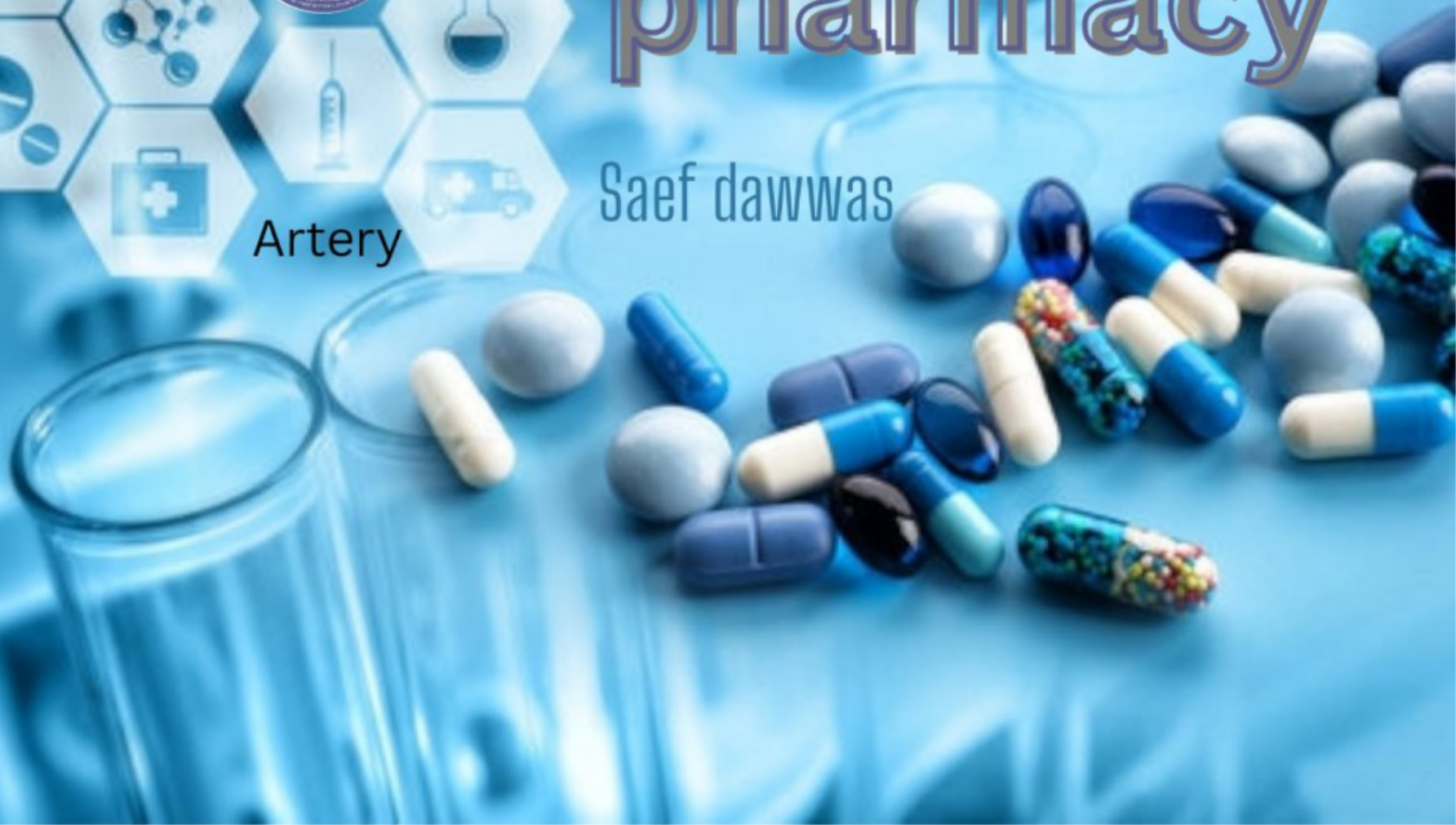


# Industrial pharmacy

Saef dawwas

Artery



## Practical considerations in Powder mixing

- When mixing formulations where the proportion of active drug is low, a more even distribution may be obtained by building up the amount of material in the mixture sequentially (geometric dilution).

