

Recent Technique Using In Tablet Coating

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ABSTRACT:-

Pharmaceutical solid dosage forms include tablets, pellets, pills, beads etc. Tablet is most commonly used pharmaceutical dosage form which has ease of administration. Tablets are coated for many reason such as masking odour, taste, colour of the drug, providing physical and chemical protection to drug, protecting drug from the gastric environment. Coating is a process by which a layer of coating material is applied to the surface of a dosage form. Coating may also contain active ingredient. There are various strategies for tablet coating which include sugar coating, film coating, and enteric coating. The amount of coating on the surface of a tablet is critical to the effectiveness of the oral dosage form. Recent trends in tablet coating focuses on overcoming disadvantage of solvent based coating. This review concerns with the coating process, equipments involved, coated tablets evaluation and specialized coating techniques. Key Words:

I. INTRODUCTION:-

World Journal of Pharmacy and Pharmaceutical Sciences drugs was probably an adaptation from early food preservation methods and French publication in the 1600s described coating as a means of masking the taste of medicines.

In modern process, The first reference to tablet film coating appeared in 1930 but it was not until 1954 that Abbott Laboratories produced the first commercially available film-coated tablet. This was made by the development of wide variety of materials-for example, the cellulose derivatives. Tablet coating can be described as a process of applying an edible paint on the surface of a pharmaceutical dosage form to achieve specific benefits.

The tablets are then allowed to dry and the film eventually forms a non- sticky dry surface. Coating is also performed for the following reasons: Enhancing product acceptance and

appearance, Protects the tablet (or the capsule contents) from stomach acids, Protects the stomach lining from aggressive drugs such as enteric coated aspirin, provides a delayed release of the medication, Maintains shape of the tablet.

PRINCIPLE:-

The appearance Solution in which influences the release pattern as little as possible and does not markedly change.

Modified release with specific requirement and release mechanism adapted to body function in the digestive tract.

Color coating which provides insulation.

To incorporate another drug or formula adjuvant in the coating to avoid chemical incompatibilities or to provide sequential drug release.

To improve the pharmaceutical elegance by use of special colors and contrasting printing.

OBJECTIVES OF COATING:

Offer a physical and chemical protection to the drug from environment (light, moisture, and air atmospheric degradation such as oxidation, absorption or evolution of moisture) etc.

To control and sustain the release of the drug from the dosage form.

To protect the drug from the gastric environment of stomach with acid- resistant enteric coating.

To separate incompatible ingredients and prevent their interaction.

To improve the pharmaceutical elegance by special colors and contrasting printing.

ADVANTAGES OF TABLET COATING:

Coating is necessary for tablets giving a smoother finish, makes large tablets easier to swallow and also to mask the unpleasant taste.

Smoother finish makes large tablets easier to swallow.

Tablet coating does not affect tablet disintegration and drug availability, it is cheap, flexibility, highly resistant to heat, and moisture, no taste and odor, color and additives can be easily incorporated.

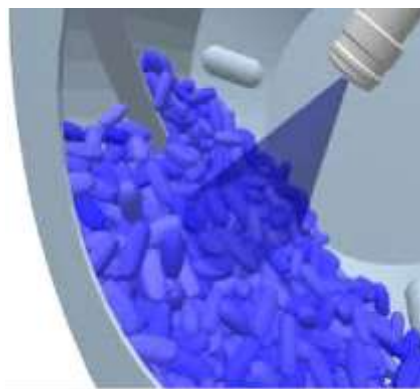
To increase the shelf life of tablet.
To enhance the aesthetic appeal and brand image.

DISADVANTAGE OF TABLET COATING:

Tablet coating increase the cost of formulation.
Tablet coating may interfere in pharmacodynamics properties of drug formulation.
Something coating may result in various film defects like, mottling, capping, chipping, bridging.
The process remained complicate

COATING PROCESS:

The coating may be shaped with the aid of an unmatched application or can be constructed up in layers through the use of more than one spraying cycles. Rotating coating pans are regularly used within the pharmaceutical industry. Uncoated tablets are located inside the pan and the liquid coating answer is brought into the pan even as the tablets are tumbling .



vFig.No.1

TABLET PROPERTY:

Tablets can be made in virtually any shape, although requirements of patients and tableting machines mean that most are round, oval or capsule shaped. More unusual shapes have been www.wjpps.com Vol 6, Issue 4, 2017. 2192 Parveen et al.

