Capsule Filling Machine

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Abstract: Encapsulation, sometimes referred to as capsule filters, capsule filling machines, or encapsulation machines, are mechanical devices that are extensively used in the industrial and pharmaceutical sectors. Using powder, active granules, semisolids, or liquids containing active pharmaceutical ingredients, or a combination of components and solution that describes the active pharmaceutical ingredients and excipients, these machines fill soft or hard gelatin capsules of different gelatin sizes. The process of packing content into an empty capsule is known as encapsulation. There has only been one description of the instrumentation of capsule filling machines that use strain gauges and work on the tamp-filling concept. traditional springs that are located between the tamping pins and the upper portion of tamping head are replaced by apneumatic system. It was discovered that the usage The only function of the pneumatic tamping head is to regulate the fill weight while tamping. The tamping pin and powder bed height parameters should be changed to make significant fill weight adjustments during the machine's setup phase.

Keywords: Capsules, Gelatin, Soft and Hard gelatin capsule, Advantages and Disadvantages, Capsule-filling machines, Types of capsule-filling machines Their Working Principle

1.INTRODUCTION

The capsule: A hard or soft dissolving shell encloses the therapeutic content in capsules, which are solid dosage forms. Gelatin is typically used to make the shells. The capsule can be thought of as a "container" drug delivery system since it offers an odorless and tasteless dose form without the requirement for a further coating procedure, which tablets may necessitate. The Latin word capsula, which means "small container," is where the word "capsule" originates. In drug development, capsules play a crucial role.Due to their manufacturing procedure, they are frequently regarded as the main oral dosage form in comparison to other dosage forms.

Advantage:

- They are frugal.
- They are convenient to handle and transport.
- Capsules can be administered with ease and cover up the taste and smell of disagreeable medications.
- They look good.
- They are simple to swallow with a gulp of water since they are slippery when wet.

Disadvantage:

- Drugs that are hygroscopic are not appropriate for filling capsules because they absorb water from the capsule shell, which makes it brittle.
- are therefore unsuitable for capsule filling
- A shorter lifespan. Compared to tablets, capsules expire more quickly.
- More costly.
- Animal products might be present.

2. BASIC COMPOSITION OF CAPSULE

Gelling Agent: They give the capsule shell a gel-like consistency, giving it thickness and stability so that ingredients can be filled A gelling agent Is a material that can produce solid gels at low concentrations, usually as low as 0.15, such as hydrocolloids, cellulose derivatives, starches, natural gum, or synthetic polymers.

Coloring Agent:

As the name indicates, it's purpose is to coat the capsules with different appealing colours. Coloring agents are substances which color other substances that are devoid of color (transparent, white, orgray) or change the color of the substance that already has a different color

Flavoring Agent: This rarely used ingredient is used to add various flavorants to capsules to cover up their taste and make them more appealing for patients

Plasticizer: It provides stability and makes the capsule shell's polymer film flexible and elastic. They are added as fillers in capsule dosage form and also to increase bulk and ensure content uniformity.

Storage and Stability: Finished hard-gelatin capsules normally contain an equilibrium moisture content of 13% to 16%.

This moisture acts as a plasticizer and thus is critical to the physical properties of the shells. At lower moisture contents (< 12%), shells become too brittle; at higher moisture contents (> 18%), they become too soft. It is best to avoid Extremes of temperature and to maintain a relative humidity of 40% to 60% when handling and storing capsules.

Quality Control Test for Capsules:

1.Disintegration Time Test

Disintegrative of hand and soft gelatin capsules is evaluated to ensure that the drug substance is fully available for dissolution and absorption from the gastrointestinal tract. The compendial disintegration test for hard and soft gelatin capsules follows the same procedure and uses the same apparatus described in the article "Quality Control Tests for Tablet.

2.Dissolution test.

The drug material must be dissolved at the site of drug absorption for both physiological availability and drug absorption to occur. A dissolution test measures the rate and degree of medication dissolution from the capsule dosage firm. This test serves as a quality control measure to make sure that various medication product batches have comparable drag and dissolving properties and that a particular batch of capsules dissolves similarly to the initial clinically effective batch. The equipment, dissolve media, and test used in the compendial dissolution test for capsules are identical to those used for uncoated and plaincoated tablets. However, there are times when the analysis is hampered by the capsule shell.

Weight Variation Test:

Stability Test:

The gross weight of ten gelatin capsules is calculated separately for soft gelatin capsules. After that, each capsule is opened using a clean, dry cutting tool (such as scissors or a sharp open blade), and the contents are extracted using a solvent that dissolves the fill but leaves the shell intact. After letting the solvent drain at room temperature for roughly half an hour, each cleaned shell is weighed separately. Subtraction is used to obtain the net contents, and the percentage of medicine in the formulation can be used to calculate the amount of active component in each capsule.

