Tablets

UNIT III

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Introduction

Solid medicaments may be administered orally as powders, pills, cachets, capsules or tablets .These dosage forms contain a quantity of drug which is given as a single unit and they are known collectively as solid unit dosage forms, even in the case of sustained action preparations which, technically, contain the equivalent of several normal doses of drug .The stringent formulation requirements of modern medicaments, the many advantages of tablet and capsule medication, coupled with expanding health services and the commitment need for large-scale economic manufacture, have led to a steady decline in the prescribing of powders and pills .Tablets and capsules, on the other hand, currently account for well over two third of the total number and cost of medicines produced all over the world.

Tablet is defined as a compressed solid dosage form containing medicaments with or without excipients. According to the Indian Pharmacopoeia Pharmaceutical tablets are solid, flat or biconvex dishes, unit dosage form, prepared by compressing a drugs or a mixture of drugs, with or without diluents. They vary in shape and differ greatly in size and weight, depending on amount of medicinal substances and the intended mode of administration. It is the most popular dosage form and 70% of the total medicines are dispensed in the form of Tablet. All medicaments are available in the Tablet form except where it is difficult to formulate or administer.

The advantages of the Tablet dosage form are:

1. They are unit dosage form and offer the greatest capabilities of all oral dosage form for the greatest dose precision and the least content variability.

2. Cost is lowest of all oral dosage form.

3. Lighter and compact.

4. Easiest and cheapest to package and strip.

5. Easy to swallowing with least tendency for hang-up.

6. Sustained release product is possible by enteric coating.

7. Objectionable odour and bitter taste can be masked by coating technique.

8. Suitable for large scale production.

9. Greatest **chemical and microbial stability over all oral dosage form.**

10. Product identification is easy and rapid requiring no additional steps when employing an **embossed and/or monogrammed punch face.**

Disadvantages of Tablet dosage form are:

1. Difficult to swallow in case of children and unconscious patients.

2. Some drugs resist compression into dense compacts, owing to **amorphous nature, low density character.**

3. Drugs with poor wetting, slow dissolution properties, optimum absorption high in GIT may be difficult to formulate or manufacture as a tablet that will still provide adequate or full drug bioavailability.

4. Bitter testing drugs, drugs with an objectionable odor or drugs that are sensitive to oxygen may require encapsulation or coating. In such cases, capsule may offer the best and lowest cost.

General properties of Tablet dosage forms:

1. A tablet should have elegant product identity while free of defects like chips, cracks, discoloration, and contamination.

2. Should have sufficient strength to withstand mechanical shock during its production packaging, shipping and dispensing.

3. Should have the chemical and physical stability to maintain its physical attributes over time

4. The tablet must be able to release the medicinal agents in a predictable and reproducible manner.

5. Must have a chemical stability over time so as not to follow alteration of the medicinal agents.

Different types of Tablets

(A) Tablets ingested orally:

1. Compressed tablet, e.g. Paracetamol tablet
2. Multiple compressed tablet
3. Repeat action tablet
4. Delayed release tablet, e.g. Enteric coated Bisacodyl tablet
5. Sugar coated tablet, e.g. Multivitamin tablet
6. Film coated tablet, e.g. Metronidazole tablet
7. Chewable tablet, e.g. Antacid tablet

(B) Tablets used in oral cavity:

1. Buccal tablet, e.g. Vitamin-c tablet
2. Sublingual tablet, e.g. Vicks Menthol tablet
3. Troches or lozenges
4. Dental cone

(c) Tablets administered by other route:

1. Implantation tablet
2. Vaginal tablet, e.g. Clotrimazole tablet

(D) Tablets used to prepare solution:

1. Effervescent tablet, e.g. Dispirin tablet (Aspirin)
2. Dispensing tablet, e.g. Enzyme tablet (Digiplex)
3. Hypodermic tablet
4. Tablet triturates e.g. Enzyme tablet (Digiplex)

Tablet Ingredients

In addition to active ingredients, tablet contains a number of inert materials known as additives or excipients. Different excipients are:

1. Diluent
2. Binder and adhesive
3. Disintegrents
4. Lubricants and glidants
5. Colouring agents
6. Flavoring agents
7. Sweetening agents

1. Diluent: Diluents are fillers used to make required bulk of the tablet when the drug dosage itself is inadequate to produce the bulk. Secondary reason is to provide better tablet properties such as improve cohesion, to permit use of direct compression manufacturing or to promote flow. A diluent should have following properties:

1. They must be non toxic

2. They must be commercially available in acceptable grade

3. There cost must be low

4. They must be physiologically inert

5. They must be physically & chemically stable by themselves & in combination with the drugs.

6. They must be free from all microbial contamination.

7. They do not alter the **bioavailability of drug.**

8. They must be color compatible.

Commonly used tablet diluents

1. Lactose-anhydrous and spray dried lactose
2. Directly compressed starch-Sta Rx 1500
3. Hydrolyzed starch-Emdex and Celutab
4. Microcrystalline cellulose-Avicel (PH 101and PH 102)
5. Dibasic calcium phosphate dehydrate
6. Calcium sulphate dihydrate
7. Mannitol
8. Sorbitol
9. Sucrose- Sugartab, DiPac, Nutab
10. Dextrose

2. Binders and Adhesives: These materials are added either dry or in wet-form to form granules or to form cohesive compacts for directly compressed tablet.

Example: Acacia, tragacanth- Solution for 10-25% Conc.
Cellulose derivatives- Methyl cellulose, Hydroxy propyl methyl cellulose, Hydroxy propyl cellulose
Gelatin- 10-20% solution
Glucose- 50% solution
Polyvinylpyrrolidone (PVP)- 2% conc.
Starch paste-10-20% solution
Sodium alginate
Sorbitol

3. Disintegrants: Added to a tablet formulation to facilitate its breaking or disintegration when it contact in water in the GIT.

