
Abstract

Food manufacturing companies have a flaw that is concealed; unequal distribution of the ingredients in their packaging line. This problem results in packages with different proportions instead of the identical bags intended made. Such big manufacturers tackle such an issue with marketing, for example, “enjoy an odd mix.” Still, this affects customer satisfaction which affects their profit as well. This issue happens especially when the container of a product is see-through, customers have been noticed to be picky about the mix inside. Therefore, this project aims to develop and construct a machine that should solve this phenomenon. The machine will use helical actuators that pour the required proportions of each product simultaneously into a weight head. This will ensure the bags are as identical as possible with a minimum error rate. The proposed machine could be adopted by industries in the mechatronics and packaging industries. Yet, now the funder is a local company named Ezz Al-Maslamani Company. This project will be divided into two phases: the first is designing the machine as well as doing all the calculations necessary for the work environment, while the second phase is validating the machine in Ezz Al-Maslamani Company and running it.

The main objectives of this project are summarized as follows:

- Design a machine that will ensure an identical mix in packages. This will be done using SolidWorks as well as Factory I/O to test and simulate the PLC.
- Customer satisfaction: It has been observed that customers are picky about see-through packages depending on which ingredients they like the most. This machine will ensure everyone has the same mix every time.
- Gain ISO 9001 for the company: 9000 family means there is a standard within the production as well as other things. This project will ensure standard mixes along the packages, thus moving the company closer to an ISO certificate.

The previously mentioned objective will be accomplished using the following components: the machine that will be constructed contains mechanical and electrical components. The mechanical components will include actuators such as helical screw conveyors, pneumatic systems, and silos for the products that will be mixed. On the other hand, the electrical parts will include a PLC integrated into an HMI and motors. The electronics used will be sensors and a weighted head.

Due to various reasons, the project has transitioned into a prototype stage due to several distinguished engineers recommending this course of action, given the inherent uncertainty surrounding the mechanism. In this prototype, three Arduino units were utilized as a substitute for the PLC. Additionally, MATLAB's App Designer was employed instead of a traditional HMI.