World Journal of Pharmacy and Pharmaceutical Sciences manufactured but patients find these harder to swallow and they are more vulnerable to chipping or manufacturing problems. The tablet is composed of the Active Pharmaceutical Ingredient (that is the active drug) together with various excipients.

TYPES OF COATING

Sugar coating:

Compressed tablets may be coated with colored or uncolored sugar layer. The coating is water soluble and quickly dissolves after swallowing.

Sugar coating process involves five separate operations:

Sealing/Water proofing

The seal coat provides a moisture barrier and hardness the surface of the tablet in order to minimize attritional effects. Common materials used as a sealant include Shellac, Zinc, Cellulose

acetate phthalate (CAP), Polyvinyl acetate phthalate, Hydroxyl propyl cellulose, Hydroxyl propyl methylcellulose etc.

Subcoating

Subcoating is the actual start of the sugar coating process and provides the rapid buildup necessary to round up the tablet edge. It also acts as the foundation for the smoothing and color coats.

Grossing/smoothing

The grossing/smoothing process is specifically for smoothing and filing the irregularity on the surface generated during subcoating. It also increases the tablet size to a predetermined dimension.

Color coating

This stage is often critical in the successful completion of a sugar coating process and involves the multiple application of syrup solution (60-70% sugar solid) containing the tablet coating.

Polishing

Sugar-coated tablets needs to be polished to achieve a final elegance. Polishing is achieved by applying the mixture of waxes like beeswax, carnuba wax, candelila wax or hard paraffin wax to tablets in polishing pan.

Film Coating :

Film coating is more favored over sugar coating. Materials used in film coating are -

Film formers, which may be enteric or non enteric
Solvents
Plasticizers
Colorants

Classification Of Coating Equipments

PAN COATING

Perforated coating systems include both batch and continuous coating processes.

Conventional Coating System
Perforated Coating System

Tablet coating pan

Tablet coating pan is used for sugar and film coating of tablets, pellets, granules etc. It consists of ellipsoidal shaped pan made of stainless steel sheet and mounted on the gear box shaft which is driven by an electric motor.

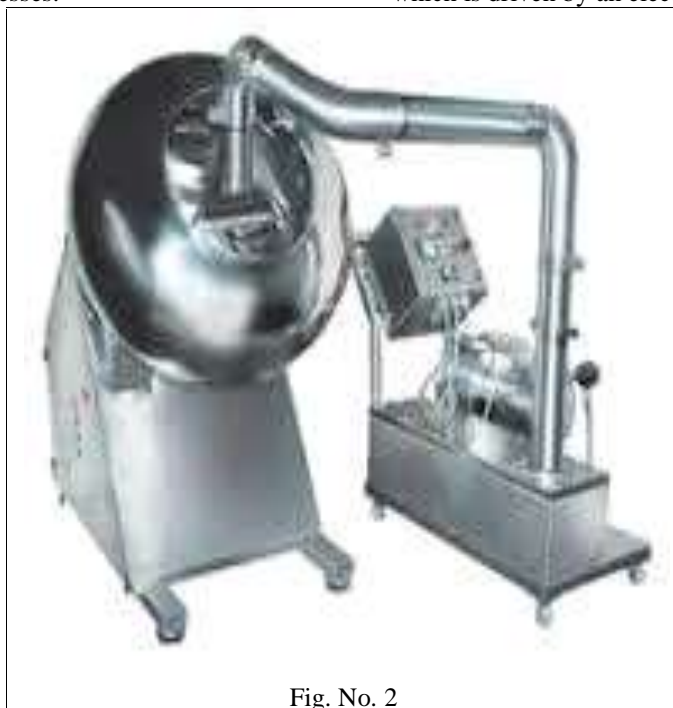


Fig. No. 2

A.Coating Pans Perforated

Pans are typically used for aqueous and solvent film coating and sugar coating of tablets in pharmaceutical applications. The system

incorporates a horizontally position perforated drum equipped with air atomized spray nozzles and process air flow controlled to temperature, humidity and volume



Fig. No. 3

B. Multi-Drum Lab Perforated Pan Coater

This lab coater is capable of handling up to four different sized pans– 30 in., 24 in., 20 in. and 16 in.

providing maximum flexibility from 2 liter through 56-liter batch sizes.



