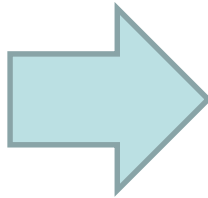


CREAM SEPARATION

Centrifugation

Principle of separation

**Centrifuge
increases
the forces
on particles
many fold**

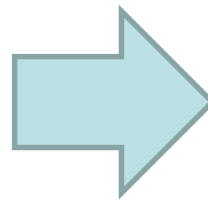


**The particles that do
not settle readily or at
all in gravity settlers
can be separated
from fluids.**

Centrifugation

If gravity separation is too slow because of:

- closeness of the densities of the particle and the fluid, or
- association forces holding components together (as in emulsions)



Centrifugation

Centrifuges are also used in *centrifugal filtration*, where the centrifugal force is used (not the pressure difference) to separate the solids through a filter medium.

Centrifugation

Major applications of Centrifuges

Separation of immiscible liquids

Tubular bowl centrifuge

Disc bowl centrifuge

Clarification of liquids by removal of small amounts of solids

Solid bowl clarifier

**Nozzle centrifuges/
valve discharge centrifuges**

Removal of solids from liquids

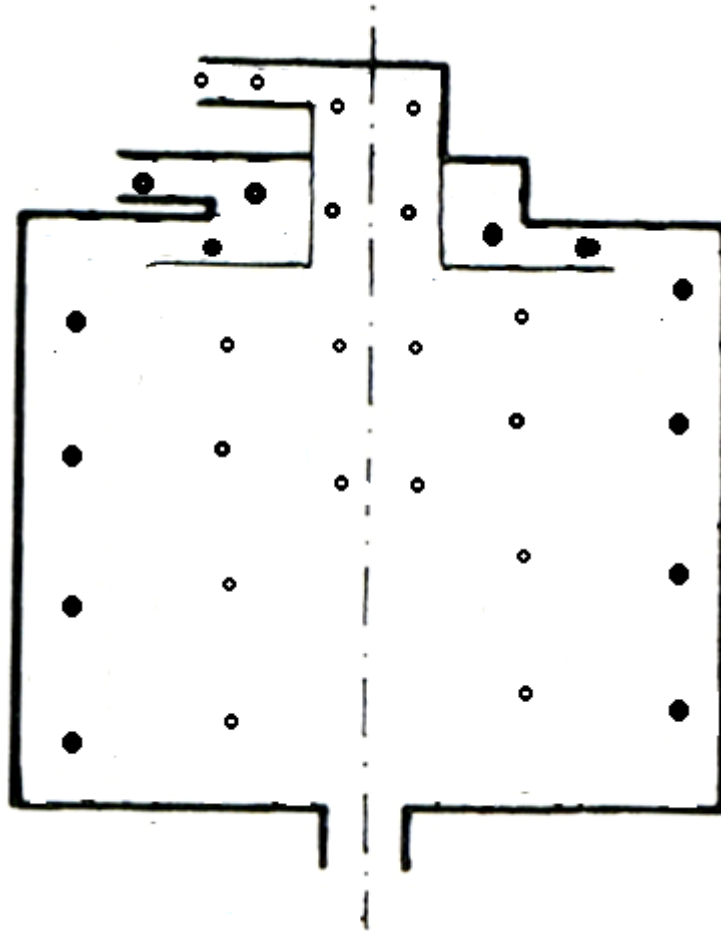
**Conveyor bowl
Screen conveyor
Basket centrifuge
Reciprocating conveyor centrifuges**