بنستخدمها لما يكون  
عنا مادة فعالة قليلة  
وكمية excipient  
كبيرة فنحط المادة  
الفعالة وبنحط كمية  
من ال excipient  
(ما بنحطها كاملة) وبنخلط منيح وبعدين

منضيف ضعف الكمية الاولى وهكذا حتى تخلص كمية ال excipient (يعني اول مرة ١ كيلو ثاني مرة ٢ ثالث مرة ٤)

- The volume of powder mixture in the mixer should be appropriate. Both overfilling and underfilling may reduce mixing efficiency.

زي ما اخذنا بلاب  
الديس

لو عبيته كامل ، مارح يكون في حرية بالحركة لا particles  
ف ما حينخلطوا كميتهم كثير قليلة ف برضو ما رح ينخلطوا بكفاءة

- The mixer should produce the mixing mechanism appropriate for the formulation:

- Potent drugs: diffusion is necessary
- Cohesive material: shear mixing

بختار جهاز يكون فيه blade عشان تقطع  
المادة النها بتكون مكتلة على بعضها

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## Practical considerations in Powder mixing

- In order to determine suitable mixing time, the mixing process should be checked by removing and analyzing representative samples after different mixing intervals.

باخذ عينات وبحللها  
على فترات زمنية  
مختلفة

بتخلص من هاي  
الشحنات عن طريق اني  
بوصله بسلك يفرغ هاي  
الشحنات الكهربائية  
الزائدة في الارض

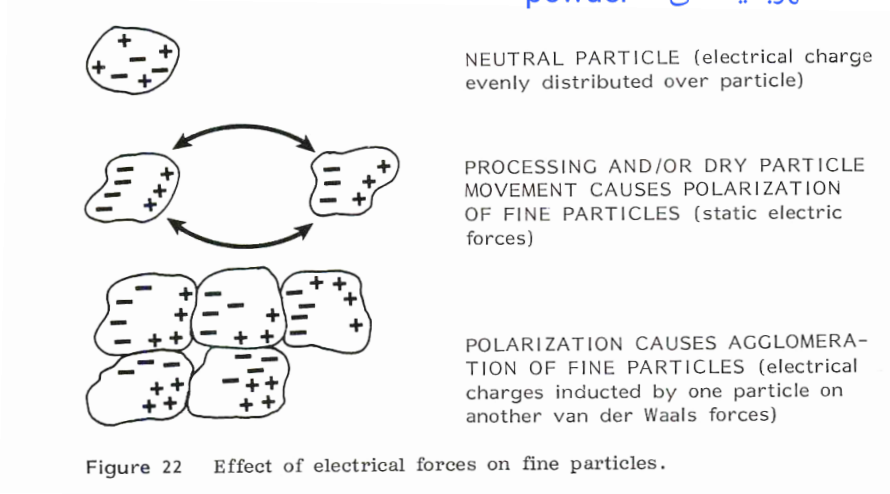
- Static charges may be generated during mixing that result in reduction in diffusive mixing.

نتيجة عملية الخلط واحتكاك ال particles مع بعضها وهاي  
بتأثر على ال flow للمادة انها بتزيد الترابط بينها

- This is enhanced by low humidity in atmosphere. The mixer should be suitably earthed to dissipate the static charge.
- Vibrations may cause segregation in normal mixes and dislodging of adsorbed particles in ordered mixes.

