INDUSTRIAL PHARMACY-I

UNIT II-TABLETS AND LIQUID ORALS

CLASS 12

Topic: Equipments and tablet tooling

Tablet compression machine

Tablets are made by compressing a formulation containing a drug or drugs with excepients on stamping machines called presses
Components include:
Hoppers –holding and feeding granulation to be compressed
Dies:define the size and shape of the tablet
Punches :for compressing the granulation within the dies
Cam tracks:guiding the movement of punches
A feeding mechanism:for oving granules from the hopper into dies

Sequence of events involved in the formation of Tablets

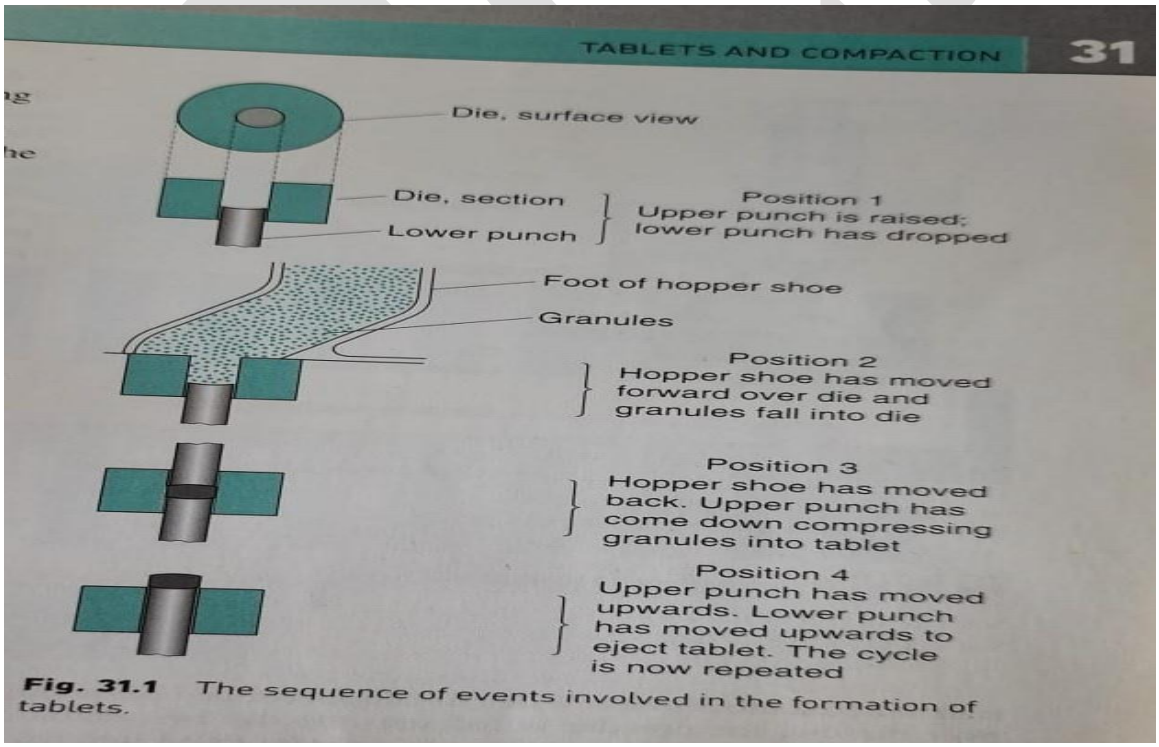


Fig. 31.1 The sequence of events involved in the formation of tablets.

Types of compression machine

Tablet presses are classified as either single punch or multi station rotary presses

Single press

Multi stationary rotary press

Single punch press(eccentric press)

Single punch press(eccentric press)

Possesses one die one pair punches
The powder is held in the hopper which is connected to a hopper shoe located at die table
Hopper shoe move to and fro over die either a rotational or translational movement
Hopper shoe located over the die the powder is fed into the die by gravitational powder flow

Single punch press(eccentric press)

Amount of powder filled into die is controlled by position of lower punch
When the hopper shoe located below the die upper punch descends and the powder is compressed

Lower punch is stationary during compression and the pressure is applied by upper punch and controlled by its displacement
After ejection the tablet is pushed away by the hopper shoe as it moves back to the die for next tablet

Single punch press(eccentric press)