Example: Starch- 5-20% of tablet weight.
Starch derivative – Primogel and Explotab (1-8%)
Clays- Veegum HV, bentonite 10% level in colored tablet only
Cellulose
Cellulose derivatives- Ac- Di-Sol (sodium carboxy methyl cellulose)
Alginate
PVP (Polyvinylpyrrolidone), cross-linked

Superdisintegrants: Swells up to ten fold within 30 seconds when contact water.

Example: Crosscarmellose- cross-linked cellulose, Crosspovidone- cross-linked povidone (polymer), Sodium starch glycolate- cross-linked starch. These cross-linked products swell upto 10n fold with in 30 seconds when in contact with water.
A portion of disintegrant is added before granulation and a portion before compression, which serve as **glidants or lubricant. Evaluation of carbon dioxide in effervescent tablets is also one way of disintegration**

4. Lubricant and Glidants: Lubricants are intended to prevent adhesion of the tablet materials to the surface of dies and punches, reduce inter particle friction and may improve the rate of flow of the tablet granulation.

Glidants are intended to promote flow of granules or powder material by reducing the friction between the particles.
Example: Lubricants- Stearic acid, Stearic acid salt - Stearic acid, Magnesium stearate, Talc, PEG (Polyethylene glycols), Surfactants
Glidants- Corn Starch – 5-10% conc., Talc-5% conc., Silica derivative - Colloidal silicas such as Cab-O-Sil, Syloid, Aerosil in 0.25-3% conc.

5. Coloring agent: The use of colors and dyes in a tablet has three purposes:

(1) Masking of off color drugs
(2) Product Identification
(3) Production of more elegant product

All coloring agents must be approved and certified by FDA. Two forms of colors are used in tablet preparation – FD &C and D & C dyes. These dyes are applied as solution in the granulating agent or Lake form of these dyes. Lakes are dyes absorbed on hydrous oxide and employed as dry powder coloring.

Example: FD & C yellow 6-sunset yellow
FD & C yellow 5- Tartrazine
FD & C green 3- Fast Green
FD & C blue 1- Brilliant Blue
FD & C blue 2 - Indigo carmine
D & C red 3- Erythrosine.
D & C red 22 – Eosin Y

6. Flavoring agents: For chewable tablet- flavor oil are used

7. Sweetening agents: For chewable tablets: Sugar, mannitol.

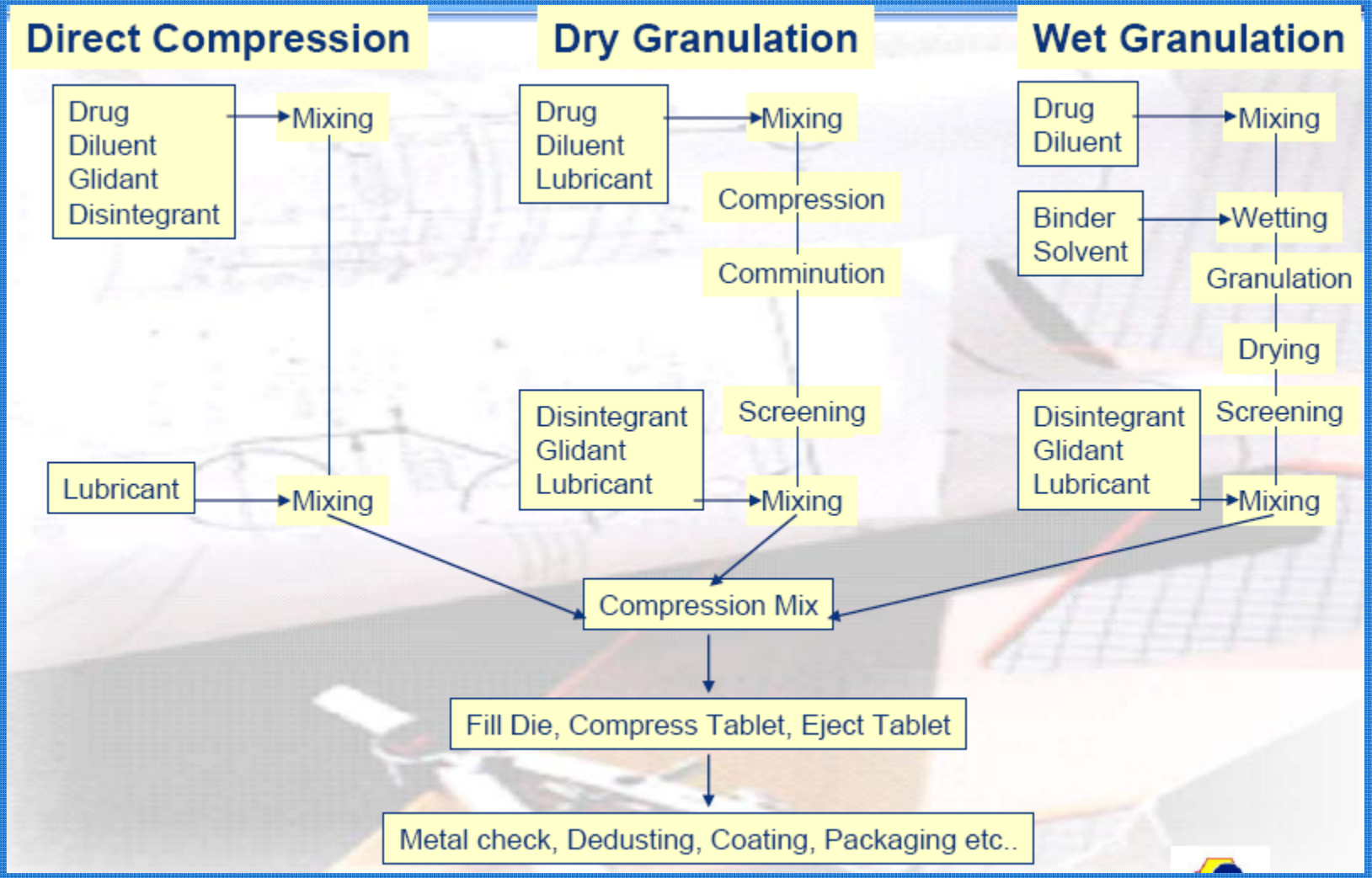
Saccharine (artificial): 500 time's sweeter than sucrose

Disadvantage: Bitter aftertaste and carcinogenic

Aspartame (artificial)

Disadvantage: Lack of stability in presence of moisture.

