

DEVELOPMENT OF AN AUTOMATED OPERATION FOR VARIABLE SPEED DRIVE COUPLED FAN MOTOR IN TROUGH WITHERING

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Sri Lankan black tea is manufactured in traditional factories with old machineries, thus productivity remains low with high energy consumption. Conventional method of controlling the withering process with manually operating withering fans is very inefficient in energy point of view. Thus, withering process accounts about half of the total electrical energy consumption in the tea industry. Present study focused to identify energy efficient withering process using the interactions among internal bed pressure, air temperature and airflow, while controlling the airflow manually with traditional handkerchief monitoring system to gain optimal withering characters. The correlation of above parameters is used to develop logic and a controlling system in managing the motor speed using controllable Variable Speed Drive (VSD) device to introduce better and less energy consumed withering process. The best airflow rate to maintain the handkerchief floating throughout the withering was identified by the correlation of airflow rate over the time and it was 500 rpm. Accordingly, a program coding was developed and applied to the micro-controllers as required to automate the withering process by using the AVR studio software to configure with AVR 328 microcontroller using Language C. Finally, the conventional withering was compared with VSD coupled automated fan motor withering on energy consumption, withering quality and duration. Results revealed a reduction on energy consumption in automated withering process with an average of 43.5% compared to the conventional. Visual or physical difference among automated and conventional withered leaf was not seen. An extended duration for automated withering was found, which negligible. In conclusion, an automated VSD coupled fan motor introduces less energy consumed withering process for the Sri Lankan black tea industry than manually controlled VSD or conventional withering.

Keywords: Automated withering, Energy consumption, Tea manufacture