Cream separation

Tubular bowl centrifuge

Disc bowl centrifuge

Tubular bowl centrifuge

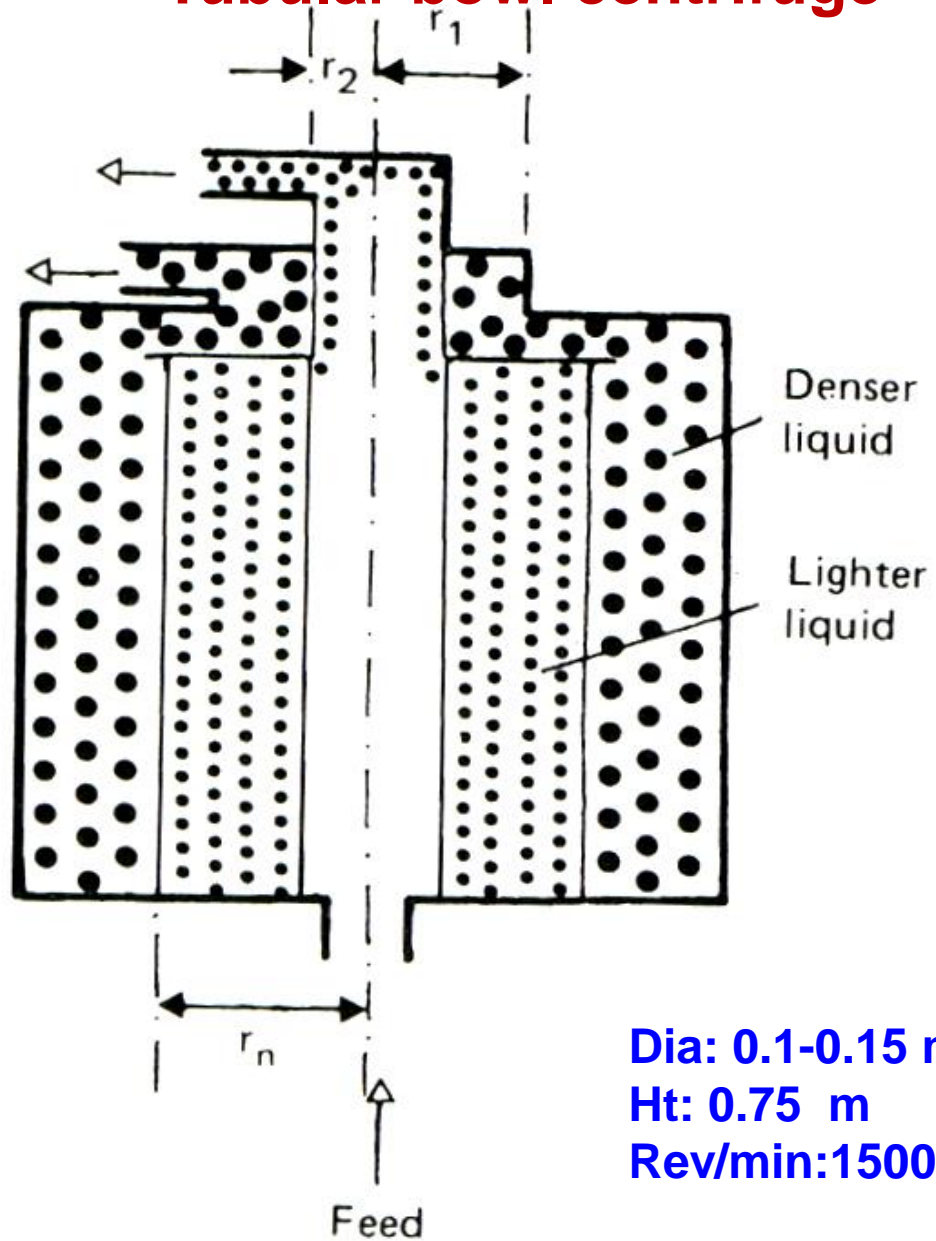


Dia: 0.1-0.15 m,
Ht: 0.75 m
Rev/min:15000-50000

Tubular bowl centrifuge

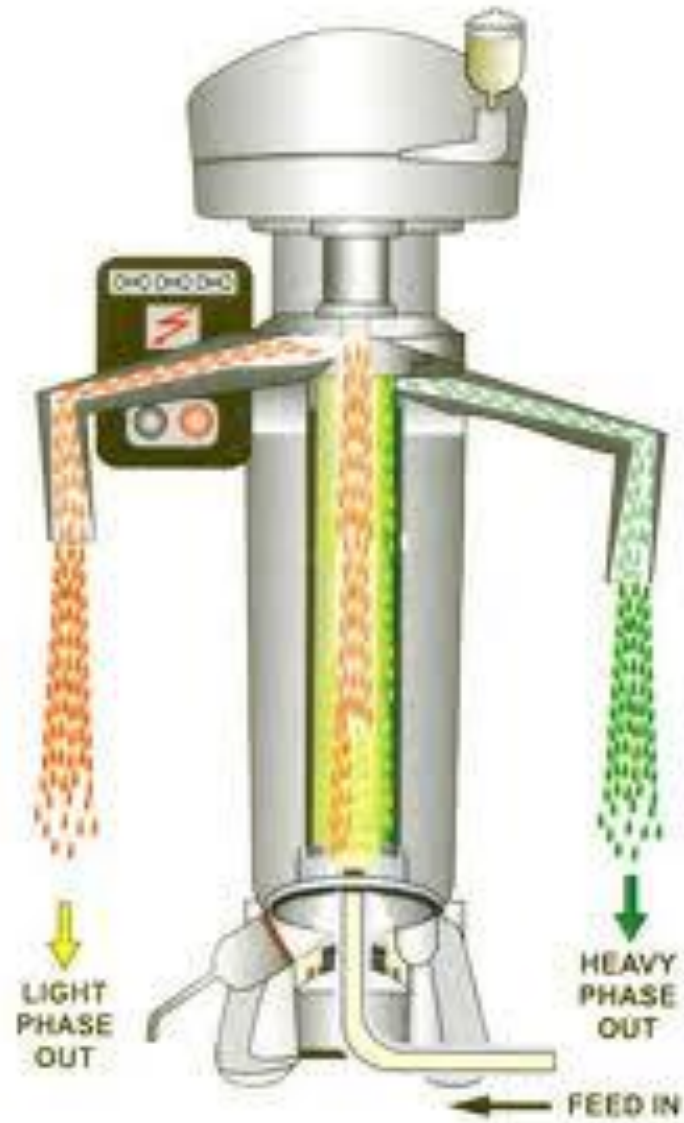
- Vertical cylinder (or bowl), typically 0.1-0.15 m in diameter and 0.75 m long.
- Rotates inside a stationary casing (15000-50000 rev/min depending on the diameter).
- Tubular bowl centrifuges, which develop about 13000xg force, are also known as **super centrifuges**.
- Feed liquor is introduced continuously at the base of the bowl and the two liquids are separated and discharged through a circular weir system into stationary outlets.
- Some narrow centrifuges known as **ultra centrifuges** have a diameter of 75 mm and very high speeds of about 60000 rev/min.