Granulation technology on large scale by various techniques



Tablet Compression Machine

Tablets are made by compressing a formulation containing a drug or drugs with excipients on stamping machine called presses. Tablet presses are designed with following basic components:

1) Hopper for holding and feeding granulation
2) Dies that define the size and shape of the tablet.
3) Punches for compressing the granulation within the dies.
4) Cam tracks for guiding the movement of the punches.
5) A feeding mechanism for moving granulation from hopper into the dies

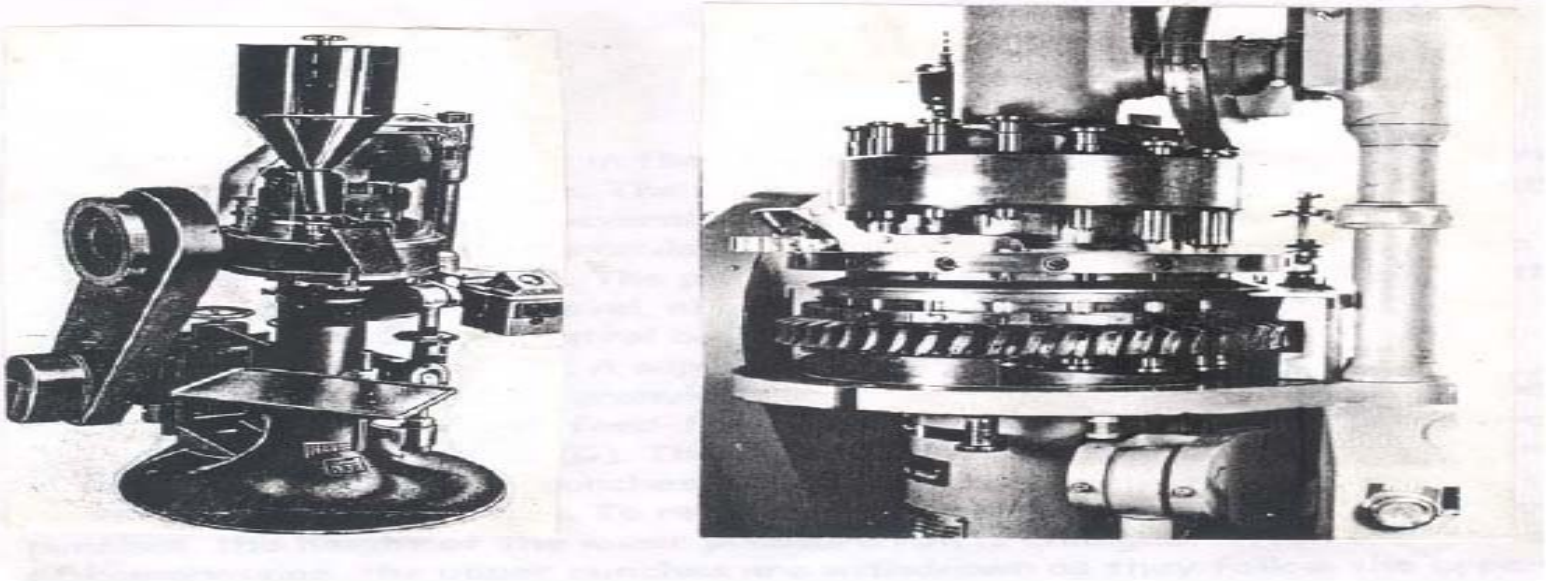


Fig. 15 Single punch tablet machine (left) & 16 station rotary tablet machine(R)
(Courtesy, Bentley's text book of pharmaceutics, by E A Rawlins, eighth edition)

