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Escuela Académico Profesional de Ingeniería Industrial

Tesis

**Improvement of Processes in the Mixing and
Drying of Bricks in the Company Toro S. A. C.**

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Improvement Of Processes In The Mixing And Drying Of Bricks In The Company Toro S.A.C

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Abstract— Against a backdrop of projected growth in the construction market and a decline in domestic brick production in Peru, the company faces pressure to optimise its production processes. The effective implementation of humidity controls and improvements in the drying process was considered crucial to minimise the environmental impact of operations and ensure a more sustainable use of natural resources. This work aims to propose the application of precise technological controls to manage humidity and optimise the drying process in the Toro S.A.C. brick company, not only that, but also to reduce the effect on the environment and support the preservation of natural resources. Tools such as: Direct visual observation, graphic representation of the process, time recording, detailed process analysis, Ishikawa cause and effect diagram were used, which made it possible to identify problems, evaluate, investigate the causes, apply improvements and subsequently evaluate their effectiveness. After the implementation of these controls, the results showed a significant improvement in the optimisation and quality of brick manufacturing production. Variability in the amount of moisture and wastage due to brick deformation were reduced, contributing to the company's competitive efficiency and long-term sustainable viability in the market.

Keywords— Moisture control, Drying process, Operational efficiency, sustainability

I. INTRODUCTION

Against a backdrop of projected growth in the construction market, coupled with the recent 6.8% decline in domestic brick production to September 2022 [1], attributed to factors such as the high level of political noise and the postponement of residential projects, the company faces additional pressure to optimise its production processes. Given its strategic location with two facilities located in Carabayllo and a daily manufacturing of 2,000 tonnes of bricks [2], effective implementation of humidity controls and improvements in the drying process are crucial to reduce the environmental impact of operations and to ensure a more sustainable use of natural resources [3]. Consequently, addressing these challenges not only has direct economic implications on the company's competitiveness, but also has a significant impact on its

environmental and social responsibility, aligning it with green business practices and in harmony with the natural environment. The focus of this research is based on the critical need to implement precise technological controls for optimal moisture management and the efficient improvement of the drying process within the brick manufacturing company Toro S.A.C. This becomes fundamental not only to increase optimisation and elevate excellence in brick production [4], but also to reduce the effect on the environment and support the preservation of natural resources [5], [6].

Research by the Centre for Energy Development and Sustainable Energy explores the brick kiln approach, examining the challenge of temperature control and pollutant emissions in brick production, highlighting the importance of implementing innovative technology to increase productivity and mitigate environmental impact. First, a study of an automated hybrid solar thermal/electric hybrid kiln is presented, which uses a sliding control (SMC) to manage the change of kiln temperature more quickly and efficiently. This technology is implemented using a microcontroller programmed in C++ and combined with a flat plate solar thermal collector, reducing energy costs and optimising commercial viability [7]. On the other hand, a comparative study of gas emissions between an ecological kiln and an artisanal brick kiln is analysed, showing that the latter has a lower fuel consumption and emits fewer pollutants, which improves the well-being of workers and reduces the environmental impact [8]. In addition, a bibliometric and thematic review is conducted on the impact of brick kilns on the environment and society, highlighting the health, environmental and social problems associated with brick production and suggesting the need to adopt cleaner and more sustainable technologies in the industry [9]. These studies demonstrate the relevance of implementing advanced controls and sustainable practices in brick manufacturing to promote the preservation of natural resources and mitigate the environmental impact of this industry.