CITY OF STRUTHERS
WWTP STANDBY POWER GENERATOR
AND METHANE GAS CONVERSION PROJECT

a) The City of Struthers wastewater treatment plant's anaerobic digestion process produces a significant volume of unfiltered methane gas as a byproduct of the wastewater treatment. Presently a portion of the methane gas is used to produce the heat the digesters. The excess methane gas, which is not used in the treatment process, is safely flared off to the atmosphere. The excess methane gas will be used to operate the 500 kw generators. The generators will supply the digesters with hot water to maintain the sludge at a constant temperature thereby reducing the requirement of using natural gas and produce electricity that will supplement a major portion of the electrical power used at the treatment plant. The thickener will reduce the secondary sludge volume pumped to the digesters and will result in additional digester capacity and reduction in utilities.

b) The Project includes following equipment:

1. <u>500 kw Electrical Generators</u>

   The project includes (2) 500 kw natural gas generators with associated paralleling switchgear. The two natural gas generators will be powered by utility supplied natural gas or plant supplied digester gas. Each generator will be rated for prime operation or 24 hours per day. The paralleling switchgear will be rated at 1600 amps, 480/277 volts, 3 phase, 4 wire. The paralleling operation will be between the two 500 kw generators and the main power feed from the electric utility. The intent is not to supply the power to the utility grid but to supplement the plant's power requirements. The generators will supply the digester with hot water to maintain the sludge at a constant temperature.

2. <u>Dystor Gas Holder System</u>

   The existing cover of primary or secondary digester will be demolished and replaced with Dystor Gas Holder to store the methane gas. The Dystor system is a gas holder design that uses a dome-shaped, engineered membrane system to store methane gas, provide for sludge storage, and prevent odors. The system includes two durable membranes. The outer membrane is cable restrained and remains inflated in a fixed position. An inner membrane moves freely as it stores or releases gas generated from the anaerobic digestion process. An air handling system maintains a preset operating pressure between the two membranes. This keeps the outer membrane inflated, while exerting a constant pressure on the stored gas regardless of inner membrane position. Operating pressure is easily varied within the design range without adding or removing ballast. Membranes are sealed tight to the digestion tank's wall, preventing odors from escaping. In operation, as methane gas is withdrawn from the gas storage chamber, a fan supplies air to the air chamber. This expands the air chamber so it displaces the methane gas. As gas is added, an adjustable pressure relief valve equalizes the pressure in the two chambers by venting the air chamber and allowing the gas chamber to expand.

   The benefits are as follows:

   - More gas storage
   - More sludge storage

- Automatic operation
- True odor containment
- Reduced maintenance
- Very economical
- Environmentally stable

3. Mixers for Sludge Storage Tank

The waste activated sludge from the retention basin area and waste trickling filter sludge from the final clarifiers will be pumped and stored in existing sludge holding tank prior to thickening. This sludge must be mixed and aerated in order to stay fresh and homogenous. The floating type aerator will be provided in the existing sludge holding tank, which is a combination of aerator and mixer and is very efficient for both the mixing and aeration requirements. The aerator is mounted on floats so it is easy to install and with the varying liquid level of a sludge holding tank, the floating aerator moves very well. This type of aerator has subsurface discharge so it reduces the amount of splashing and aerosol as compared to other type of aerators. The preliminary size of the unit will be Aeration Industries model number based on 15 to 25 hp requirements and will be sized as required by the ten state standards.

4. Waste Gas Burner and Piping Replacement

The existing Varec Figure No. 239 burner is designed to provide a circular ring of pilot gas to initially light the main gas and to continue burn after main flame ignition providing a "curtain" of flame. This curtain of flame assures the continuous ignition of waste gas. The waste gas burner will be replaced with a new one with the same model no. and pilot ignition system. The unit provides a manually initiated ignition spark and provision to continuously cycle the spark on and off. A compact ignition transformer with a dual cycling timer switch is provided inside a weatherproof enclosure. The existing unit is approximately 20 years old and has met its useful life. The existing 6" dia methane gas line from the digester building to the waste gas burner will be replaced with a new one because of a sag in the line.

5. Sludge Thickener

The thickener will thicken the liquid waste activated sludge and the liquid trickling filter sludge prior to pumping to the digester from approximately 0.5 to 3.5%. The anaerobic digestion process requires the sludge to be digested at a temperature between 95 and 100 degrees Fahrenheit. The reduction is sludge volume pumped to digester by thickening the sludge will substantially reduce the energy required to heat the sludge. In addition to the energy saving related to heating the sludge pumped to the digester as previously stated, which improves the digestion efficiency, digester gas generation and handling less liquid that reduces the cost of pumping. The unit will be sized for feed rate of 80 to 120 gpm and will include flocculation tank, disk system, static mixers, discharge tank, disk drive and thickened sludge storage+ hopper.