٤٤

## هاد تأثير الشحنات الكهربائية على ال powder

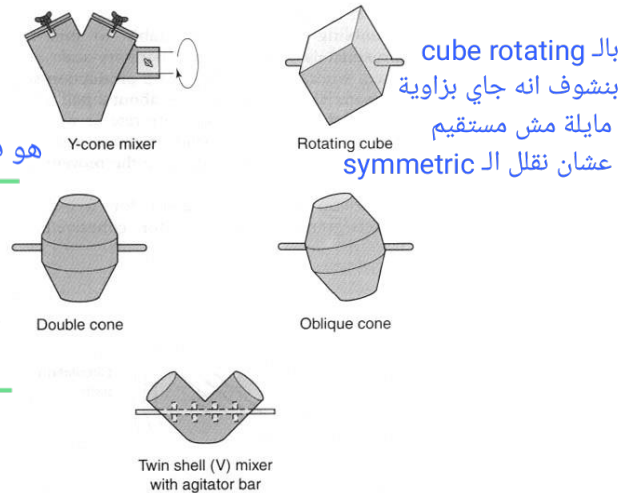


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## Powder mixing equipment

### Tumbling mixers

- Mixing containers are mounted so that they can rotate about an axis. هو فقط وعاء بيدور ف بتنخلط المواد فيه
- Commonly used for mixing of free flowing powders and are not suitable for cohesive powders. هي وحدة من الطرق الي ممكن الجأ لها عشان احسن ال flow
- Commonly used for mixing granules with lubricant, glidant and external disintegrant.



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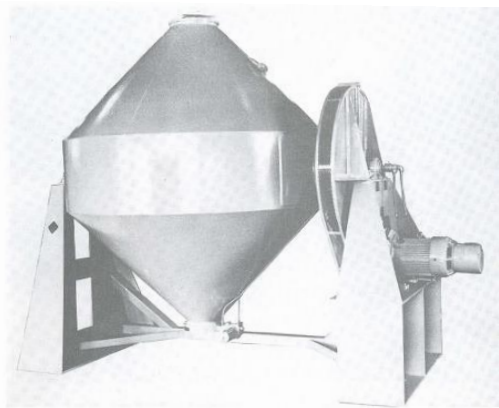
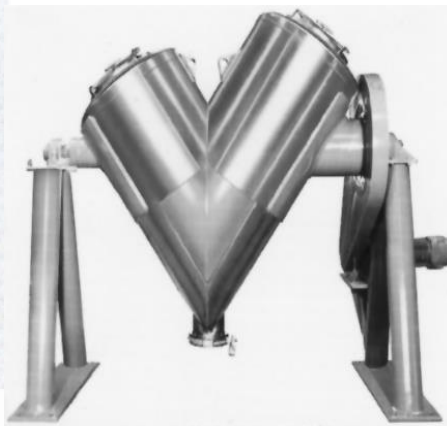


Figure 28 Double-cone blender. (Courtesy of Patterson-Kelley Company, Division of HARSCO Corporation, East Stroudsburg, Pennsylvania.)



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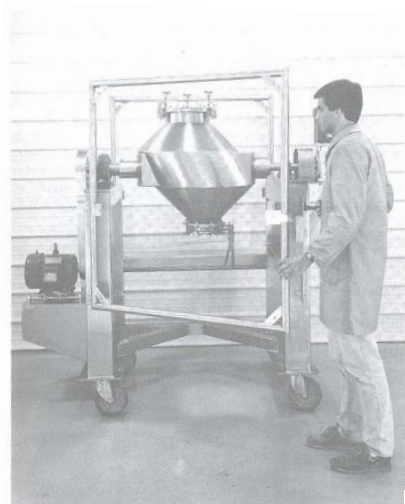


Figure 29 Slant double-cone mixer. (Courtesy Gemco, Middlesex, New Jersey.)

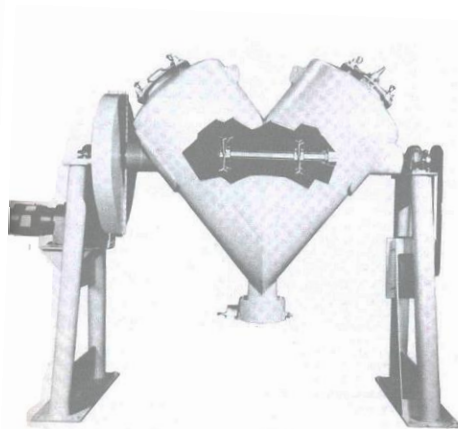


Figure 31 V-shaped blender with agitator mixing assembly. (Courtesy of Gemco, Middlesex, New Jersey.)