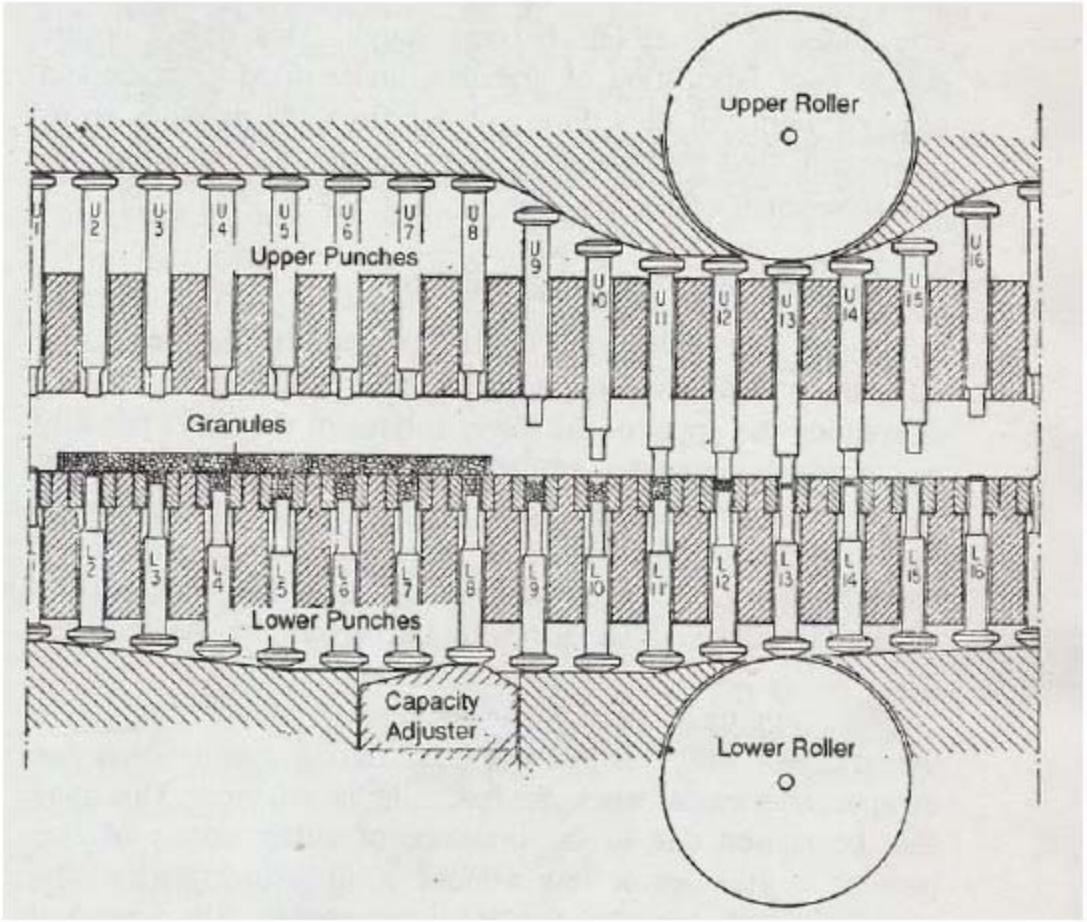


Fig. 16 The compression cycle of a rotary tablet press

(Courtesy, The theory and practice of Industrial pharmacy Leon Lachman, third Edition

Evaluation of Tablet

1. General Appearance: The general appearance of a tablet, its identity and general elegance is essential for consumer acceptance, for control of lot-to-lot uniformity and tablet-to-tablet uniformity. The control of general appearance involves the measurement of size, shape, color, presence or absence of odor, taste etc.

2. Size & Shape: It can be dimensionally described & controlled. The thickness of a tablet is only variables. Tablet thickness can be measured by micrometer or by other device. Tablet thickness should be controlled within a ± 5% variation of standard value.

3. Unique identification marking: These marking utilize some form of embossing, engraving or printing. These markings include company name or symbol, product code, product name etc.

4. Organoleptic properties: Color distribution must be uniform with no mottling. For visual color comparison compare the color of sample against standard color.

5. Hardness and Friability: Tablet requires a certain amount of strength or hardness and resistance to friability to withstand mechanical shakes of handling in manufacture, packaging and shipping. Hardness generally measures the tablet crushing strength

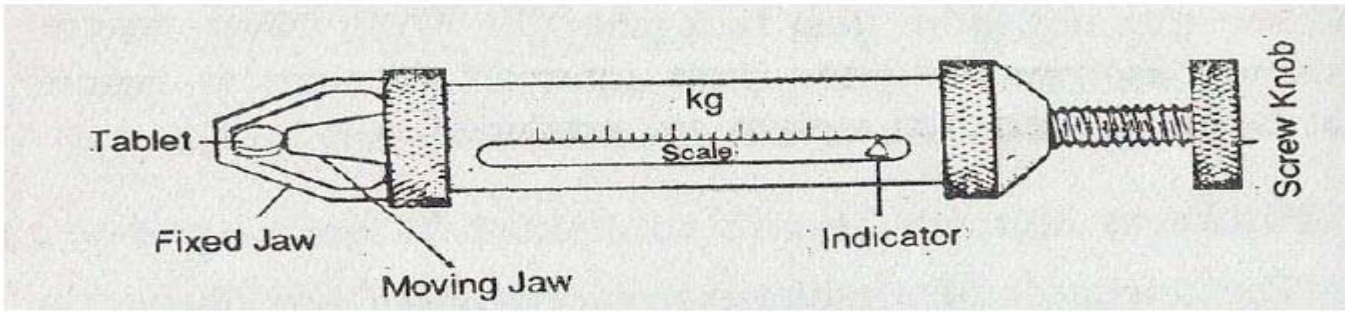


Fig. 17 Monsanto hardness tester

6.Friability: Friability of a tablet can determine in laboratory by Roche friabilator. This consist of a plastic chamber that revolves at 25 rpm, dropping the tablets through a Distance of six inches in the friabilator, which is then operate for 100 revolutions. The tablets are reweighed. Compress tablet that lose less than 0.5 to 1.0 % of the Tablet weigh are consider acceptable.

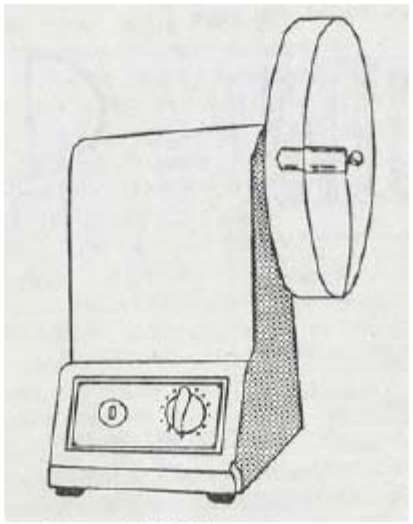


Fig. 18 Roche Friability test apparatus

2. Drug Content and Release:

(I) **Weight Variation test (U.S.P.):** Take 20 tablet and weighed individually. Calculate average weight and compare the individual tablet weight to the average. The tablet pass the U.S.P. test if no more that 2 tablets are outside the percentage limit and if no tablet differs by more than 2 times the percentage limit.

(II) **Content Uniformity Test:** Randomly select 30 tablets. 10 of these assayed individually. The Tablet pass the test if 9 of the 10 tablets must contain not less than 85% and not more than 115% of the labeled drug content and the 10^{th} tablet may not contain less than 75% and more than 125% of the labeled content. If these conditions are not met, remaining 20 tablet assayed individually and none may fall out side of the 85 to 115% range.

(III) **Disintegration Test (U.S.P.):** The U.S.P. device to test disintegration uses 6 glass tubes that are 3" long; open at the top and 10 mesh screen at the bottom end. To test for disintegration time, one tablet is placed in each tube and the basket rack is positioned in a 1-L beaker of water, simulated gastric fluid or simulated intestinal fluid at 37 ± 2° C such that the tablet remain 2.5 cm below the surface of liquid on their upward movement and not closer than 2.5 cm from the bottom of the beaker in their downward movement. Move the basket containing the tablets up and down through a distance of 5-6 cm at a frequency of 28 to 32 cycles per minute. Floating of the tablets can be prevented by placing perforated plastic discs on each tablet.