Types of Capsules:

Generally capsules are of two types:

1. Hard gelatin capsules:

One kind of capsule that is typically used to hold dry powder or tiny pellets of medication is the firm gelatin capsule. Gelatin capsule: Oral medications include tablets and hard gelatin capsules that are filled with powder. capsules are often packed with small pellets, granules, or powders. Usually used to hold dry powder or tiny pellets of medication, hard gelatin capsules are a particular kind of capsule.

2.Soft gelatin capsule:

In contrast to hard gelatin capsules, soft gelatin capsules dissolve more quickly and are typically used to hold liquid or powdered medications. Soft gelatin capsules may function more quickly than other capsule caps and dissolve easily in the stomach's gastric fluids. When stomach acid rapidly dissolves a soft gelatin capsule, the contents are instantly delivered into the bloodstream. Generally used to store gelatin, soft gelatin capsules disintegrate faster than hard gelatin capsules. pharmaceuticals in liquid or powder form.

3.CAPSULE FILLING MACHINE

An encapsulator, capsule filler, or encapsulation machine are other names for a capsule filling machine. a type of pharmaceutical processing device that fills empty capsules with different substances that include active pharmaceutical ingredients (APIs) in the form of liquids, granules, pills, powder, pellets, or different combinationtions 1. Based on their purposes and capabilities, capsule filling machines can be divided into two groups: Both home and professional capsule-filling devices are available. 2. Semiautomated and completely automatic capsule fillers are commonly used for medium or pilotproduction, whereas manual capsule fillers are primarily intended for individual use in manufacturing processes that call for precisely or less of the specified contents to be placed in the capsule.

Capsule Filling or Encapsulator Machine:

Working Principle:

Rectification, which gets rid of faulty gelatin capsules, is one of the most often used capsule machine operating principles. Additionally, each gadget must to be capable of separating capsule caps and administering various medications to them.

Additionally, they must to be able to expel filled capsules and reattach caps. Therefore, walk them through the following procedures if they inquire about how capsule machines operate. Placing the machine on a level surface is the first step. After that, you deconstruct the capsules by opening them and ensuring that the longer lids are on the bottom, facing up, and the shorter lids are on top. After that, the apparatus shuts the empty caps after filling them with various materials. The model and features determine the entire procedure.

Capsule Encapsulation Machinery: Parts and Working Principle

Parts:

- Hopper: Feeds empty capsules to the machine.
- Capsule Orienting System: Aligns capsules for filling.
- Dosing System: Measures and fills powder or liquid into capsules.
- Filling Station: Fills capsules with precise amount of material.
- Capsule Closing System: Closes filled capsules.
- Ejection System: Removes filled and closed capsules.
- Control Panel: Regulates machine operations.
- Safety Features: Protects operators and ensures product quality.

Working Principle:

Step 1: Capsule Orientation

- Empty capsules are fed into the hopper.
- Capsules are oriented and aligned for filling.

Step 2: Dosing and Filling:

- Dosing system measures precise amount of powder or liquid.
- Filling station fills capsules with measured material.

Step 3: Capsule Closing

- Capsule closing system seals filled capsules.
- Capsules are pressed together to ensure secure closure.

Step 4: Ejection

- Filled and closed capsules are ejected from the machine.
- Capsules are collected for further processing or packaging.

Types of Capsule Encapsulation Machines:

- Manual Capsule Fillers
- Semi-Automatic Capsule Fillers
- Automatic Capsule Fillers
- High-Speed Capsule Fillers

Key Features:

- Precise dosing and filling
- High-speed production
- Automated capsule orientation and closing
- Safety features (e.g., capsule jam detection)
- Easy cleaning and maintenance

Advantages:

- Increased efficiency and productivity
- Improved accuracy and consistency
- Reduced labor costs
- Enhanced product quality
- Flexibility for various capsule sizes and materials

Applications:

- Pharmaceutical industry
- Nutraceutical and dietary supplement industry
- Cosmetic industry
- Veterinary medicine industry

Troubleshooting Common Issues:

- Capsule jams
- Inconsistent filling
- Machine malfunction
- Powder or liquid leakage
- Capsule damage

Maintenance and Validation:

- Regular cleaning and maintenance
- Validation protocols for cGMP compliance
- Operator training and qualification

Understanding the parts and working principle of capsule encapsulation machinery ensures efficient and effective production of high-quality capsules.