Fig. No.4

GAS SUSPENSION

Gas suspension subclasses primarily are distinguished by the method by which the coating is applied to the substrate.

a.Fluid Bed process system

The fluidized bed coating process is a simple dipping process that can be either conventional or electrostatic. In the convention fluidized bed process, the fluidized bed is a tank with a porous bottom plate.

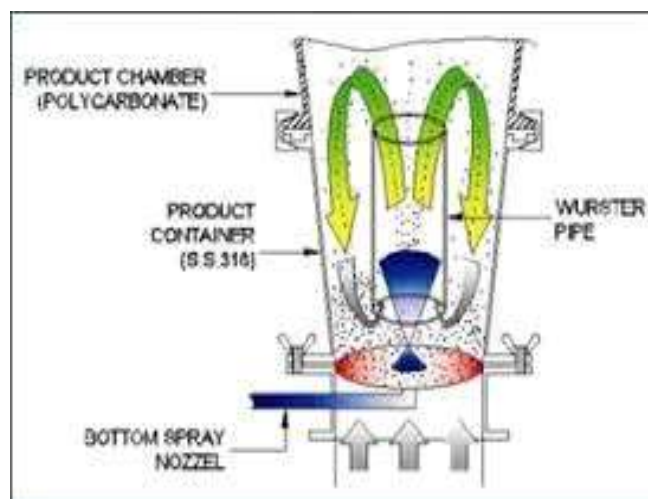


Fig. No. 5

b. Spray coating machine

This is an attachment to the existing coating pan and most suitable for the rapid and uniform coating of Tablets, Granules and Pallets.

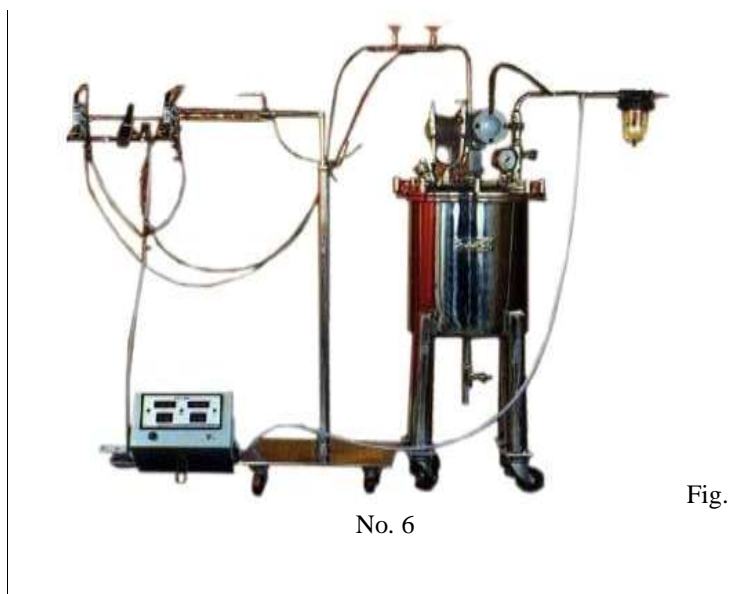


Fig.

No. 6

PROCESS PARAMETER

The spraying rate affects the moisture content which in turn affects quality and uniformity of the film. A low spray rate will give a brittle film due to incomplete coalescence due to inadequate wetting and a high spray rate causes over wetting resulting in picking and sticking. The spray rate also interacts with tablet temperature and a low tablet temperature with high spray rate can produce cracks in the film. Increase in pressure reduces the surface roughness by producing thin dense film however excessive pressure forms very fine droplets which spray dries before getting to tablet bed causing spray loss.

RECENT ADVNCEMENT OF COATING TECHNOLOGY COMPRESSION COATING

These sorts of tablet have elements like, inner core and surrounding coat. The core is small porous tablet and organized on one turret. For

preparing final tablet, a bigger die hollow space in every other turret is used wherein first the coat cloth is crammed to half of after which center tablet is robotically transferred, again the last space is filled with coat fabric and ultimately compression force is applied. Often, the coat is water soluble and disintegrates without difficulty after swallowing.

PREPARATION OF THE COMPRESSION-COATED

A carefully weighed quantity of powder mixture was positioned inside the die and compressed on a Carver Press (Wabash, IN) at a acknowledged force with the tooling proven to produce a cup-fashioned tablet. The cup changed into left in the die and a recognized quantity of both a model drug and a mix containing the drug changed into located inside the cup and tamped gently with the punch in a prolonged role.

