3 MATERIALS AND METHODS

3.1 Materials Used

3.1.1 Waste Water Materials

The waste water of sugarcane is collected at Central Sugar Refinery, Shah Alam for about 75 Litres. The samples were collected from the pond before the effluents enters the treatment process. During collecting the samples, the temperature is recorded. The samples were filtered using sieve, and stored in a cold room at 4°C prior to use. Samples analysed for chemical oxygen demand (COD), total suspended solids (TSS), pH, and volatile suspended solids (VSS).

Figure 3-1 Waste Water of sugarcane
3.1.2 Chemicals

The chemical used for this research is Potassium Hydroxide (KOH). KOH were used to absorb CO$_2$ from the mixture of CO$_2$ and CH$_4$ after the methanogenic process.

3.2 Experimental Procedures

Raw sugarcane wastewater will be treated by UMAS in a laboratory digester with an effective 200-litre volume. Figure 3.2 & 3.3 presents a schematic representation of the Ultrasonicated-Membrane Anaerobic System (UMAS) which consists of a cross flow ultra-filtration membrane (CUF) apparatus, a centrifugal pump, and an anaerobic reactor. 25 KHz multi frequency ultrasonic transducers (to create high mechanical energy around the membrane to suspend the particles) connected into the MAS system. The ultrasonic frequency is 25 KHz, with 6 units of permanent transducers and bonded to the two (2) sided of the tank chamber and connected to one (1) unit of 250 Watts 25 KHz Crest's Genesis Generator. The UF membrane module had a molecular weight cut-off (MWCO) of 200,000, a tube diameter of 1.25 cm and an average pore size of 0.1 μm. The length of each tube was 30 cm. The total effective area of the four membranes was 0.048 m$^2$. The maximum operating pressure on the membrane was 55 bars at 70 °C, and the pH ranged from 2 to 12. The reactor was composed of a heavy duty reactor with an inner diameter of 25 cm and a total height of 250 cm. The operating pressure in this study was maintained between 2 and 4 bars by manipulating the gate valve at the retentate line after the CUF unit.

The raw waste water of sugarcane is stored inside the reactor, and then the sample was left for 5 days for acclimation process. After 5 days, the process had been started continuously for 5 hours. The controlled parameters in this experiment are pH, pressure and volume. The volume will be maintained for 50L for every process that runs. After 5 hours, the amount of COD, BOD, TSS, VSS, and VFA were determined from permeate and treated. The process will be run for 12 times to compare the value of all the parameters stated.
To gas collector
Pressure Gauge
Valve
Reactor
Membrane
Reptate
Ultrasonicated membran UF module
Permeate
Pump
Sludge wastage
Feeder tank

Figure 3-2: Experimental Set-up

Figure 3-3: Schematic for Ultrasonic Membrane Anaerobic System (UMAS)