

Optimization of the production process of bakery products by digitizing the fermentation process: Using RFID to automate the logistic proving process  
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## INTRODUCTION

Bakery products fermentation is one of the most complex and delicate parts of the production process because it involves both process variables and characteristics of the raw material.

On the other way currently, digitization has an almost transversal presence, adapting and facilitating the processes previously carried out in a traditional way, defining strategies in information systems, carrying out diagnoses, identifying vulnerabilities and developing measures to mitigate them.

The bases of our process include

The traditional procedure of the proving stage was basically linear, supported by conveyors and at all times dependent on the know-how of the operator.

In this respect, the product is deposited on trays and these are organized onto trolleys that are taken to the proving chamber on one of the two existing lanes with the trays alternating left and right.

Once the proving time has been manually counted and it deemed adequate, another operator removes the trolleys from the other side of the chamber in order to transport it to the baking stage.

This manual process caused many issues with product quality due to incorrect proving times, the fluctuation of parameters due to the opening and closing of doors which caused interruptions in temperature and a lack of control over the process in general.

## OBJECT

The purpose of the present study is to develop an automated system for the process of entry and exit of the carts of pastry product to the fermentation chamber, avoiding the human factor, promoting the control and recording the manufacturing parameters.

## METHODOLOGY

The procedure is based on the digitization of the System. For this, two RFID antennas have been installed at the entrance and 2 more at the exit of the camera. All are connected to a PLC and have direct integration to an interface visible by the operators at the two points of the camera.

Each of the recipes that are worked on in this production line have been characterized with a particular proving time that will be controlled by the catchment systems installed. .

Each trolley has been fitted with a 13.56 mHz RFID tag with a unique license plate that is recognized on passing of the chamber entrance. The tag is read and the a record of the license plate is kept by the PLC upon entry. Once the appropriate proving time has been reached for each product, a light signal alerts the operator that the stage has come to an end.

## RESULTS

Several tests have been carried out, monitoring at all times where each of the master trolleys is and the time that elapses inside the chamber (see attached images). . This system allows us to see the location of each trolley in real time as well as the product being transported and how long it will take for the optimum proving moment to arrive, indicating a synoptic red once it reaches such a time .

In addition, with this system all the data collected in each production is stored into a record, which offers the possibility to consult both specific procedures which have been carried out at any one time as well as the controlled parameters (humidity and temperature)

Trolley being introduced by operator



RFID antenna installed on lane 1



RFID antenna reading RFID tag



RFID tag installed on each trolley



Trolleys loaded with trays



General view of proving chamber



Row 2 of the chamber in closer detail



Recipe and setup screen



Request to allow trolley entry into right lane



The removal of trolleys prohibited



Using radio frequency identification technologies we can provide great solutions without incurring costly expenses, in addition the reliability of the system has been 100%. There have been no issues since this system was developed.