

SOFT GELATIN CAPSULE

Part 2



SOFT GELATIN CAPSULES

Definition:-

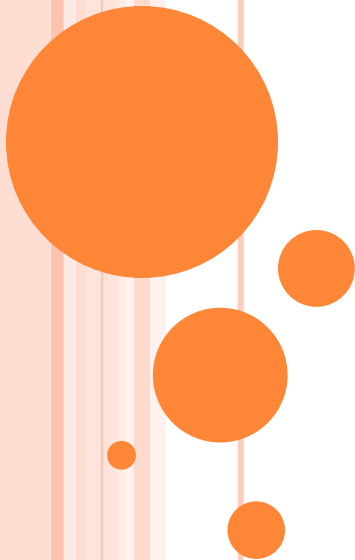
Soft gelatin capsules are one piece, hermetically sealed, soft gelatin shell containing a liquid, a suspension, or a semisolid.

Soft gelatin is mainly composed of:

Gelatin, plasticizers, and water in addition to preservative, colouring and opacifying agents, flavoring agents and sugars.

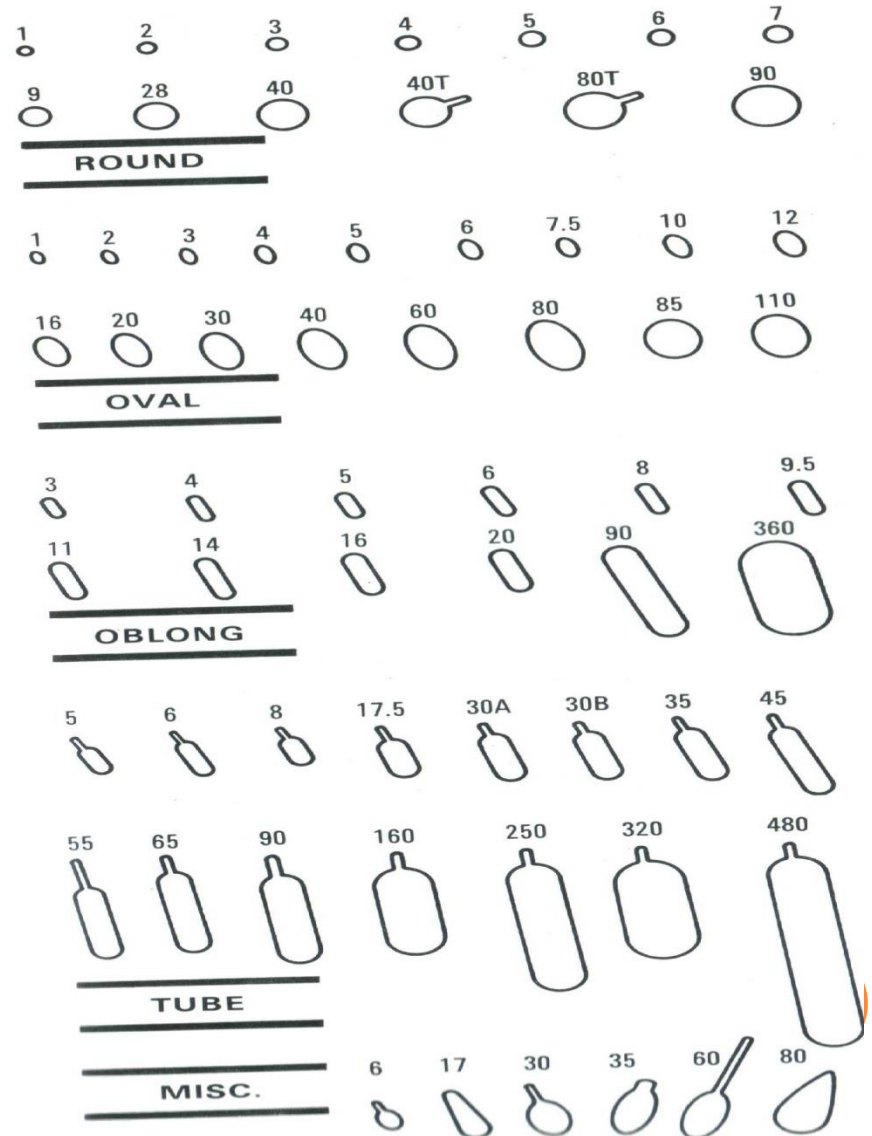
APPLICATIONS OF SOFT GELATIN CAPSULES

1. As **an oral dosage form** for human or veterinary use.
2. As a suppository dosage form for **rectal (pediatric and geriatric) or vaginal route.**
3. As a specialty package in tube form, for human or veterinary **single dose application of topical, ophthalmic and otic preparations and rectal ointments.**