According to the test the tablet must disintegrate and all particles must pass through the 10 mesh screen in the time specified. If any residue remains, it must have a soft mass.

Disintegration time: Uncoated tablet: 5-30 minutes

Coated tablet: 1-2 hours

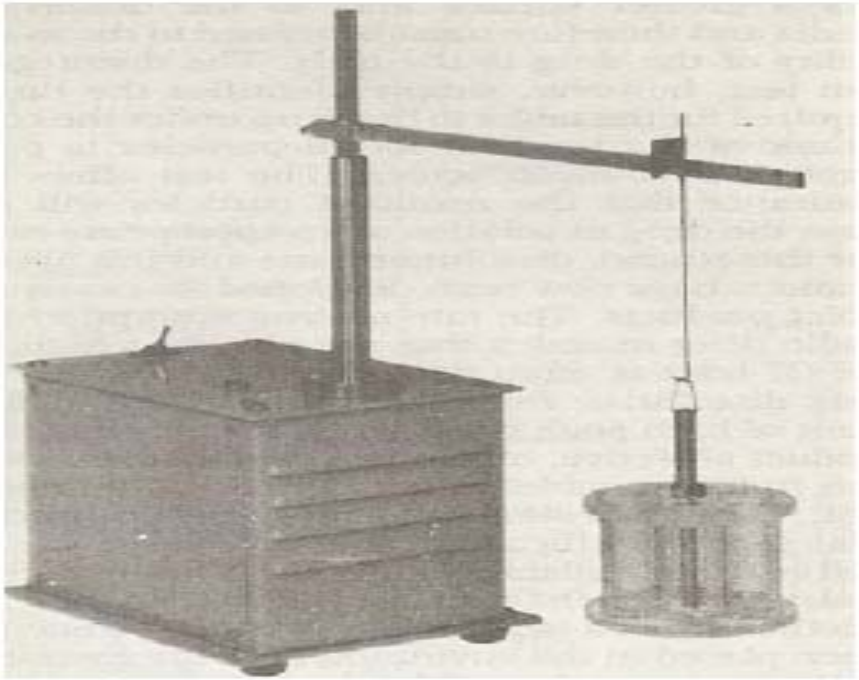


Fig. 19 Disintegration test apparatus

3.Dissolution Test (U.S.P.): Two set of apparatus:

Apparatus-1: A single tablet is placed in a small wire mesh basket attached to the bottom of the shaft connected to a variable speed motor. The basket is immersed in a dissolution medium (as specified in monograph) contained in a 100 ml flask. The flask is cylindrical with a hemispherical bottom. The flask is maintained at 37±0.5°C by a constant temperature bath. The motor is adjusted to turn at the specified speed and sample of the fluid are withdrawn at intervals to determine the amount of drug in solutions.

Apparatus-2: It is same as apparatus-1, except the basket is replaced by a paddle. The dosage form is allowed to sink to the bottom of the flask before stirring. For dissolution test U.S.P. specifies the dissolution test medium and volume, type of apparatus to be used, rpm of the shaft, time limit of the test and assay procedure for. The test tolerance is expressed as a % of the labeled amount of drug dissolved in the time limit.

Fig. 20 Dissolution test apparatus

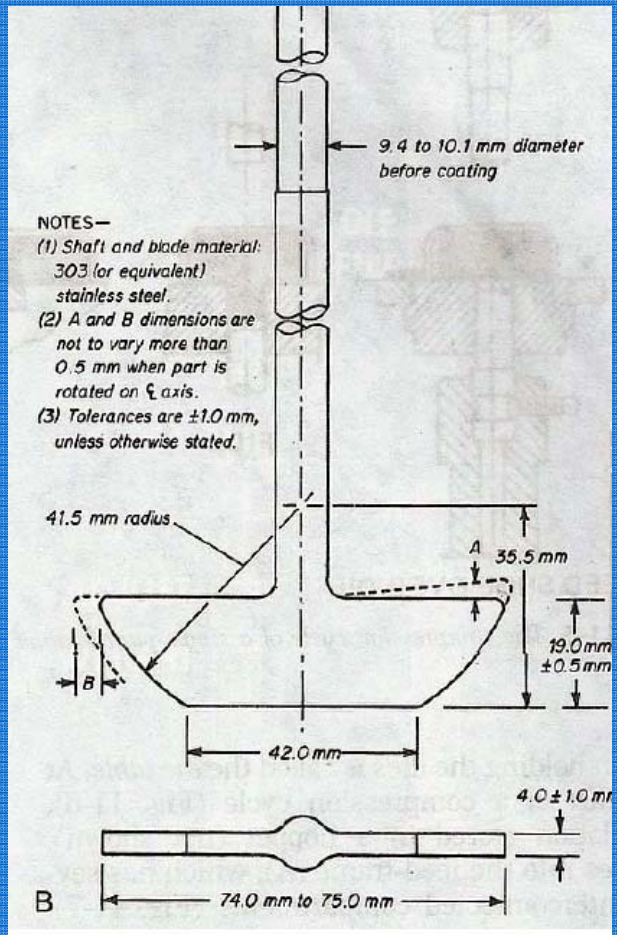


Fig. 22 USP dissolution apparatus 2

Tablet Coating

Tablet coatings perform one or more of the following functions. They may: mask the taste of unpalatable drugs, protect the drug from deterioration due to light, oxygen or moisture, separate incompatible ingredients, control the release of medicament in the gastrointestinal tract, and provide an elegant or distinctive finish to the tablet.

The materials used for coating may largely comprise sucrose (sugar coating), water-soluble film-forming polymers (film coating) or substances which are soluble in the intestinal secretions but not in those of the stomach (enteric coating). These types of coating can all be applied by the pan or fluid-bed processes; the compression coating technique is suitable for sugar and enteric coatings, but not for film coating.

