HUMIDITY CONTROL SYSTEM FOR ROLLING AND FERMENTING ROOM OF A TEA FACTORY

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Declaration

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Signature: Date:

The above candidate has carried out research for the Masters under my supervision.

Signature of the supervisor: Date:

Dr. D. P. Chandima

Abstract

This thesis presents a research carried out to develop a humidity control system for tea rolling and fermenting room of a tea factory. During the rolling process, cell breakage causes the mixing of enzymes with other chemical compounds, and fermentation starts and continues throughout the rolling and roll breaking processes. Further fermentation is allowed to continue on fermenting racks for such time as desirable. Rolling room operation should be geared for ventilating and humidifying to control those fermentation reactions at desired levels. Moisture is an essential requirement for enzyme activity and lack of humidity leads to surface drying of dhools and loosing the liquor properties of tea. During all rolling room processes, a humid atmosphere should surround dhools and hygrometric difference between 2-3^{0}F is satisfactory. Humidification also helps in reducing the room temperature up to the level of ambient wet bulb.

Since British introduced tea to Sri Lanka, almost all the factories still use wet and dry bulb hygrometers to observe the level of humidity during rolling and fermenting processes and use manually switchable humidifiers. Tea industry is still very reluctant to give-up wet and dry bulb difference method and move to work with relative humidity. Even Tea Research Institute in Sri Lanka is still using wet and dry bulb difference method.

This research automates same art with digital wet and dry bulb sensors and reads level of relative humidity using a digital humidity sensor as an addition. While providing traditional dry-wet (D-W) control mode, the controller also provides humidity control mode for the customers to choose. Displaying relative humidity level at traditional dry-wet mode addresses the knowledge gap of tea makers to move to the direct humidity control mode from traditional wet and dry bulb difference method. The developed humidity control system addresses the lapses of previous products and performs satisfactorily compared to widely used low resolution alcohol wet and dry bulb hygrometers and automatically switches ON or OFF relevant humidifiers to maintain the desired humidity level.

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List of Abbreviations

Abbreviation	Description
D-W	Dry temperature - Wet temperature
RTD	Resistance Temperature Detector
HS1101	Humirel HS1101 Relative Humidity Sensor
DHT22	DHT22 digital Humidity and temperature sensor
DS18B20	DS18B20 digital, factory calibrated temperature sensor
SHT11	SHT11 digital humidity and temperature sensor
NTC	Negative Thermal Coefficient
A/D	Analog to Digital
%RH	Relative Humidity
OTP	One Time Programmable
LSB	Least Significant Bit
MSB	Most Significant Bit
ACK	Acknowledge
DC	Direct Current
ICSP	In Circuit Serial Programming
PID	Proportional Integral Derivative
PCB	Printed Circuit Board
PIC	Peripheral Interface Controller
MCU	MicroController Unit
eeprom	Electrically Erasable Programmable Read Only Memory