SHAPE OF CAPSULE

- The shape of soft gelatin capsules is round, oval, oblong and tube shape.
- Maximum capsule size and shape convenient for oral human use is:
20 minim oblong
16 minim oval
9 minim round



MANUFACTURE OF SOFT GELATIN CAPSULES

Are manufactured by four methods:

- **Plate process.**
- **Rotary die process.**
- **Reciprocating die (developed process for rotary die).**
- **Accogel machine (unique equipment that accurately fills powdered dry solids into S.G.C.).**

PLATE PROCESS: (OLDEST PROCESS)

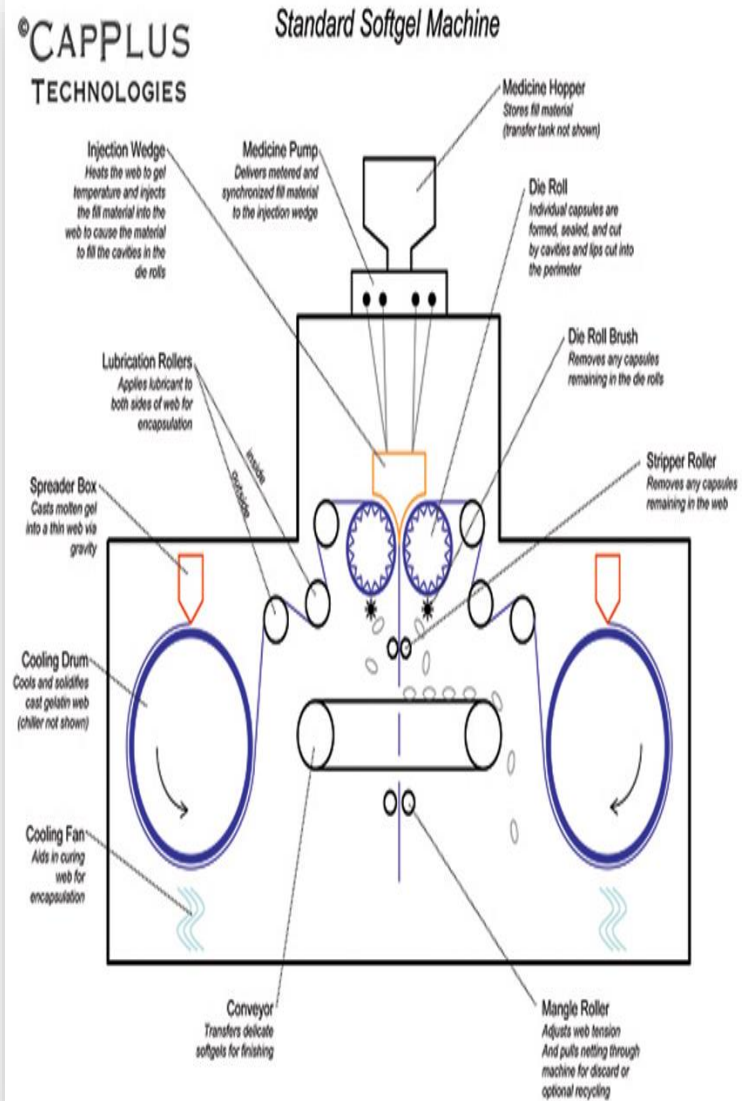
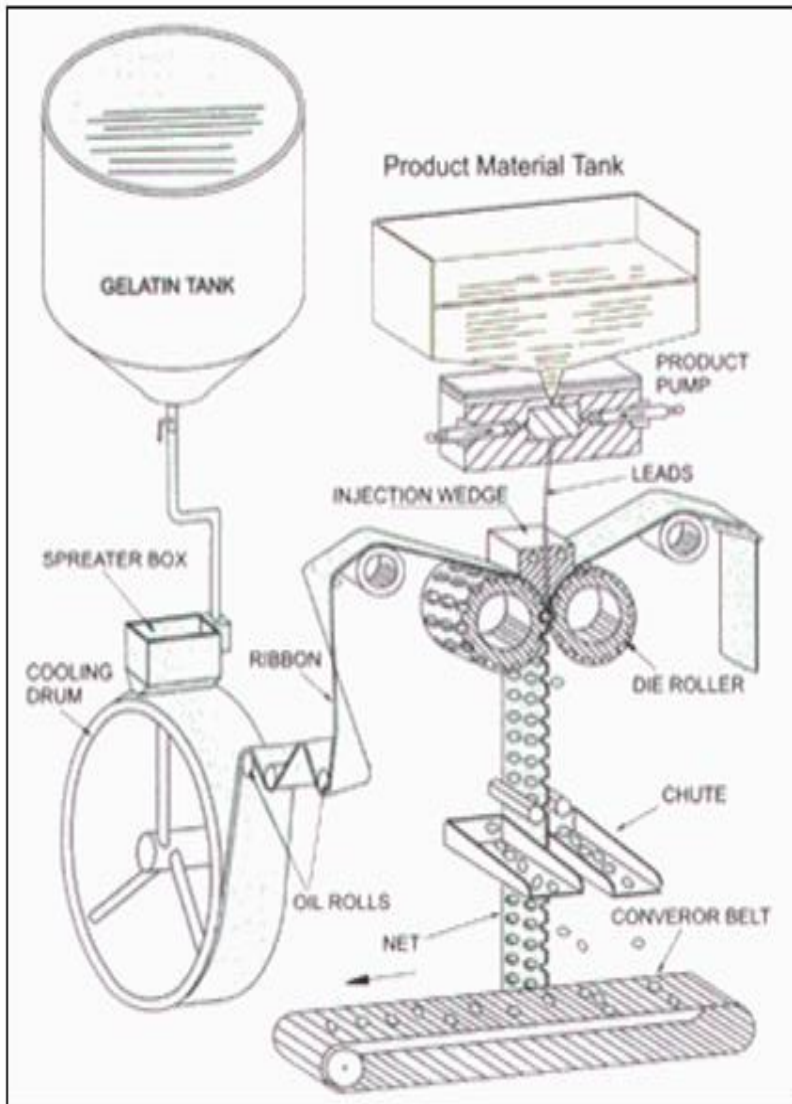
- Gelatin sheet is placed over a die plate containing numerous die pockets,
- Application of vacuum to draw the sheet in to the die pockets,
- Fill the pockets with liquid or paste,
- Place another gelatin sheet over the filled pockets, and
- Sandwich under a die press where the capsules are formed and cut out.