Types of Coating

Different coating processes are: Pan coating, Fluid Bed Coating, Compression coating

A. Pan Coating

Fig. 23 Tablet coating pan

Formulations of coating solution: The constituents of coating solutions used for sugar coating are given below:

Seal coating	Sub coating	Syrup coating	Polishing soln.
Zein/Shellac	Gelatin	Colorant	Carnauba wax
Oleic acid	Acacia	Sub coating powder	(yellow)
Propylene glycol	Sugar cane powder	Cal. Carbonate	Bees wax
PEG 4000	Corn syrup	Cane sugar powder	(white)
Methylene chloride	Syrup	Corn starch	Paraffin wax
Alcohol	Distilled water	Syrup	Naphtha
		Distilled water	

Enteric coating polymers: Cellulose acetate phthalate, Acrylate polymers, Hydroxypropyl methyl cellulose phthalate, Polyvinyl acetate phthalate

Solvents used for coating: Ethanol, Methanol, Isopropanol, Chloroform, Acetone, Methylene chloride, Methylene ethyl ketone

B. Fluid-Bed Coating

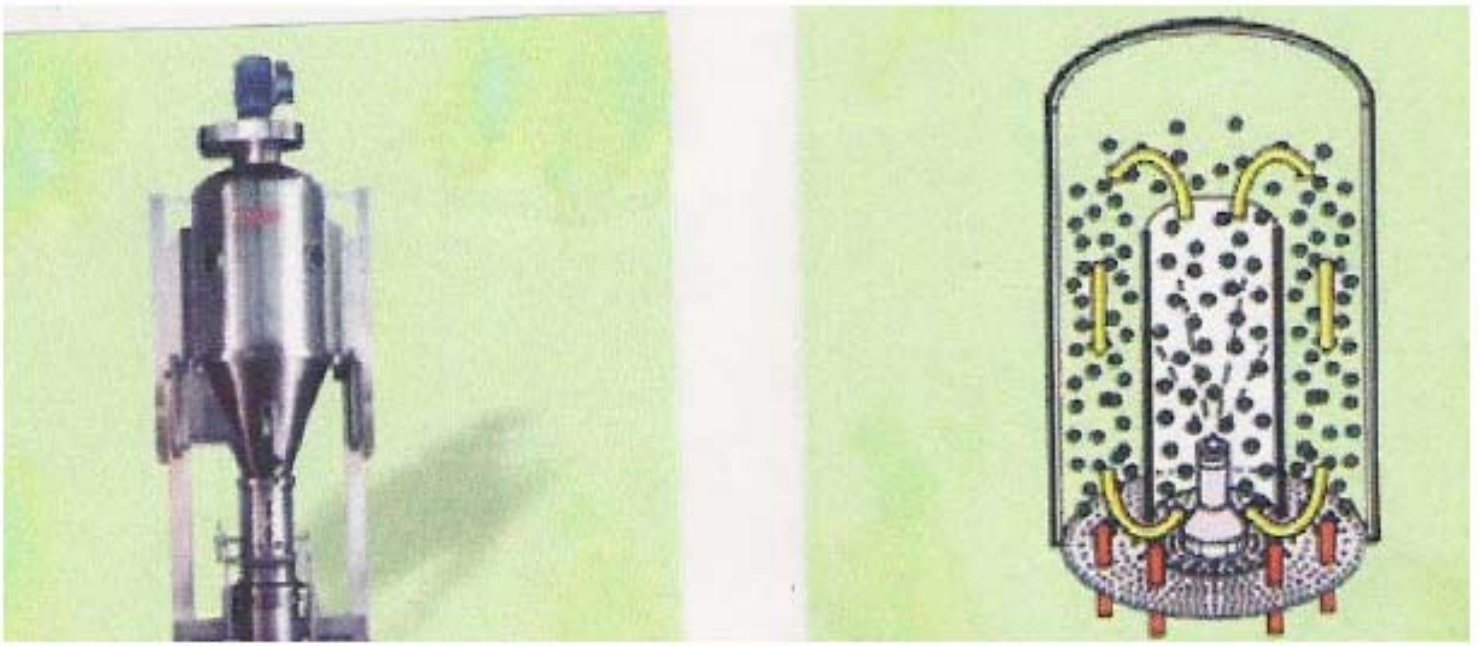


Fig. 29 Fluid Bed Coater:

Compression Coating Machines

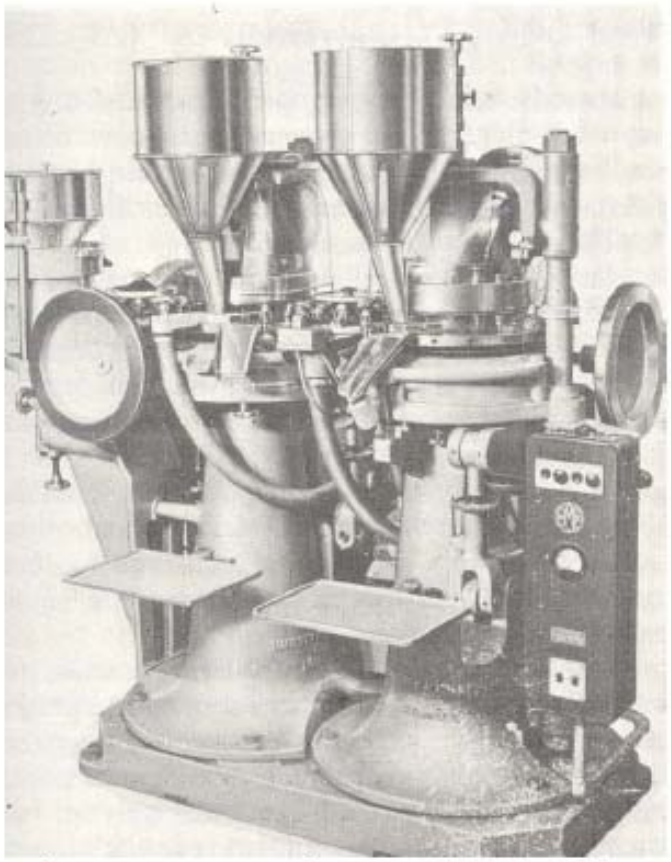


Fig.25 Compression coating machine.

