SIMULATION OF A CONTROLLED SYSTEM OF THE TRANSESTERIFICATION OF SOYBEAN OIL FOR BIODIESEL PRODUCTION

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In recent years the global limit of production and demand of combustibles continues to increase. From 2012-2013, total world consumption of oil increase 1.4%, while overall global production increased only 0.6% in 2013. Besides the Oil price rises every day besides the harmful effects to the environment.

Biodiesel is a viable alternative to these problems because the effects of its combustion do not cause major damage to the environment and it is produced from a renewable resource. However, its production it is not always efficient and there are regulations for production. The uses in diesel engines and commercialization have a few problems. That is why automatic control of the production of biodiesel is very important to ensure product quality and optimize the production process.

The aim of this study was to develop an automatic control strategy, based on the mathematical representation of the transesterification reaction in a batch reactor for biodiesel production enabling process optimization. The mathematical model used was based on transesterification reactions of six differential equations involving biodiesel production (E) from triglyceride of soybean oil (TG) and diglycerides (DG) and (MG) as intermediaries, as well as the generation of by-product glycerin. The system also considers the kinetics of the reaction and the effect of temperature according to the Arrhenius equation. It was conducted the simulation of transesterification reaction at different temperatures according to several variable (30, 40, 50, 60 and 70 C) with all reactants and...
products. Besides the mathematical model was linearized by Taylor series and it was generated a system model predictive control (MPC) to determine the optimum conditions of the process according to european standards and significantly to reduce the reaction time. The results show that the control can streamline the process, comply with regulations and reduce reaction time.