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Small scale ethanol micro distillery using cassava and cassava peels as feedstock

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Ethanol micro distillery (400 to 500 litres per day, ≥90% alcohol by volume) was designed and fabricated to produce ethanol at a very reasonable cost using cassava and cassava peels as feedstocks. This was done to support the activities of an international organisation that is encouraging the use of ethanol cookstoves in Nigeria. Ethanol cookstoves is known to be safer, more environmental friendly and does not impact negatively on the health of the user like the popular kerosene and even wood fire that is prevalent in rural Nigeria. Nigeria is the world's largest producer of cassava (*Manihot esculenta*), producing about twenty six million tons yearly. Researchers have estimated that cassava peels and chaff resulting from the production of fufu represents up to 25% of the cassava plant. Other has shown that the carbohydrate content of cassava peels is about 69.5% to 75.5% and these consist of starch, cellulose and hemicelluloses. The cassava peels can usually be sourced for free in most part of rural Southern Nigeria where cassava is being processed into garri and fufu. The micro distillery is designed to use mainly cassava peels which have been pre processed to separate the mainly starchy portion for use as feedstock in the micro distillery. Cassava tubers itself can be used during that period of the year when heavy rains makes it impossible to dry the peels (with sunlight) and cassava itself is very cheap during those period. Industrial enzymes (α amylase and glucoamylase) were used to convert the starch to fermentable sugars in the micro distillery. The application of the enzymes was manipulated to reduce energy consumption during the processing stage while cellulase is being sourced to be used in addition to the amylases in order to increase the yield of fermentable sugars and consequently ethanol. Distillation and ethanol recovery is done in a distillation tank to which a randomly packed distillation column has been attached. The distilled ethanol is condensed in a condenser containing spiral metal tubes that is being cooled by chilled water generated by a cooling plant. The cooling plant also supplies the water for cooling the mash during the conversion of starch to fermentable sugars in the processing tank. The micro distillery is initially designed to be fired with LPG gas. However, the use of a small wood fired steam boiler is being considered and here also a bye product of cassava processing (cassava stumps, which is the end trimmed off the cassava tubers) may also be very useful as fuel for the boiler.

Biography

Oladapo Olomo Loto completed a Bachelor of Technology (B. Tech) honours degree in Biochemistry with first class honours from the Federal University of Technology, Akure, in 1987. He clinches the Vice Chancellor's prize as the best overall or all round graduating student in the University in 1987. He joined the Nigerian Brewing Industry in 1988 and took on various roles such as Shift Brewer, Brewing Manager, Development Brewer and Head Brewer with subsidiaries of Multinational Brewing Companies (Heineken and Diageo). He started Applied Brewing Solutions in 2006 and initially focused on developing beverages for the Nigerian market by partnering with international food ingredients suppliers. He relies heavily on his experience as a Brewer in developing this Micro Distillery.

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