BIOGAS TECHNOLOGY APPLICATION TO MANAGE WASTE AND WASTEWATER OF PALM OIL MILL FOR ENERGY AND ENVIRONMENTAL CONSERVATION

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ABSTRACT

Palm oil processing generates significant amount of wastes in liquid and solid form. Solid wastes include empty fruit bunches, palm pressed fibres and palm kernel shells are often sold to other industries or internally used as fuel source for generating heat and electricity. For such industry, rate of palm oil mill effluent (POME) is in a range of 0.5 - 0.7 m^3/TFFB, including empty fruit branch (EFB) pressed liquor. Since raw POME contains high organic and solid content, many palm oil mill separate decanter cake from liquid waste stream. Solids can therefore be reduced up to 10 - 15% by using three phases separator. However, POME with or without decanter cake separation is an attractive source for biogas production via anaerobic digestion. Hence, selection of the most appropriate digester type is strongly important for efficient and effective wastewater management. This paper presents the conceptual design experiences of A+ Biogas system to manage wastewater from palm oil industry. Based on practical experiences, A+ CSTR followed by A+UASB and A+HCSR digesters are used to manage wastewater with cake separation (organic load 55 kgCOD/TFFB). Meanwhile, wastewater without cake separation (organic load 64 kgCOD/TFFB) is managed by using A+ CHCR and A+ UASB digesters. Biogas produced from POME and wet cake is approximately 46 - 48 Nm^3/m^3_{ww} and 80 - 100 Nm^3/ton $_{wet\ cake}$ or 28 - 30 Nm^3/tonFFB. Since biogas comprises of 60% CH_4 and HHV 21 MJ/Nm^3, biogas can be used to generate heat, electricity or used directly in boilers. Effluent and stabilized sludge can improve the soil conditioner and replace some parts of chemical fertilizer in palm oil plantations.

KEYWORDS: Anaerobic digestion; biogas; cake; palm oil; palm oil mill effluent