provide efficient, continuous, trouble free and cost effective operation over the lifetime of the plant.

| Features | Advantages |
|---|---|
| Diffuser aeration | • No ragging or blinding of impellor<br>• High mixing efficiency of whole tank<br>• Tolerant to increase in dry solids content<br>• Uniform temperature distribution improving overall efficiency<br>• No grit build up |
| Low absorbed power | • Low operation costs<br>• Increased efficiency |
| Belt drive | • Flexibility to reduce or increase gas flow rate to control the mixing process |
| Top plate assembly | • Indicators provide gas flow confirmation on each feed line<br>• Trimming valves allow control of bubble pattern to ensure efficient mix<br>• Non return valves allow routine maintenance with no downtime |
| Gas Compressor | • Elevated temperature input improves overall efficiency<br>• Standby operation eliminates downtime during maintenance<br>• Low maintenance cost<br>• Quick installation |

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