가축분뇨를 이용하는 미생물연료전지 개발을 위한 구조개선

*,**장 재경, 유 영선, 이 성현, 김 종구, 강 연구, 김 영화

The Structure Improvement of Microbial Fuel Cell to Generate Electricity from swine wastewater

*,**Jaekyung Jang, RyouYoung Sun, SungHyoun Lee, JongGoo Kim, YounKoo Kang, Young Hwa Kim

These studies convert to useful electricity from swine wastewater and to treat this wastewater. In order to operate the microbial fuel cell(MFC) for the swine wastewater, the anode volume of MFCs was scaled up with 5L in the vacant condition. Graphite felts and low-priced mesh stainless-less as electrode had mixed up and packed into the anode compartment. The meshed stainless-less electrode could also be acted the collector of electron produced by microorganisms in anode. For a cathode compartment, graphite felt loaded Pt/C catalyst was used. Graphite felt electrode embedded in the anode compartment was punched holds at regular intervals to prevent occurred the channeling phenomenon. The sources of seeding on microbial fuel cell was used a mixture of swine wastewater and anaerobic digestion sludge(1:1). It was enriched within 6 days. Swine wastewater was fed with 53.26 ml/min flow rate. The MFCs produced a current of about 17 mA stably used swine wastewater with 3,167± 80 mg/L. The maximum power density and current density was 680 mW/m^3 and 3,770 mA/m^3, respectively. From these results it is showed that treatment of swine wastewater synchronizes with electricity generation using modified low priced microbial fuel cell.

Key words : Microbial fuel cell(미생물연료전지), swine wastewater(가축분뇨), electricity generation (전기발생)

E-mail : *,** jkjang1052@korea.kr

농림부산물 원료 펠릿 및 농업용 펠릿 난방기

*강 연구, 유 영선, 강 금춘, 김 종구, 김 영화, 장 재경, 이 형모

Pellet Made of Agricultural By-product and Agricultural Pellet Boiler System

*Y.K.Kang, Y.S.Ryou, G.C.Kcang, J.G.Kim, Y.H.Kim, J.K.Jang, H.M.Lee

Biomass is considered to be a major potential fuel and renewable resource for the future. In fact, there is high potential to produce the large amount of energy from biomass around the world. In this study, to obtain basic data for practical application of wood pellet and wood pellet boiler system as heating system in agriculture, agricultural biomass resources were surveyed, pellet was made of agricultural by-product such as stem of rape, oat and rice, ricehusk and sawdust and wood pellet boiler system with capacity of 116 kW was manufactured and installed in greenhouse of 38.5 m×32 m. High heating value, bulk density and ash content of pellet made of agricultural by-product and efficiency and heating performance of this system was estimated. Rice straw was the largest agricultural biomass in 2005 and the total amount of rice straw converted into energy of 131.71×10^{11} kJ. And in 2005, total amount of forest' by-product converted into energy of 29,277.05×10^{11} kJ. High heating values of pellets made of agricultural by-products of stem and seed of rape, stem of oat, rice straw and rice husk were 16,034, 16,026, 16,089, 15,650, 15,044 kJ/kg respectively. High heating values of pellets made of agricultural by-products were 83.6% compared to that of wood pellet. Average bulk density of pellets made of agricultural by-products of stem and seed of rape, stem of oat, rice straw and rice husk was 1,400 kg/m^3. Ash contents of the pellets were 6.6, 7.0, 6.2, 5.5, 33% respectively. Ash content of rice husk pellet was the largest compared to other kind of pellets. To increase efficiency of agricultural pellet boiler, the boiler adopted secondary heat exchanger. The agricultural pellet boiler designed and manufactured in this study had high efficiency of 84.2% compared to the conventional agricultural pellet boiler, when water flow rate, exhaust gas temperature and average combustion furnace temperature were 39L/min, 180℃, 680℃ respectively. And pellet supplying and pausing time were 13, 43 seconds respectively. In March of 2010, prices of wood pellet, agricultural tax free diesel, diesel, kerosene were 350 won/kg, 811 won/L, 1,422 won/L, 976 Won/L respectively. Also in terms of energy, prices per same heating value were 77.8, 90.1, 158, 108.4 Won/Mcal. Energy saving rate of wood pellet was 16, 50, 39% compared to agricultural tax free diesel, diesel and kerosene respectively.

Key words : Biomass(바이오매스), Wood pellet(우드펠릿), Plastic greenhouse(비닐하우스), Heating system(난방시스템), High efficiency(고효율)

E-mail : * ykk0977@korea.kr