

Application of the QFD method to the design of a cocoa pulping machine

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Abstract

Cocoa pulping currently is a process that is developed manually in several regions of Colombia, due to many farms do not have enough technology to develop the cutting and pulping of the cocoa pod, which generates delays, low performance, low quality of the cocoa derives products and economic losses. The Quality Function Deployment (QFD) method and Bibliometric analysis (BA) were applied to designing a machine for cocoa pulping for a farm in Cesar, Colombia. Firstly, a Bibliometric analysis was developed to visualize trends and hot keywords, countries, and clusters related to the Cocoa and Quality of this essential agricultural branch worldwide of scientific obtaining publication details from the Scopus database. Secondly, the QFD method was applied to translate the customer requirements into detailed requirements to perform a low-cost machine, eco-friendly, versatile, and easy to use. Finally, the design results validation was carried out through the finite analysis method using Ansys and Solidworks CAD software. The BA results show that cocoa processing is an important topic worldwide, with a fast-growing of 2.59% in the last 76 years, where around 5800 authors have been published articles related to cocoa and quality subject in different ways. From QFD results and simulations obtained on the structure of the machine of AISI 304 steel, this material supports the stresses and deformations generated in the regular use of the machine (4700 pods per hour), guarantying the satisfaction of the customers, and above all the cocoa quality and the economy of the farm producers of cocoa beans in Colombia. Finally, the results obtained demonstrate that the QFD method is a valuable tool to knowing the needs and requirements of the customers and translate thus to engineering specifications where the design group develops different proposals taking into account costs, safety, and performance of the machine through modern computational CAD software and design theories.