Other methods of coating equipments:
Perforated Pan Systems

Accela-Cota: It is a prototype of perforated cylindrical drum providing high drying air capacity. Therefofe it is preferred for film coating.

Fig.27 Accela-Cota

Hi-coater system: The drying air is directed into the drum is passed through the tablet bed, and is exhausted through the perforations in the drum.

Fig. 28 Hi-coater system

SUPERCELL™ Tablet Coater

Revolutionary tablet coater that accurately deposits controlled amounts of coating materials on tablets, even if they are extremely hygroscopic or friable.

Fig. 30 The SUPERCELL™ Tablet Coater

Fig. 31 The SUPERCELL™ Tablet Coater

Problems in tableting

1 Capping

2 Lamination / Laminating

3 Chipping

4 Cracking

5 Sticking / Filming

6 Picking

7 Binding

8 Mottling

9 Double impression

Problems and remedies for tablet coating

1 Blistering

2 Chipping

3 Cratering

4 Picking

5 Pitting

6 Blooming

7 Blushing

8 Colour variation

9 Infilling

10 Orange peel/Roughness

11 Cracking/Splitting

THE CAUSES AND REMEDIES OF CAPPING RELATED TO 'FORMULATION' (GRANULATION)

Sr. No.	CAUSES	REMEDIES
1.	Large amount of fines in the granulation	Remove some or all fines through 100 to 200 mesh screen
2.	Too dry or very low moisture content (leading to loss of proper binding action).	Moisten the granules suitably. Add hygroscopic substance e.g.: sorbitol, methyl- cellulose or PEG-4000
3.	Not thoroughly dried granules.	Dry the granules properly.
4.	Insufficient amount of binder or improper binder.	Increasing the mount of binder OR Adding dry binder such as pre-gelatinized starch, gum acacia, powdered sorbitol, PVP, hydrophilic silica or powdered sugar.
5.	Insufficient or improper lubricant.	Increase the amount of lubricant or change the type of lubricant.
6.	Granular mass too cold to compress firm.	Compress at room temperature.

THE CAUSES AND REMEDIES OF CAPPING RELATED TO ‘MACHINE’ (DIES, PUNCHES AND TABLET PRESS)

Sr. No.	CAUSES	REMEDIES
1.	Poorly finished dies	Polish dies properly. Investigate other steels or other materials.
2.	Deep concave punches or beveled-edge faces of punches.	Deep concave punches or beveled-edge faces of punches.
3.	Lower punch remains below the face of die during ejection.	Make proper setting of lower punch during ejection.
4.	Incorrect adjustment of sweep-off blade.	Adjust sweep-off blade correctly to facilitate proper ejection.
5.	High turret speed.	Reduce speed of turret (Increase dwell time).

The Causes and Remedies of Lamination related to MACHINE (Dies, Punches and Tablet Press)]

Sr. No.	CAUSES	REMEDIES
1.	Rapid relaxation of the peripheral regions of a tablet, on ejection from a die.	Use tapered dies, i.e. upper part of the die bore has an outward taper of 3° to 5°.
2	Rapid decompression Use pre-compression step.	Reduce turret speed and reduce the final compression pressure.

THE CAUSES AND REMEDIES OF CHIPPING RELATED TO FORMULATION (GRANULATION) ARE AS FOLLOWS

Sr. No.	CAUSES	REMEDIES
1.	Sticking on punch faces	Dry the granules properly or increase lubrication.
2.	Too dry granules.	Moisten the granules to plasticize. Add hygroscopic substances.
3.	Too much binding causes chipping at bottom.	Optimize binding, or use dry binders.

THE CAUSES AND REMEDIES OF CHIPPING RELATED TO MACHINE (DIES, PUNCHES AND TABLET PRESS)

Sr. No.	CAUSES	REMEDIES
1.	Groove of die worn at compression point.	Polish to open end, reverse or replace the die.
2.	Barreled die (center of the die wider than ends)	Polish the die to make it cylindrical
3.	Edge of punch face turned inside/inward.	Polish the punch edges
4.	Concavity too deep to compress properly.	Reduce concavity of punch faces. Use flat punches.

THE CAUSES AND REMEDIES OF CRACKING RELATED TO FORMULATION (GRANULATION)

Sr. No.	CAUSES	REMEDIES
1.	Large size of granules.	Reduce granule size. Add fines.
2.	Too dry granules.	Moisten the granules properly and add proper amount of binder
3.	Tablets expand.	Improve granulation. Add dry binders.
4.	Granulation too cold.	Compress at room temperature

THE CAUSES AND REMEDIES OF CRACKING RELATED TO MACHINE (DIES, PUNCHES AND TABLET PRESS)

Sr. No.	CAUSES	REMEDIES
1.	Tablet expands on ejection due to air entrapment.	Use tapered die.
2.	Deep concavities cause cracking while	removing tablets Use special take-off

THE CAUSES AND REMEDIES OF STICKING RELATED TO FORMULATION (GRANULATION)

Sr. No.	CAUSES	REMEDIES
1.	Granules not dried properly.	Dry the granules properly. Make moisture analysis to determine limits.
2.	Too little or improper lubrication	Increase or change lubricant.
3.	Too much binder	Reduce the amount of binder or use a different type of binder.
4.	Hygroscopic granular material.	Modify granulation and compress under controlled humidity.
5.	Oily or way materials	Modify mixing process. Add an absorbent.
6.	Too soft or weak granules.	Optimize the amount of binder and granulation technique.