4.TYPE OF CAPSULE FILLING MACHINES

Depending on the pharmaceutical industry's need for capsule fillers, there are various kinds of capsule filling machines on the market.

There are three main categories of capsule fillers:

1. A machine that fills capsules by hand or by hand

2. A mechanism that fills capsules semi-automatically

3. A machine that automatically fills capsules

4. A machine that loads capsules

1.Hand Operated Capsule Filling Machine is table top machine suitable for pilot & production batch requirements. Machine is having 300 holes with 25 x 12 combinations made in Stainless Steel constructions meeting GMP requirements. Machine can fill size 00 to size 5 capsules with help of different machines and interchangeable parts. Assembly has been done in such a way that it can be easily dismantle for cleaning operations.

MANUAL CAPSULE FILLING MACHINE (MODEL 100 HOLES & MAKE: OPTICS

- 100 Holes-Manual Operation
- 1200 to 1500 capsules/hour
- SS 304 Contact Parts with MS Body
- Standard Size 0 (size has to be confirmed while ordering)
- 1 set of SS Loading Tray, SS Powder Tray and Brush
- Extra Loading tray/plate is at extra cost
- Make: Optics

MANUAL CAPSULE FILLING MACHINE (MODEL 300 HOLES & MAKE)

TECHNICAL SPECIFICATIONS

- 300 Holes—A Manual Process
- Between 5000 and 6000 capsules each hour (about 60,000 capsules over an 8-hour shift)
- SS 304 contact parts
- Dimensions: 405 mm L by 300 mm W by 455 mm H
- Comes with a standard size and any size capsule change part; additional change parts of any size are available for an additional fee.
- Size combinations for the capsules include 00/0, 0/1/2, 3/4, and 5
- It weighs approximately 60 kg. About
- Create: Lodha LLP

SALIENT FEATURES:

- Capacity

The number of capsules that can be filled per hour depends on the machine's model and design. Some machines can produce up to 6,000 capsules per hour.

- Versatility

Manual capsule filling machines can handle a variety of capsules and can be used for different manufacturing needs.

- Ease of use

These machines are designed to be user-friendly and easy to mount and operate. They are also easy to disassemble and assemble for cleaning and maintenance.

- Hygiene

Manual capsule filling machines are fully washable and have contact parts made of stainless steel and non-corrosive materials to prevent contamination.

- Precision

These machines can fill capsules with the exact amount of ingredients.

- Loading trays

Manual capsule filling machines have loading trays that hold a volume of about 300 holes.

- Pin plate and sealing plate

The pin plate acts as a filter and the sealing plate seals the capsule cap.

- Cam handle

The cam handle is connected to the loading tray.

TECHNICAL SPECIFICATIONS:

- Production output: Can produce up to 6,000 capsules per hour
- Dimensions: Can be around 405 mm long, 300 mm wide, and 455 mm high
- Weight: Can weigh around 43 kg net and 50 kg gross
- Number of loading trays: Can have three loading trays
- Sequence of holes: Can have 25 x 12 = 300 holes

- Capsule sizes: Can be used for capsule sizes 00 to 5
- Materials: Can be made from stainless steel 304 or 316
- Features: Can have a powder tray, manual or auto capsule loader, and tablet filling attachment

WORKING PRINCIPLE OF MANUAL CAPSULE FILLING MACHINE:

The three basic steps of the manual capsule filling machine are as follows:
1. Loading empty capsules: While inspecting the front knob, the capsule's body and cap are separated and placed into the loading tray.
2. The filling materials are poured into the empty capsules.
3. Medication filling: Using a spoon or spatula, the operator manually adds the appropriate quantity of powder or granules to the capsules.
4. The filling material is compressed into the capsule's body and distributed evenly across the cavity.
5. Closing capsules: The operator pulls the locking lever to manually close the capsules.

2. SEMI-AUTOMATIC CAPSULE FILLING MACHINE:

semi-automatic capsule filler including single loader capsule filling machine a cGMP machine designed to fill powder, pellet and granules in capsules. We are having three different models ASCF 25, ASCF 35 and ASCF 45 which provide production output up to 25k, 35k and 45k capsules per hour respectively. Product contact parts are built with stainless steel 316 or food grade materials and all covering are made from SS 304 sheet. Machine operating mechanism is done through two parts loading rings. Empty capsules are loaded onto this ring by inbuilt capsule loader. Separation station separates capsule body and cap in separate rings. Capsule body ring putted below powder feeding station where powder is filled into capsules. Three different types of augers provided to operate different characteristics of powders.
PLC (programmable logic control) with alloperationsdisplay