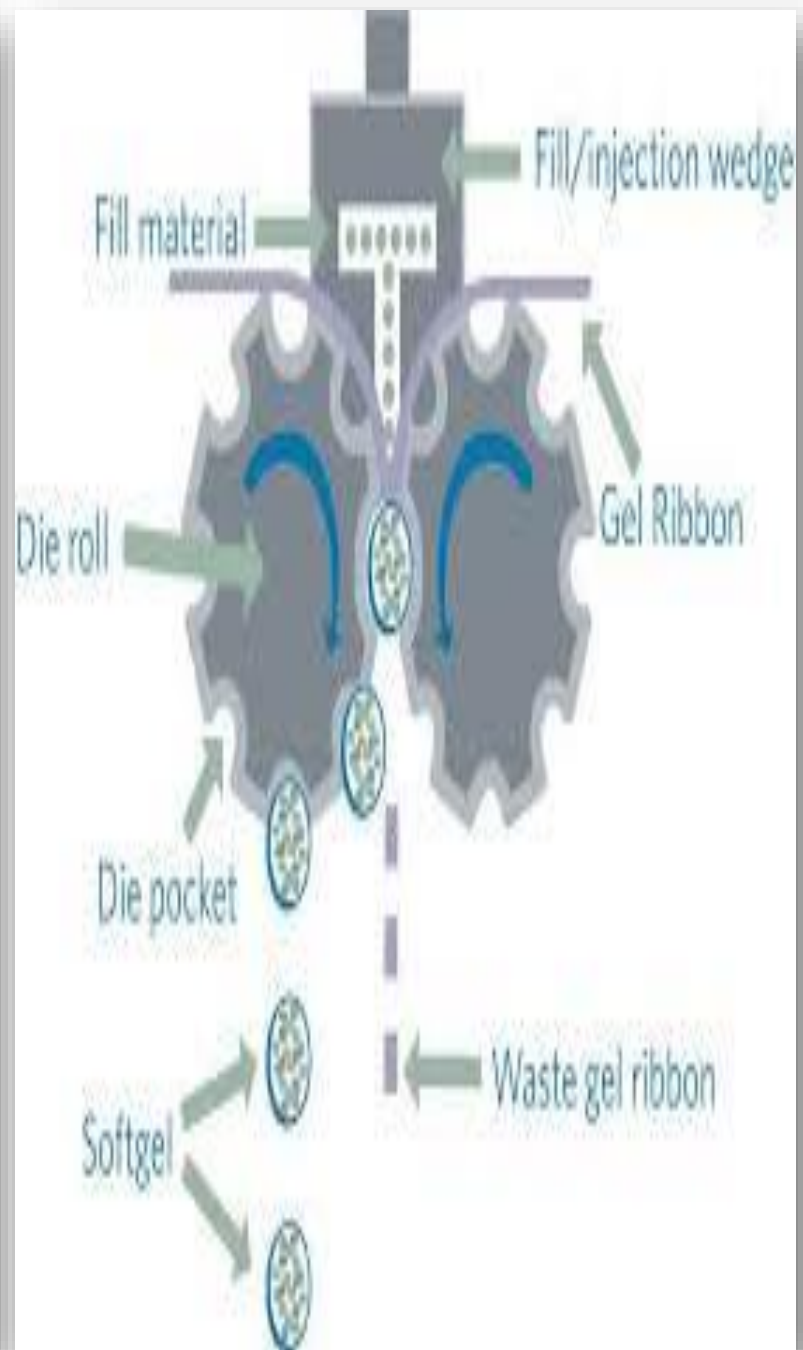
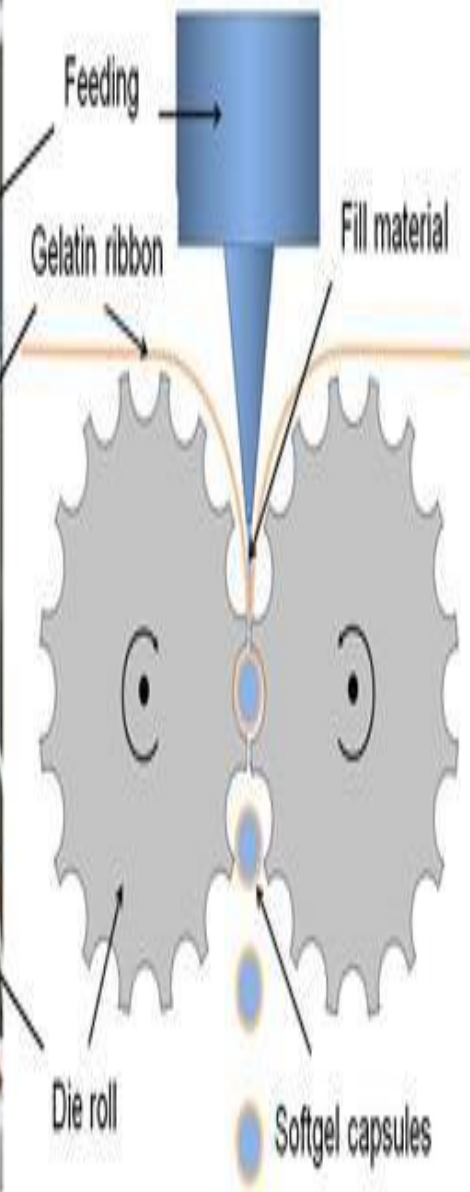
ROTARY DIE PROCESS:

