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USDA Pecan Postharvest – Cracking

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Abstract

Agricultural manufacturing and post-harvesting operations have historically been slower to adopt new technologies compared to other industries. Despite the critical importance of the pecan post-harvest value-add process, little attention has been given to optimizing the cracking stage and the machines used for it. Currently, two primary types of cracking machines exist in the industry: end-to-end and circumferential. However, these machines rely on guess and check methods for parameter settings and lack concrete feedback on their performance.

Our work is focused on utilizing advanced data collection methods such as machine vision and imaging to gain a comprehensive understanding of these cracking mechanisms. We aim to extend this understanding beyond the specific brand of machine, with a combination of high throughput testing and low throughput, high fidelity testing. By identifying correlations between key cracking parameters and their impact on crack quality and half yield, we hope to optimize the cracking process and improve the overall efficiency and control of post-harvest operations in the pecan industry.

The JC (South African) cracker has been selected as the method of high throughput testing for circumferential cracking while the Meyer cracker has been selected for representation of end-to-end cracking. The parameters in the design of experiments for both of these machines were selected primarily from industry feedback collected on current operational practices with these types of machines. Additionally, preliminary studies have been conducted to verify the parameter levels for cracking.

Keywords: Industry 4.0, Design Optimization, Agricultural Postharvesting.