GLYCERIN BLEACHING PROCESS RESPONSE USING FUZZY PI PLUS PID CONTROLLER

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ABSTRACT

This paper was aimed to develop and implement a Fuzzy PI+PID Controller for a glycerin bleaching process. A proportional–integral–derivative controller (PID controller) is a generic control loop feedback mechanism (controller) widely used in industrial control systems – a PID is the most commonly used feedback controller. A PID controller calculates an "error" value as the difference between a measured process variable and a desired setpoint. The controller attempts to minimize the error by adjusting the process control inputs. Fuzzy controllers are very simple conceptually. They consist of an input stage, a processing stage, and an output stage. The input stage maps sensor or other inputs, such as switches, thumbwheels, and so on, to the appropriate membership functions and truth values. The processing stage invokes each appropriate rule and generates a result for each, then combines the results of the rules. Finally, the output stage converts the combined result back into a specific control output value. In this study, the ideal PID control structure was tuned by using Ziegler Nichols tuning method and Integral of Time and Absolute Error (ITAE) method. The performance of the system was evaluated in terms of settling time (Ts), rise time (Tr) and percentage overshoot. Apart from that, the performance for different membership function was also compared. The results revealed that Fuzzy PI+PID controller method improve the glycerin bleaching process performance.

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CHAPTER1

INTRODUCTION

1.0 Background

Color is a major characteristic in preparation of hardened products from pure glycerin like margarine base stocks. Color pigments presence in the crude glycerin contributes the undesirable color effects to the quality of the finished product [1-2]. The glycerin bleaching process [3] is important for producing a light colored pure glycerin of acceptable quality.

Mechanically the glycerin bleaching process is carried out by adding the adsorbent to the reactor tank containing contaminated crude glycerin, stirring the mixture to achieve good contact of adsorbent with the glycerin and maintaining the temperature for a sufficient time before drawing off the bleached glycerin. The performance for glycerin bleaching process using adsorption method significantly depend on the properties of the crude glycerin to be bleached, dosage and type of absorbents used and the bleaching operating temperature [4].

Amongst, the operating temperature was the most parameter affecting the quality of finished bleached glycerin. This is due to the application of heat to the glycerin will creates more color formation which will decrease the nutrition values as the temperature increase [1-4]. The task to maintain and control the temperature for a typical process is a very challenging task. It has been found out to be intrinsically difficult due to various factors such as producing slow dynamic response because of the process scale and the process thermal response [5]. In addition, the process will have lag or time delay before it reaches a steady uniform level which is stable. As in this paper, the time delay is 420s.