The material to be encapsulated flows by gravity. Two plasticized gelatin ribbons are continuously and simultaneously fed with the liquid or paste fill between the rollers of the rotary die mechanism where the capsule are simultaneously filled, shaped, hermetically sealed and cut from the gelatin ribbon.

The sealing of the capsule is achieved by mechanical pressure on the die rolls and the heating (37-40°C) of the ribbons by the wedge.

The rotary die process





General Notes:

- Rotary die process reduces the loss of materials to a negligible level and reduces content variation to $\pm 3\%$.
- Production capacity of the machine is determined by the die size, the speed of the machine and the physical characteristics of the material to be encapsulated.
- For most capsules, the gelatine thickness is between 0.25-0.32 inches. Thicker shells are used on products requiring structural strength. The product cost is directly proportional to shell thickness.
- The die system cuts and hermetically seals the two halves of the gelatine ribbons together.
- The die rolls determine both the shape and size of the capsules.
- The choice of a particular manufacturing process will depend on the availability of the machines and the production needs.

Nature of capsule shell

IMPORTANT SPECIFICATIONS OF GELATIN

Bloom or gel strength: It is a **measure of cohesive strength of the cross-linking that occurs between molecules** and is proportional to the molecular weight of gelatin.

Bloom is determined by measuring the weight in grams required to move a plastic plunger of 0.5 inches in diameter, 4mm into a 6.67% gelatin gel that has been held at 10°C for 17hrs without breaking.

The unit of bloom is grams and it is between 150-250g.