Tubular bowl centrifuge



Dia: 0.1-0.15 m,
Ht: 0.75 m
Rev/min:15000-50000

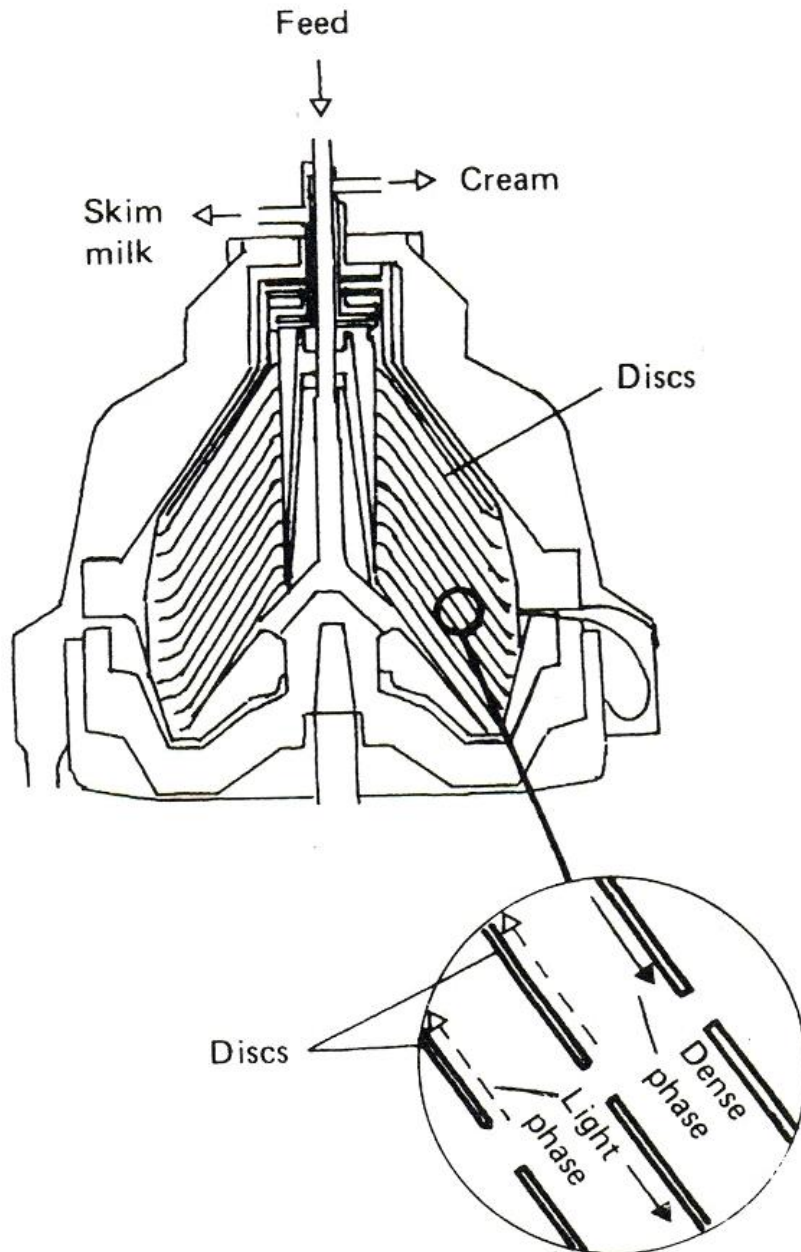
Tubular bowl centrifuge



Tubular bowl centrifuge



Disc bowl centrifuge

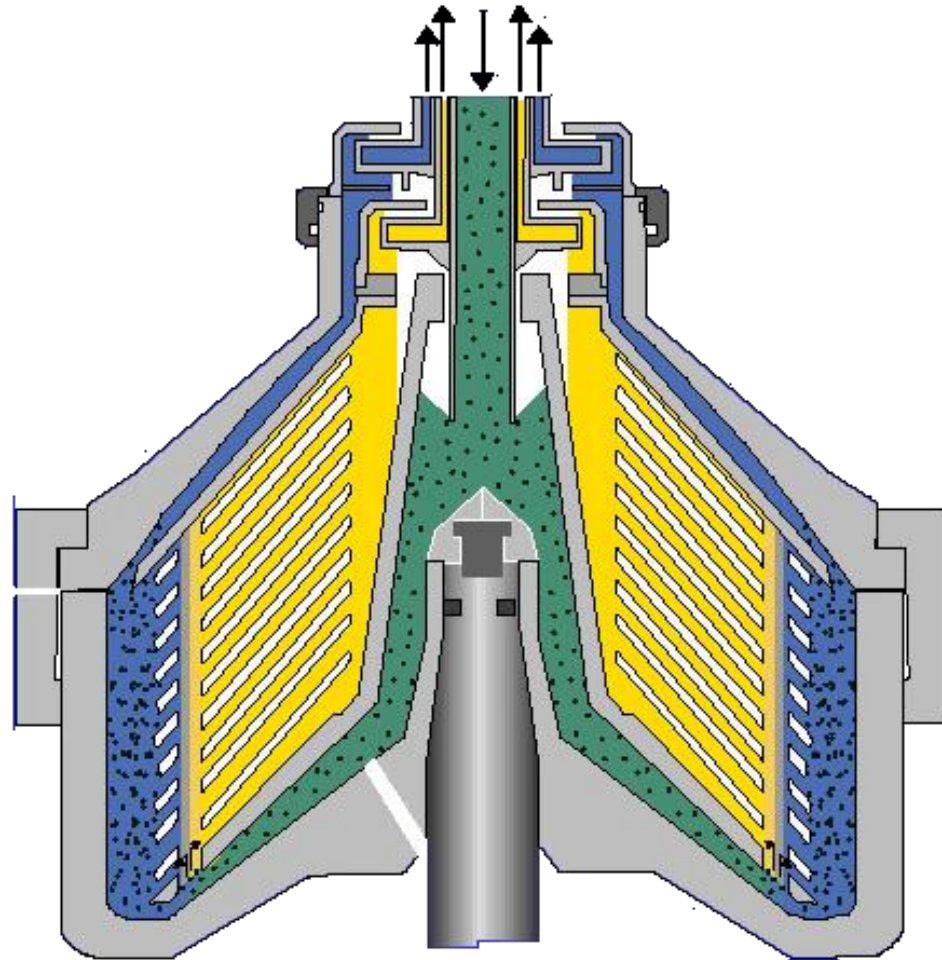


Dia: 0.2-1.2 m
Rev/min:2000-7000
Cone gap: 0.5-1.27 mm

Disc bowl centrifuge

- **Cylindrical bowl (0.2-1.2 m dia), which contains a stack of inverted metal cones.**
- **Cones rotate at 2000-7000 rev/min.**
- **Fixed clearance between cones: 0.5-1.27 mm; have matching holes which form flow channels for liquid movement.**
- **Due to the centrifugal force,**
 - **Denser fraction moves towards the wall of the bowl, along the underside of the discs.**
 - **Lighter fraction moves towards the centre along the upper surfaces.**
- **Both liquid streams are removed continuously by a weir system at the top in a similar way to the tubular bowl system.**

Disc bowl centrifuge



Milk



Cream



Skim Milk



Solid impurities

Disc bowl centrifuge



Disc bowl centrifuge

- Disc bowl and tubular centrifuges can have capacities of up to 150000 l/h.
- Better separation is obtained by the disc bowl centrifuge due to the formation of thinner layers of liquid.
- Periodic cleaning of deposited solids is required.

Applications :

- Separation of cream from milk
- Clarification of oils, coffee extracts and juices
- Separation of starch-gluten.

Domestic cream separator



Domestic cream separator



Thank You