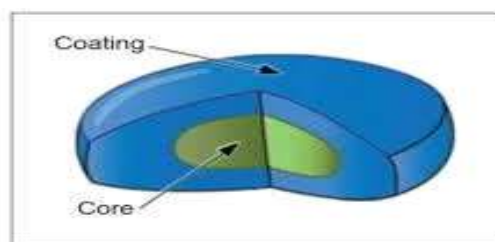


Fig. Coated tablet

Fig. No. 7

ELECTROSTATIC COATING:

In electrostatic powder coating, we spray powder via a place of strong electric area and excessive unfastened-ion concentration. Passing through this location, the particles are charged as discussed earlier. The process of powder particles charging within the electric area of corona discharge is governed with the aid of Pauthenier’s equation. Charging is most strongly laid low with field power, powder particle size and form, and the length of time the particle spends within the charge area .

Electrostatic Dry Coating

An electrostatic dry powder coating method for tablets become evolved for the first time with the aid electrostatic dry powder coating in a pan coater gadget.

The optimized dry powder coating method produces capsules with smooth surface, correct coating uniformity and release profile that are corresponding to that of the tablet cores. This novel electrostatic dry powder coating technique is an opportunity to aqueous or solvent based coating technique for pharmaceutical products is represented in Figure 8.

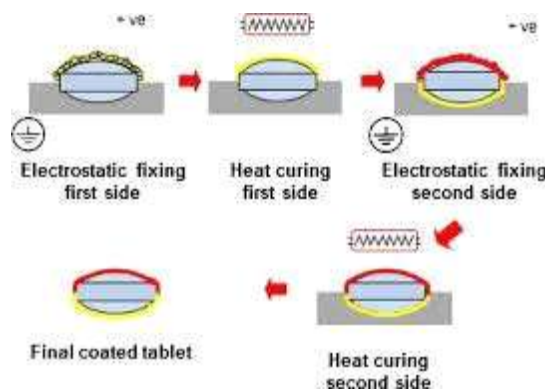


Fig. No. 8

According to the charging mechanism, there are two types of spraying units:

a.Mechanism of corona charging

On this mechanism, the electrical breakdown and ionization of air with the aid of enforcing high voltage on a sharp pointed needle like electrode at the hole of the gun.

The powder debris picks up the negative ions on their manner from the gun to the substrate. The movement of particles between the substrate and the charging gun is performed by way of the aggregate of electrical and mechanical forces.

b. Mechanism of tribo charging

In the tribo charging, it makes using the principle of friction charging associated with the dielectric properties of solid substances and so that no loose ions and electric area might be present between the spray gun and level-headed substance. For tribo charging guns, the electric forces are only regarded to the repulsive forces among the charged particles.

Magnetically Assisted Impaction Coating (MAIC)

Several dry coating methods have been developed such as compression coating, plasticizer dry coating, heat dry coating and electrostatic dry coating. These methods generally allow for the application of high shearing stresses or high impaction forces or exposure to higher temperature to achieve coating. The strong mechanical forces and the accompanying heat generated can cause

layering and even embedding of the guest particles onto the surface of the host particles.

Apparatus for MAIC

Apparatus for MAIC consist of processing vessel surrounded by the series of electromagnets connected to the alternating current host and guest materials are placed in the vessel along with the measured mass of the magnetic particles.

The magnetic particles are made of barium ferrite and coated with polyurethane to prevent contamination of the coated particles. When a magnetic field is present, the magnetic particles are agitated and move furiously inside the vessel, resembling a fluidized bed system.

These agitated magnetic particles then impart energy to the host and guest particles, causing collisions and allowing coating to be achieved by means of impaction or peening of the guest particles onto the host particles.