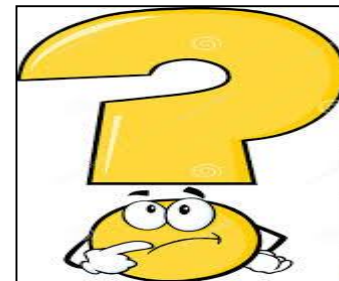
Viscosity: Is determined on a 6.67% concentration of gelatin in water at 60°C and it is a **measure of the molecular chain length and determines the manufacturing characteristics of the gelatin film.**

Standard used: 25-45 millipoise.

Low viscosity with **high Bloom** gelatin are used for capsulation of hygroscopic vehicles or solids.

Iron content: Iron is always present in the raw gelatin, and its concentration usually depends on the iron content of the large quantities of water used in its manufacture .

Amount of iron should not exceed 15 ppm. Why??? (HW)



PLASTICIZER AND GELATIN RATIO

In soft gelatin capsule the amount of plasticizers (glycerin) used is more.

In soft gelatin capsule the plasticizer and gelatin ratio is:

0.8 : 1

In hard gelatin capsule the plasticizer and gelatin ratio is:

0.4 : 1

Typical Shell "Hardness" Ratios and Their Uses

Hardness	Ratio Dry Glycerin/ Dry Gelatin	Usage
Hard	0.4/1	Oral, oil-based, or shell-softening products and those destined primarily for <u>hot, humid</u> areas.
Medium	0.6/1	Oral, tube, vaginal oil-based, water-miscible-based, or shell-hardening products and those destined primarily for <u>temperate</u> areas.
Soft	0.8/1	Tube, vaginal, water-miscible-based or shell-hardening products and those destined primarily for <u>cold, dry</u> areas.

TABLE 13-3. Additional Components of the Gelatin Mass

<i>Ingredient</i>	<i>Concentration</i>	<i>Purpose</i>
<i>Category I</i>		
Methylparaben, 4 parts; Propylparaben, 1 part	0.2%	Preservative
FD&C and D&C water-soluble dyes, certified lakes, pigments, and vegetable colors, alone or in combination	q.s.	Colorants
Titanium dioxide	0.2 to 1.2%	Opacifier
Ethyl vanillin	0.1%	Flavoring for odor and taste
Essential oils	to 2%	Flavoring for odor and taste
<i>Category II</i>		
Sugar (sucrose)	to 5%	To produce chewable shell and taste
Fumaric acid	to 1%	Aids solubility; reduces aldehydic tanning of gelatin



THE NATURE OF CAPSULE CONTENT

- ✓ The content of soft gelatin capsule is a liquid, or a combination of miscible liquids, a solution of solid in a liquid or suspension of solid in liquid.
- ✓ Liquids which are both water-miscible and volatile can not be included as a major constituent of capsule content since they can migrate into the hydrophilic gelatin shell and volatilize from its surface. Water, ethanol and emulsions fall into this category.
- ✓ Gelatin plasticizers such as glycerin and propylene glycol can not be major constituents of the capsule content, owing to their softening effect on the gelatin shell, which thereby makes the capsule more susceptible to effects of heat and humidity.



- ✓ As a minor constituents (up to **5%** of cap. contents) **water and alcohol** can be used as a co-solvent.
- ✓ Up to **10% glycerin/ PG** can be used as a co-solvent.
- ✓ Also, **preparations for encapsulation should have a pH between 2.5 and 7.5**, since preparations that are more acidic can cause hydrolysis and leakage of the gelatin shell. and preparations that are more alkaline can tan the gelatin and thus affect solubility of the shell.
- ✓ The capsulation of water immiscible liquids (vegetable oils and mineral oils) is the simplest form of soft gelatin capsulation and usually requires little or no formulation.



- ✓ Except for accogel process, solids are filled into soft capsules in the form of either solution or suspension.
- ✓ The preparation of a **solution of a solid medicament** should be the first goal; usually the solution is easily capsulated and exhibit **better uniformity, stability** and **biopharmaceutical properties** than suspension.
- ✓ For oral products, the **medicament should have sufficient solubility in the solvent system** so that the necessary dose is contained in a maximum fill volume of 16 to 20 minims **(1 to 1.25 ml)**.
- ✓ Solids are not soluble in the solvent system are capsulated as suspension.
- ✓ The choice of suspension medium are directed toward producing the smallest size capsule .



Advantages of SGC

- Pharmaceutically elegant and easily swallowed.
- They permit liquid medication to become easily portable.
- Accuracy and uniformity of dosage.
- Pharmaceutical availability of drugs formulated for this dosage form (drugs are more rapidly and completely available from the SGC than from the commercial tablets or capsules).
- Physiological availability of drugs is often improved since these capsules contain the drug in liquid form.

