

Screening and segregation of whole cocoa bean fractions

Background

A whole cocoa bean is the starting material for making cocoa mass (aka cocoa liquor), cocoa butter, and cocoa powder, used as ingredients in chocolate and chocolate flavored products. The cocoa bean consists primarily of the cotyledon or nib (88%), an outer shell (11%) and a mix of very fine (<1mm) cocoa and non-cocoa related matter (1%). To separate the cotyledon from the shell, the bean is commonly cracked first, which can generate nibs of small but variable sizes and shapes, making it difficult to sort them from the fines and shell fragments.

To ensure the best cocoa quality possible and to minimize the likelihood of contaminants like metals and toxins, the shell and fine components should be separated from the nibs. Current industrial systems, most commonly aspirators that leverage the density difference to blow the lighter components out of the stream, struggle to distinguish and fully segregate the different components, leading to yield losses from misclassifying nibs as shells/dust. An additional complication is that cocoa beans are naturally high in fat, which can cause caking, where nibs and fines clump together. This reduces the effectiveness of industrial systems (15-20 MT/hour throughput) designed to separate these components and leads to further losses.

What we're looking for

We are looking for a process and/or equipment capable of differentiating and segregating cocoa bean fractions - nibs, shells, and fines.

Solutions of interest include:

- Mechanical separation equipment (e.g. sieving, air classification, vibratory systems)
- Vision systems (automated optical sorting)
- Alternative process workflows

Our must-have requirements are:

- Ability to reliably identify nib fractions.
- Assist in the effective and efficient segregation of fractions (e.g., nibs in shell, or shell in nibs), with the potential to achieve less than 0.5% w/w misclassifications once integrated into existing processes.
- Potential to operate 24/7 at high flow rates.

Our nice-to-have's are:

- Minimize operational costs through innovative design or process efficiency.
- Energy-efficient technology or processes.
- Compact design that reduces equipment footprint.
- Operate continuously without requiring manual cleaning and maintenance during operations.
- Minimize or prevent accumulation of product/waste.

Acceptable technology readiness levels (TRL): Levels 2-9

1. Basic principles observed
2. Concept development
3. Experimental proof of concept
4. Validated in lab conditions
5. Validated in relevant environment
6. Demonstrated in relevant environment
7. Regulatory approval
8. Product in production
9. Product in market

What we can offer you

Eligible partnership models:

- Sponsored research
- Co-development
- Supply/purchase
- Licensing
- Material transfer
- Capstone project

Benefits:

Sponsored Research

We will offer research funds up to 100k USD for early stage solutions. Additionally, for later stage solutions, we could fund the co-development to finalize the invention and license / purchase the technology

Expertise

Access to Cargill Cocoa and Chocolate scientists, engineers and operations experts, as needed.

Compounds and Reagents

Beans for testing solutions up to 1MT, depending on TRL of proposed solution.

Who we are

Our global team includes more than 1,500 research, development, applications, technical services and intellectual property specialists working in more than 200 locations. Together, they provide a spectrum of services encompassing technical service, applications, development, research, intellectual asset management, and scientific and regulatory affairs.

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