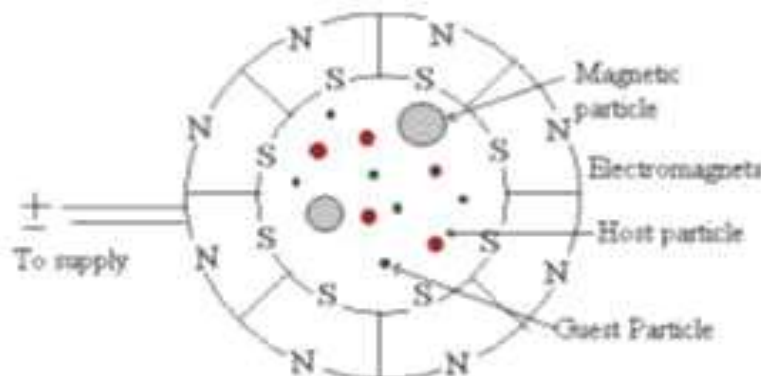


Fig. No. 9

The magnetic particle motion studies suggests that the primary motion due to the magnetic field is the spinning of the magnetic particles, promoting de- agglomeration of the guest particles as well as the spreading and shearing of the guest particles onto the surface of the host particles

In this process, drying is very fast, making it possible to coat extremely hygroscopic tablets. The deposition accuracy is sufficiently high to layer API onto tablets, and uniform layers of taste masking or modified release coatings can be applied consecutively within a single continuous batch.

Super Cellum Technology

The —standardl practice of tablet coating often delivers a non-homogenous product. Because the tablets are loaded in large rotating pans and vented for hot air drying, edges of tablets can get grounded off and intagliation can get filled in by coating material leading to uneven coating on edges/corners and tablet faces. Supercell™ Coating Technology may also be used for coating of flat or highly oblong tablets or friable tablets.

Unique features of super cell coating technology are:

- Continuous coating**
- Short processing time**
- Flexible modular design**
- No scale-up to parameters**
- Batch size for R&D (Minimum size ~30 grams)**
- Enhancing technology**
- Multi-layer coating**



Fig. No. 10

SYLOID® FP Silica In Pharmaceutical Filmcoating

Recently, film coatings have also shown encouraging results to enable the oral delivery of peptide therapeutics. Syloid® FP silica's have been used as excipients in many pharmaceutical formulations due to their unique morphology.

The combined adsorption capacity, porosity, particle size and greater surface area allow them to provide several benefits simultaneously which can expedite manufacturing and improve efficacy of the final dosage form. Syloid® FP silica can be used in polymeric coating systems in combination of vinyl/cellulose or acrylic polymers In standard concentrations—Addition of Syloid® 244FP silica to film coating provides.

Following advantages:

- Improved spray properties
- Elimination of the need for talc
- Prevention of valve clogging
- Minimal settling in spray lines
- Smoothen tablet surface
- Reduction of adhesion
- Improvement of suspension properties

Fluid Bed Coating Process

Fluid bed processing involves coating, granulation, agglomeration and drying of

particulate material. A fluidized bed is a bed of solid particles with a stream of air or gas passing upward through the particles at a rate great enough to set them in motion. It is possible to propagate wave motion, which creates the potential for improved mixing. The fluid bed can be used to coat particles for controlled release or taste masking, dry the wet product, agglomerate particles, improve flow properties etc.

The three patterns of the fluid-bed processes could be characterized by the position/location of the spray nozzle i.e. top spray, bottom spray and tangential spray. The most commonly known fluid-bed process for coating in the pharmaceutical industry is the bottom-spray (Wurster) process.

FBC Operation and Operation Parameters

Air enters through the plenum chamber and is evenly distributed to provide uniform fluidization and heat transfer. Pellets are fluidized by air stream, as the particle moves up ward, they are decelerated in the expansion chamber and then fall outside the wurster column. The returned particles move downward until they are sucked back up to the loop again.