Produce 200 tablets per minute
Use in the production of small batches during formulation development for tablets of clinical trails

Multi-station rotary presses

Developed to increase output of tablets(10000 tablets per minute)
Use –during scale up and large scale production
A rotary press operates with a no of dies and sets of punches
There–small rotary press,60 or more for large presses
Dies are mounted in a circle in the die table and the punches rotate together during operation of a machine
One die always associated with two punches
The vertical movement of the punches is controlled by tracks that pass over the cams and rolls used control the volume of the powder fed into the die and the pressure applied during compression

Multi-station rotary presses

The powder is held in a hopper whose lower opening is located just above the die table
The powder flows by gravity onto the die table and is fed into the die by a feed frame
During powder compression both punches operate by vertical movement
After tablet ejection the tablet is knocked away as the die passes the feed frame

Multi-station rotary presses

The head of the tablet machine that holds the upper punches, dies and lower punches in place rotates
As the head rotates, the punches are guided up and down by fixed cam tracks, which control the sequence of filling, compression and ejection.
The portions of the head that hold the upper and lower punches are called the upper and lower turrets
The portion holding the dies is called the die table

Multi-station rotary presses

Compression cycle:

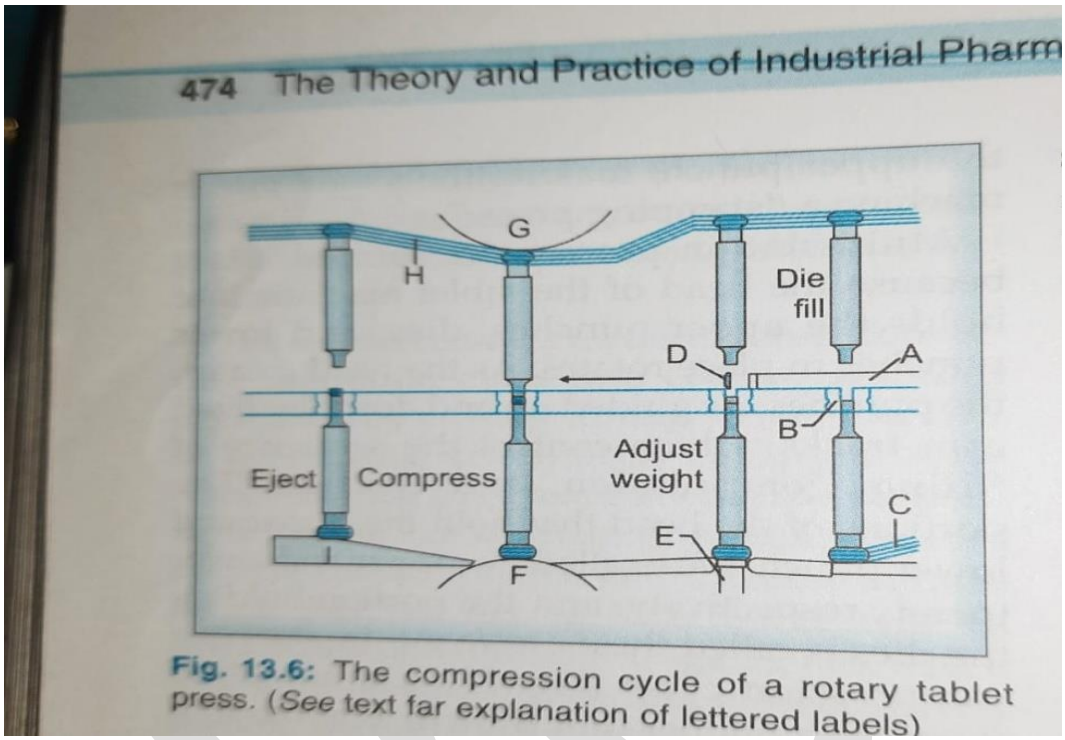


Fig. 13.6: The compression cycle of a rotary tablet press. (*See* text far explanation of lettered labels)

Granules from hopper empty in the feed frame (A) containing several interconnected compartments.

These compartments spread the granulation over a wide area to provide time for the dies (B) to fill.