THE CAUSES AND REMEDIES OF STICKING RELATED TO MACHINE (DIES, PUNCHES AND TABLET PRESS)

Sr. No.	CAUSES	REMEDIES
1.	Concavity too deep for granulation.	Reduce concavity to optimum.
2.	Too little pressure.	Increase pressure.
3.	Compressing too fast.	Reduce speed

THE CAUSES AND REMEDIES OF PICKING RELATED TO FORMULATION (GRANULATION)

Sr. No.	CAUSES	REMEDIES
1.	Excessive moisture in granules.	Dry properly the granules, determine optimum limit.
2.	Too little or improper lubrication.	Increase lubrication; use colloidal silica as a ‘polishing agent’, so that material does not cling to punch faces.
3.	Low melting point substances, may soften from the heat of compression and lead to picking.	Add high melting-point materials. Use high meting point lubricants.
4.	Low melting point medicament in high concentration.	Refrigerate granules and the entire tablet press.
5.	Too warm granules when compressing.	Compress at room temperature. Cool sufficiently before compression.
6.	Too much amount of binder.	Reduce the amount of binder, change the type or use dry binders.

THE CAUSES AND REMEDIES OF PICKING RELATED TO MACHINE (DIES, PUNCHES AND TABLET PRESS)

Sr. No.	CAUSES	REMEDIES
1.	Rough or scratched punch faces.	Polish faces to high luster.
2.	Embossing or engraving letters on punch faces such as B, A, O, R, P, Q, G.	Design lettering as large as possible. Plate the punch faces with chromium to produce a smooth and non-adherent face.
3.	Bevels or dividing lines too deep.	Reduce depths and sharpness.
4.	Pressure applied is not enough; too soft tablets.	Increase pressure to optimum.

THE CAUSES AND REMEDIES OF BINDING RELATED TO FORMULATION (GRANULATION)

Sr. No.	CAUSES	REMEDIES
1.	Too moist granules and extrudes around lower punch.	Dry the granules properly.
2.	Insufficient or improper lubricant.	Increase the amount of lubricant or use a more effective lubricant
3.	Too coarse granules.	Reduce granular size, add more fines, and increase the quantity of lubricant.
4.	Too hard granules for the lubricant to be effective.	Modify granulation. Reduce granular size.
5.	Granular material very abrasive and cutting into dies.	If coarse granules, reduce its size. Use wear-resistant dies.
6.	Granular material too warm, sticks to the die.	Reduce temperature.

THE CAUSES AND REMEDIES OF BINDING RELATED TO MACHINE (DIES, PUNCHES AND TABLET PRESS)

Sr. No.	CAUSES	REMEDIES
1.	Poorly finished dies.	Polish the dies properly.
2.	Rough dies due to abrasion, corrosion.	Investigate other steels or other materials or modify granulation.
3.	Undersized dies. Too little clearance.	Rework to proper size. Increase clearance.
4.	Too much pressure in the tablet press.	Reduce pressure. OR Modify granulation.

THE CAUSES AND REMEDIES OF MOTTLING

Sr. No.	CAUSES	REMEDIES
1.	A coloured drug used along with colourless or white-coloured excipients.	Use appropriate colourants.
2.	A dye migrates to the surface of granulation while drying.	Change the solvent system, Change the binder, Reduce drying temperature and Use a smaller particle size.
3.	Improperly mixed dye, especially during 'Direct Compression'.	Mix properly and reduce size if it is of a larger size to prevent segregation.
4.	Improper mixing of a coloured binder solution.	Incorporate dry colour additive during powder blending step, then add fine powdered adhesives such as acacia and tragacanth and mix well and finally add granulating liquid.

PROBLEMS AND REMEDIES FOR TABLET COATING

Sr. No.	CAUSES	REMEDIES
THE CAUSE AND REMEDY OF BLISTERING		
1.	Effect of temperature on the strength, elasticity and adhesion of the film	Use mild drying condition.
THE CAUSE AND REMEDY OF CHIPPING		
1.	High degree of attrition associated with the coating process.	Increase hardness of the film by increasing the molecular weight grade of polymer.
THE CAUSES AND REMEDIES OF CRATERING		
1.	Inefficient drying.	Use efficient and optimum drying conditions.
2.	Higher rate of application of coating solution.	Increase viscosity of coating solution to decrease spray application rate.
THE CAUSES AND REMEDIES OF PICKING		
1.	Inefficient drying.	Use optimum and efficient drying conditions or increase the inlet air temperature.
2.	Higher rate of application of coating solution	Decrease the rater of application of coating solution by increasing viscosity of coating solution.
THE CAUSE AND REMEDY OF PITTING		
1.	Inappropriate drying (inlet air) temperature	Dispensing with preheating procedures at the initiation of coating and modifying the drying (inlet air) temperature such that the temperature of the tablet core is not greater than the melting point of the batch of additives used.
THE CAUSE AND REMEDY OF BLOOMING		
1.	High concentration and low molecular weight of plasticizer.	Decrease plasticizer concentration and increase molecular weight of plasticizer

THE CAUSES AND REMEDIES OF BLUSHING		
1.	High coating temperature	Decrease the drying air temperatur
2.	Use of sorbitol in formulation which causes largest fall in the thermal gelation temperature of the Hydroxy Propyl Cellulose, Hydroxy Propyl Methyl Cellulose, Methyl Cellulose and Cellulose ethers.	Avoid use of sorbitol with Hydroxy Propyl Cellulose, Hydroxy Propyl Methyl Cellulose, Methyl Cellulose and Cellulose ethers.
THE CAUSE AND REMEDY OF COLOUR VARIATION		
1.	Improper mixing, uneven spray pattern, insufficient coating, migration of soluble dyes-plasticizers and other additives during drying.	Go for geometric mixing, reformulation with different plasticizers and additives or use mild drying conditions.
THE CAUSE AND REMEDY OF INFILLING		
1.	Bubble or foam formation because of air spraying of a polymer solution	Add alcohol or use spray nozzle capable of finer atomization.
THE CAUSES AND REMEDIES OF ORANGE PEEL/ROUGHNESS		
1.	Rapid Drying	Use mild drying conditions
2.	High solution viscosity	Use additional solvents to decrease viscosity of solution.
THE CAUSE AND REMEDY OF CRACKING/SPLITTING		
1.	Use of higher molecular weight polymers or polymeric blends.	Use lower molecular weight polymers or polymeric blends. Also adjust plasticizer type and concentration.

Thank ‘u’