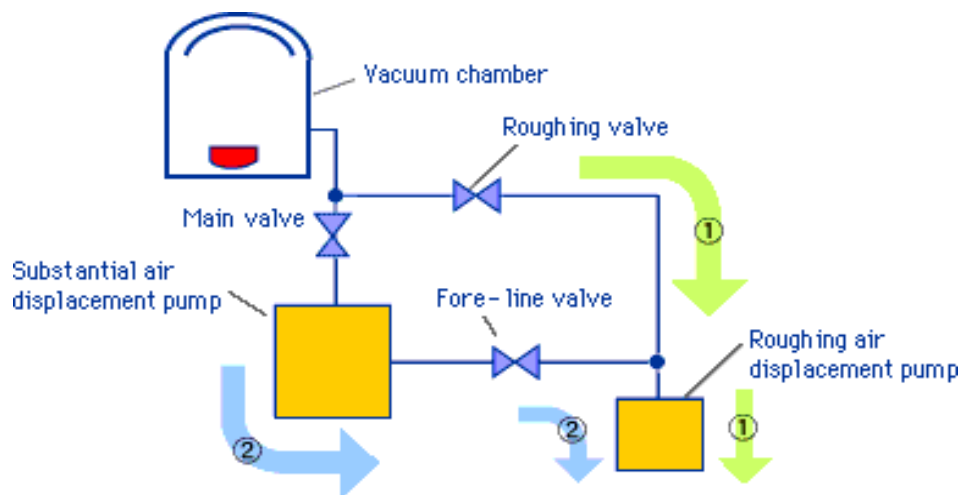


Fig. No. 11

Dip Coating Process

Dip coating is a famous way of creating thin films for research functions. Uniform films may be implemented onto flat or cylindrical substrates. For commercial strategies, spin coating is used greater often in represents the dip coating. The dip coating process can be separated into five stages:

Immersion: The substrate is immersed inside the solution of the coating material at a constant pace.

Start-up: The substrate has remained inside the solution for a while and is starting to be pulled up.

Deposition: The thin layer deposits itself at the substrate even as it is pulled up. The retreating is carried out at a constant velocity to avoid any jitters. The speed determines the thickness of the coating.

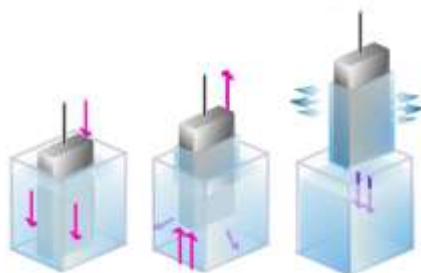


Fig. No. 12

Top Spray Coating Process

Despite the fact that the top spray fluid mattress system is extensively used for granulation its use for coating is restrained. Top spraying is the most effective method and gives the best capability and lowest capital cost.

It could be used for numerous manipulations of taste covering and many others. This method alternative is often used in the food, feed and chemical industries as the characteristic of the film mainly serves to enhance the general managing situations.

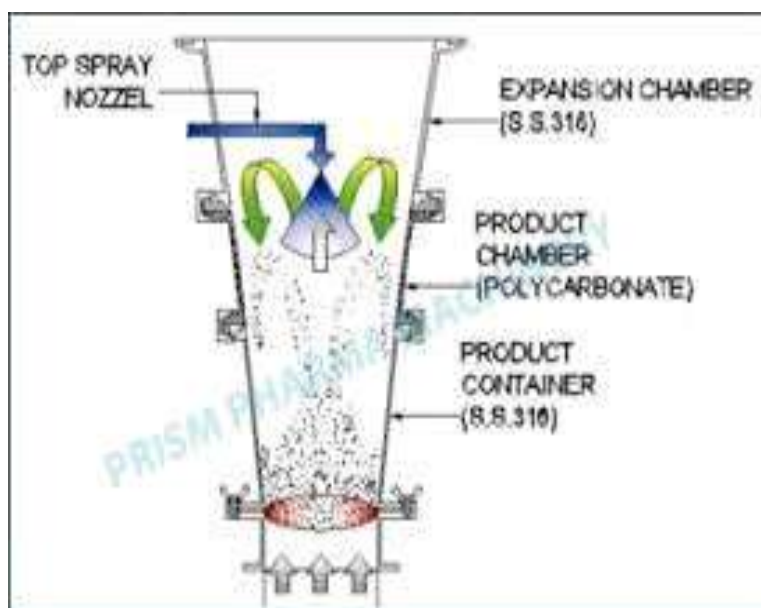
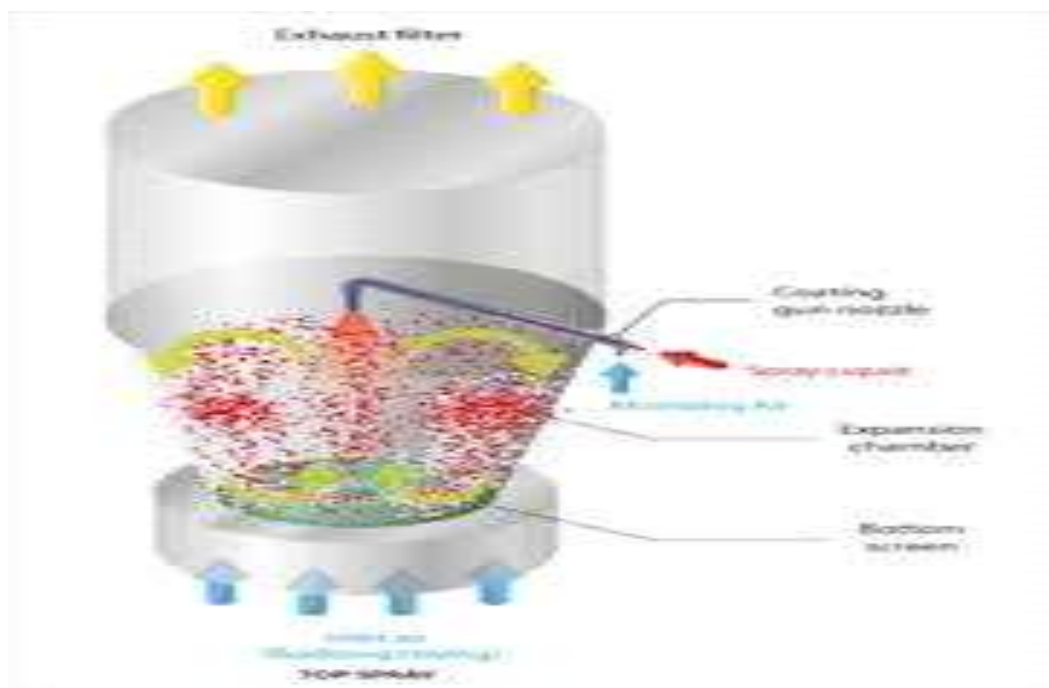


