AN IMPROVED ELECTRO-MECHANICAL TECHNIQUE FOR GROUNDNUT OIL EXTRACTION USING EMBEDDED PROCESS AUTOMATION

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ABSTRACT

This work, an improved electro-mechanical technique for groundnut oil extraction using embedded process automation aims at mitigating the poor and irregular heating approach of the traditional system which generally affects the quantity and quality of the extracted oil. Literatures on groundnut oil extraction reveal that the optimum temperature for groundnut oil extraction is 90^0C. This temperature at the preparatory heating chamber was regulated in this work by adopting an automation technique in which Proportional Integral and Derivative (PID) controller was implemented on microcontroller. Mathematical model of preparatory heating chamber, actuator and PID controller were developed. Controller design based on the models was also developed using Simulink. The models were validated through simulation and the Zeigler-Nichol tuning method was adopted as the tuning technique for varying the parameters of the PID controller in order to achieve a desired transient response of the system when subjected to a unit step input. A schematic model of the system was also captured using proteus and animated simulation was carried out to validate the system's performance to varying temperature conditions within the preparatory heating chamber. After several assumptions and simulations, a set of optimal parameters were obtained at the result of the fifth test that exhibited a commendable improvement in the overshoot and peak time, thus improving the robustness and stability of the system.

Keywords: Microcontroller, PID-Controller, Transient response, Temperature stability, Automation, Zeigler-Nichol.