



DMEC Functional Description

- **Digital Micro-dosing Cartridge (DMEC)** is a compact robot designed to precisely microdose powders into capsules, creating custom pills tailored to each patient's personalized prescription.
- At the core of the machine is a funnel that holds the powder. The top of the funnel is about 3 inches wide, narrowing to a 0.5-inch opening. Inside the funnel is a long metal tube, known as the sieve, with a diameter slightly smaller than the 0.5-inch opening. This tube rotates freely with minimal clearance between itself and the funnel outlet. The sieve has small perforations along its length, similar to a "perforated tube" or a "tube strainer."
- Much like a flour sifter, the sieve rotates within the funnel, sifting grains of powder down into the tube. The powder is collected in a small tube at the bottom, called the chalice. The chalice, about 0.25 inches long, has an inner diameter roughly the same as the capsule the powder will eventually fill. The chalice's inner wall contains micropores that allow airflow, and a small barb enables connection to an air tube. A vacuum pump is used to create suction, pulling the powder down through the sieve and compacting it inside the chalice.
- Once enough powder has collected, a solid vertical rod called the piston, which is slightly smaller in diameter than the sieve, comes down from above. It compresses the powder inside the chalice against a solid metal door that covers the bottom of the chalice. This compaction forms a small tablet, or "slug," which is the basic output of the DMEC—a compacted, circular tablet of powder with a customized mass.
- After the slug is formed, the ejection door beneath the chalice slides open. The piston pushes the slug further downward, ejecting it into a receiving capsule. The chalice is a tube with openings at the top and bottom, so during the compaction process, the powder is pushed against the closed ejection door. The door operates similarly to a cigar cutter: a flat metal plate that slides horizontally. When closed, the plate acts as a solid surface for the powder to be compacted against. When the door slides open, it reveals a hole large enough for the slug to pass through, and the piston pushes the slug out of the bottom of the DMEC into the waiting capsule.
- DMECs are designed to be used in tandem, with at least two or more units working together. This allows different powders of varying doses to be loaded into a single capsule, creating a personalized polypill specific to an individual's prescription.