The Utilization of Paper Waste as Raw Material for Making Bioethanol to Reduce the Use of Fossil-Based Fuel

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ABSTRACT

The increase of paper consumption from year to year gives high consequences to waste paper generated. Waste paper is one of potential raw material alternatives which can be converted into ethanol. The stages of making bioethanol from waste paper are pre-treatment, hydrolysis, fermentation, distillation, and concentration analysis by Chromatography Gas (CG). Pre-treatment aims to remove the ink and to break down lignin to be hydrolyzed easily. Pre-treatment is carried out by using H₂SO₄ and delignification process using NaOH. The phase of hydrolysis changes cellulose into glucose. Hydrolysis is done by using cellulose enzyme (Enzymatic Hydrolysis). Fermentation is carried out by using Saccharomyces cerevisiae bacteria. At this fermentation stage, glucose is degraded into ethanol. Distillation and dehydration stages are the stages of ethanol purification. This stage is done by separating ethanol from water and fermentation residues. Distillation is carried out at temperature of 78-80°C. Then, dehydration is done by using calcium oxide. Chromatography gas is used to analyze the ethanol content appropriateness to be used as fuel. The samples are compared to standard solutions so that ethanol levels can be determined. 10 kilograms of paper waste can produce 100 ml ethanol which has content of 81%.

Keywords: bioethanol, fuel, paper