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## USDA Pecan Postharvest – Shelling

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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 shelling stage and the machines used for it. Currently, the primary shelling method involves pecan being fed through a machine with rotating drums and a paddle shaft that impacts the shells. 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 various sensing and advanced data collection methods such as machine vision and imaging to gain a comprehensive understanding of these shelling mechanisms. The incorporation of these advanced methods will enable the ability to build a smarter system, capable of providing real-time fine-tuning of the shelling process. By identifying correlations between key shelling parameters and their impact on shelling quality, we hope to optimize the shelling process and improve the overall efficiency and control of post-harvest operations in the pecan industry.

For this purpose, the 14” Sheller manufactured by Modern Electronics and Equipment has been obtained and modified to collect data on various shelling parameters. These parameters include, but are not limited to, paddle shaft rotational velocity, pecan feed rate, and drum ring gap. Data will be collected to identify parameters with the largest effects on pecan half-yield. Results obtained from these experiments will be compared with experiments run with various pecan



moisture levels and pecan species in an effort to design an efficient, controllable shelling process.

**Keywords:** Post-Harvesting, Automation, Industry 4.0, Design Optimization