Fig. No. 13



Bottom Spray Coating Process

The maximum normally recognized fluid-bed system for coating inside the pharmaceutical industry is bottom-spray technique. The precise functions of bottom-spraying are an air distributes plate and a partition that arrange fluidization of particles of debris via the partition. The nozzle is installed at the bottom of the product box and is focused in the coating zone

Tablet Coating Defect

An ideal tablet should be free from any visual defect or functional defect. The imperfections are known as ‘_Visual Defects’ and they are either related to imperfections in any one or more of the factors.

Coating Defect with Reason and Their Remedies

Sr. No.	Tablet Defect	Defination	Reason	Remedies
01	Blistering	It is the local detachment of film from the substrate forming blister	Entrapment of gases in the film due to over heating either during spraying or the end of the coating run	Mild drying conditions are warranted in the case
02	Chipping	It is defect where the film becomes chipped and dented, usually at the edges of the tablet	Decrease in fluidizing air or speed of rotation of the drum in pan coating	Be careful not to over –dry the tablets in the preheating stage. That can make the tablets brittle & promote capping
03	Picking	In is defect where is isolated areas of film are pulled away from the surface when the tablet sticks together and then part.	Condition similar to cratering that produces an overly wet tablets can stick together and then break apart	A reduction in the liquid application rate or increase in the drying air temperature and air volume usually solves this problem.

EVALUATIONS OF ENTERIC COATED TABLETS

Hardness

The tablet crushing strength was tested by commonly used Pfizer tablet hardness tester.

Thickness

Dimensions of the tablets were measured by using the calibrated Venire calipers. Ten tablets were selected randomly from a batch average thickness was calculated.

Friability

Tablet strength was tested by Roche friabilator. Pre weighed (Model: ED-2, Electro lab) tablets were given 100 revolutions in 4 min and were de dusted.

Disintegration time

The disintegration time of the coated tablets was determined using the USP model disintegration apparatus (EI).

II. CONCLUSION

Coating enhances the quality of products. The coating is applied to a dosage form that already in functionally complete. Coating controls the bioavailability of the drug. Magnetically assisted impaction coating and electrostatic dry coating avoids most important hazards of solvents primarily based coating. Electrostatic dry coating calls for special type of powder coating composition.

Electrostatic dry coating enables coating of tablet with different colors on either facet alongside-with printing on tablet on pharmaceutical dosage shape. Major challenge for future research. Defects in the tablets can arise during manufacturing processes, storage or transport. These visual defects can reduce the acceptability by the users and effectiveness of the product. In this review defects, causes and measures to overcome these defects have been discussed and that the same could be minimized and prevented.

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