The pull down cam (C) guides the lower punches to the bottom, allowing the dies to overfill

Multi-station rotary presses

The punches then pass over a weight-control cam (E), which reduces the fill in the dies to the desired amount

A swipe off blade (D) at the end of the feed frame removes the excess granulation and directs it around the turret and back into the front of the feed frame

The lower punches travel over the lower compression roll (F) while simultaneously the upper punches ride beneath the upper compression roll

Multi-station rotary presses

The upper punches enter a fixed distance into the dies, while the lower punches are raised to squeeze and compact the granulation within the dies

After the moment of compression, the upper punches are withdrawn as they follow the upper punch raising cam (H)
The lower punches ride up the cam (I) which brings the tablets flush with or slightly above the surface of the dies
The tablets strike a sweep off blade affixed to the front of the feed frame (A) and slide down a chute into a receptacle
At the same time, the lower punches re-enter the pull down cam (C) and the cycle is repeat

Rotary tablet press

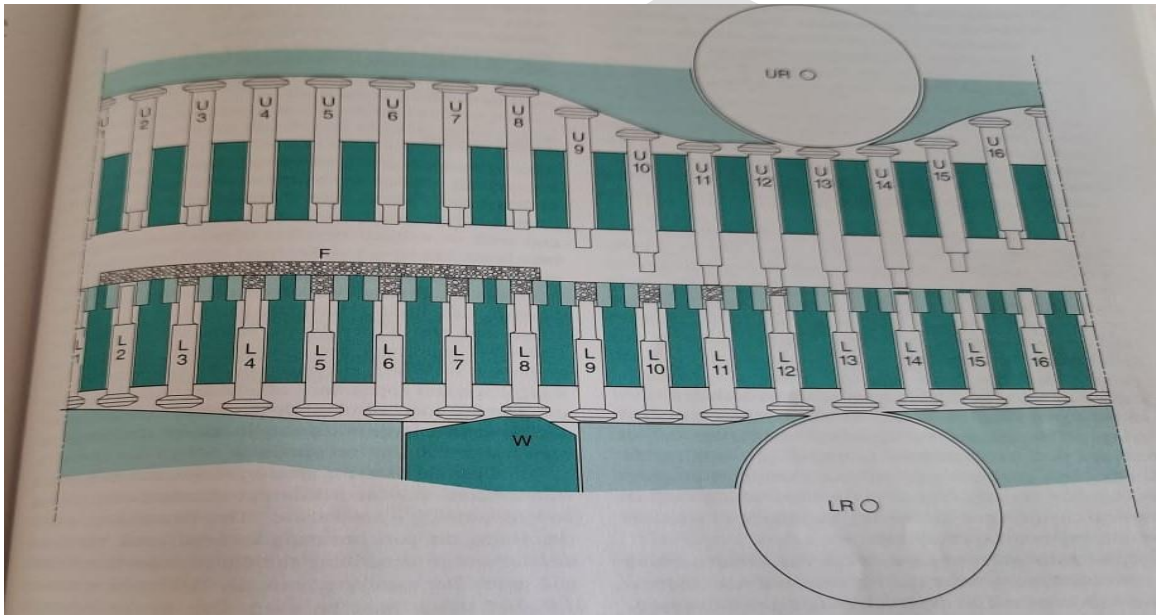


Fig. 31.4 Diagram of punch tracks of a rotary tablet press. UR, upper roller; LR, lower roller; W, powder volume adjuster; F, feed frame with granules. U1 to U8, upper punches in raised position; L1, lower punch at top position, tablet ejected; L2 to L7, lower punc dropping to lowest position and filling die with granules to an overfill at L7; L8, lower punch raised to expel excess granules giving correct volume; U9 to U12, upper punches lowering to enter die at U12; L13 and U13, upper and lower punches pass between rolle granules are compacted to a tablet; U14 to U16, upper punch rising to top position; L14 to L16, lower punch rising to eject tablet.