- A separate panel on the right side that houses all of the drive components and cabling
- Pharmaceutical-grade stainless steel that is smooth and devoid of cracks
- The time needed to disassemble and unload powder is decreased by the medication hopper's modified design.
- The loader station can accommodate less changes in capsule size over time.
- Filling station with insufficient capacity to convert powder to pellets over time
- holes per plate, sizes 00–360, 0–480, 1, 2, 540, 3, 4, and 5–600
- Filling Table Drive: 0.5 HP; Speed 2 to 14 RPM; Loader Drive: 0.25 HP; Fix speed 45 sec/plate. For example, 2, 3, 4, 5, 6, 7...
- Using VFD: No Gear Auger Drive: 1.5 HP with mechanical pulleys at 325, 350, 375, and 400
- Four-line black display
- three horsepower vacuum pump.

Semi-Automatic Capsule Filling Machine

WORKING PRINCIPLE OF A SEMI-AUTOMATIC CAPSULE FILLING MACHINE:

Both automated and manual procedures are used in thesemiautomatic capsule filling machine's operation. The semiautomatic capsule filling procedure consists of the following key steps. Filling material and capsules: The filling materials and empty capsules are poured into separate hoppers, known as powder hoppers and capsule hoppers, respectively. The operator moves the cap and body trays and loads the capsules and fillings by hand. Capsule separation: The capsule caps and body are automatically separated by the machine. Medication filling: The machine's auger controls the powder filling procedure, and the dosing disc is used to precisely adjust pace. The auger's vibrating action presses the powder from the hopper to the empty capsule shell. The powder is evenly distributed throughout the cavit after being forcibly forced to the capsule's body. The capsules are automatically locked by the machine.

AUTOMATIC CAPSULE FILLING MACHINE:

WORKING PRINCIPLE OF AUTOMATIC CAPSULE-FILLING MACHINE

Without the help or supervision of an operator, automatic capsule fillers are capable of performing the following activities automatically: capsule locking, filling, and separation. As a result, these devices can drastically save labor expenses and increase the manufacturing unit's production efficiency. There are several two types of automatic capsule filling machines: continuous motion machines and intermittent motion machines. Since the majority of the pharmaceutical industry uses intermittent motion automatic capsule fillers, the operating concept of these devices will be covered here.

AUTOMATIC CAPSULE FILLING MACHINE

Automatic Capsule Filling Machine Lab Model

is designed especially for small lab scale and R&D operations. Machine good enough for filling powder as well as pellets into different size of capsules sizes. Lab Automatic Capsule Filler suitable to fill size #00, 0, 1, 2, 3 & 4 capsules with help of format parts. Machine working stations like Capsule Feeding, Separation, Powder Dosing, Capsule Joining and Capsule Ejection all operations synchronize with one motor only. The Capsule Filler is controlled with programmable logic controller and touch screen HMI with a very user-friendly operating platform. Machine supplied with Venturi for vacuum generation hence no need for vacuum pump. Lab Model Capsule Filler is compact in size that it can be places onto platform in laboratory, drug store or pharmacy. This lab model capsule filler suitable to fill up to 3000 capsules per hour with variable speed options by provided VFD system. LI-LCF LAB is good enough for both type of HPMC and Veg

CAPACITY:

- 3000 capsules per hour for powder filling,
- 2000 capsules per hour for pellet filling,
- 2000 capsules per hour for tablets.

CAPSULE LOADING MACHINE (MODEL 300 CLM & MAKE) :

An essential component of the pharmaceutical production process for filling capsules is a capsule loading machine. For mediumsized and larger pharmaceutical enterprises, the equipment has been perfect.

The equipment saves time and labor and is easy to use. The automatic capsule loader is small and takes up little room; it produces more with a higher level of accuracy.

CONCLUSION

It appears you’re looking for an analogy or metaphor using a “capsule filling machine” in the context of drawing Conclusions or a project conclusion. Imagine a “capsule filling machine” as the process of gathering and assembling information, observations, or evidence. Each piece of data or insight is like a capsule waiting to be filled. When the machine operates effectively, it carefully Selects, organizes, and fills these capsules, representing the process of collecting and analyzing information. The “conclusion” could be compared to the completed capsules—a synthesis of all the gathered elements. Like a well-Functioning machine producing finished capsules, reaching a conclusion involves assembling and organizing the Information in a coherent and meaningful manner, resulting in a final outcome or decision. Is this along the lines of what you were exploring? If you have specific aspects or details you’d like to incorporate or Discuss regarding this analogy, please let me know!

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