Tablet tooling

Size and shape of a tablet as well as identification markings are determined by the compression machine tooling
Most common tablet shapes are circular , oval oblong, triangular and diamond
Tablets may have break marks or symbols and other markings
Markings used to identification are of two types
Embossed –raised on the tablet
Debossed-indented on the tablet

Tablet tooling

Each tooling set consists of a die upper and lower punches
Tooling must meet dosage uniformity, production effeciency, and aesthetic appearance
Terminology for punches include head,neck,barrel, stem and tip
Die-face,chamfer and bore

Tablet tooling

Tablet Tooling Terminology
1. Head : The end the punch that guides it through the cam track of tablet machine during rotation.
2. Head flat (Dwell flat) : The flat area of the head that receives the compression force from the rollers (in upper punches) & determines the weight and ejection height (in lower punches)
3. Outside head angle : The area gets in touch in with the roller prior to head flat, while compression.
Inside head angle : This is the area , which pulls down the lower punches after ejection and lifts the upper punches after compression.
4. Neck : The relieved area between the head and barrel, which provides clearance to the clams

5. Barrel : This area guides the punch (while going up and down) with reference to turret guides
6. Stem : The area of the punch opposite the head, beginning at the tip & extending to the point where the full diameter of the barrel begins. If the chamfer is present the barrel usually reaches its full diameter just above the chamber.
7. Tip: This determines size, shape & profile of the tablet
8. Tip face: This area of punch is where the tablet is formed. Good surface finish is required here to bet quality tablets
9. Working length: This distance between the bottom of the cup and the head flat is called as working length which determines weight and thickness of the tablet

10. Overall length: Distance between top of the cup and the head flat.
11. Key Angle: The relationship of the punch key to the tablet shape. The keys position is influenced by the tablet shape, take-off angle, and turret rotation.
12. Domed Heads: Increases the dwell time and hence help to achieve the better tablet hardness.
13. Dwell time: The time punches spends below the pressure roller while rotating in the machine

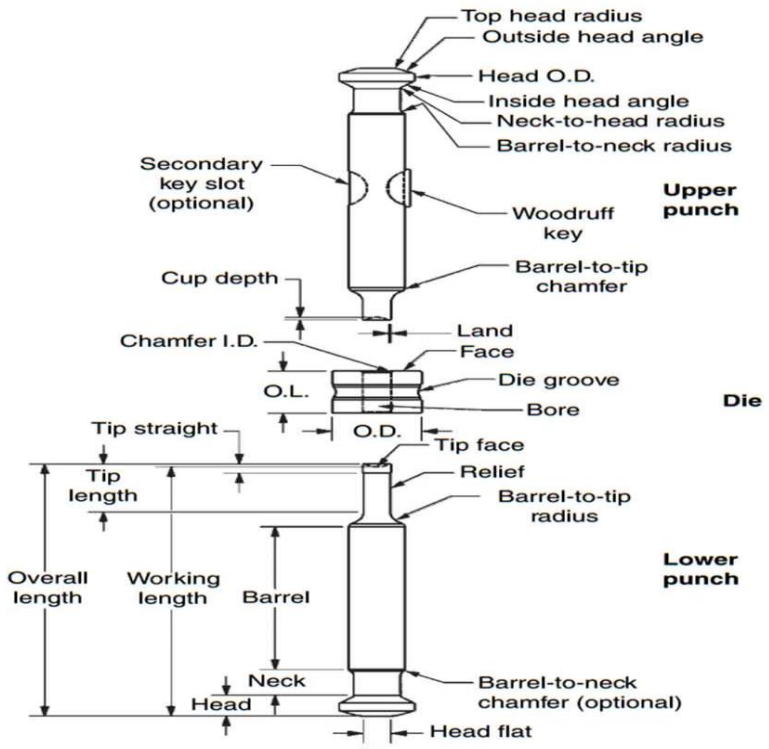
Tools are normally fabricated in steel and different steels maybe used
Choice of steel grade depends on tooling configuration(shape of the punches and dies), formulation to be compacted (abrassive or corrosive) and cost
Surface of punches and dies coated with a thin layer of metal (chrome) to modify its hardness and corrosiveness

Keyed punches: to maintain the proper upper punch orientation with in the die
shape is not round must not rotate otherwise during compression it will strike the edge of die hole
To prevent a slot is cut longitudinally into the barrel of punch and key is inserted
Key protrudes a short distance ,engages a similar slot cut into the upper punch guides on the tablet press

Tablet tooling

Type Of Tooling	Punch Diameter. (in mm)	Die Diameter. (mm)/(inch)	Punch Length (mm)/inch	Max. Tab. Size (mm) Round/Capsule
'B'	19	30.15/ 1.187	133.60	16/19
'D'	25.4	38.1/1.50	133.60	25/25
'BB'	19	24/0.945	133.60	13/14
'DB'	25.4	30.15/1.187	133.60	19/19

Tablet tooling



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