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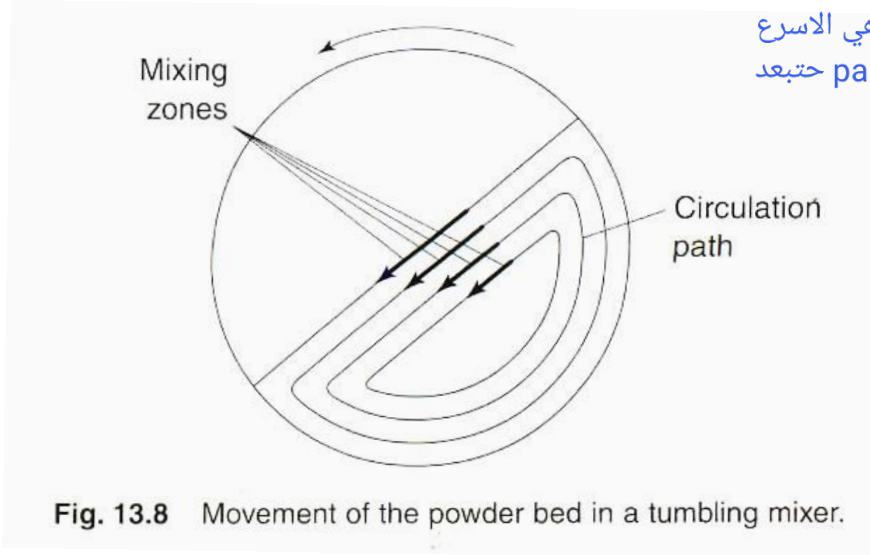
# Powder mixing equipment

## Tumbling mixers

- The shear mechanism occurs because of velocity gradient produced while diffusion occur through voids produced during powder flow. نتيجة الحركة الدورانية الـ powder يطلع فوق لحتى يوصل لنقطة تأثير الجاذبية عليه ويكون كثير عالي ف ييسقط ، وبعدين بيرجع مرة ثانية يطلع وييسقط حواجز جانبية شوكة
- The addition of prongs, baffles or rotating bars helps convective mixing.
- Care about segregation is necessary.

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بصير الـ powder يتحرك على شكل طبقات ، الطبقة الاعلى هي الاسرع ف مع الوقت الـ particles حتبعد عن بعض



٥٠

# Powder mixing equipment

## Tumbling mixers

- Capacity ranges from 50 g to 100 kg.
- The material typically occupies <sup>underfilling</sup> 1/2 to <sup>overfilling</sup> 2/3 of the mixer volume.
- The mixing efficiency depends on speed of rotation. Speed of rotation should be suitable:
  - ⊖ Very high speed will cause the powder to be held on the mixer walls by centrifugal force.
  - ⊖ Very low speed will generate insufficient bed expansion and little shear mixing.

نفس فكرة  
mill ball

لازم احرك  
بسرعة كافية

٥١

المواد بتنخلط  
على اجزاء

Table 9 Effect of Powder Fill on Blending Time of Double-Cone Blenders<sup>a</sup>

Volume percent of blender filled with powder charge	Approximate blend time (minutes) in production-size blenders
50	10
65	14
70	18
75	24
80 <sup>b</sup>	40 <sup>b</sup>

<sup>a</sup>Blending done in double-cone blenders and times measured to obtain comparable blends.

<sup>b</sup>Uniform blend not attainable with this fill level.

Source: Sweitzer, G. R., Blending and Drying Efficiency Double Cone vs. V-Shape, GEMCO, Newark, New Jersey.

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# Powder mixing equipment

**Tumbling mixers** بتصير عملية ال mixing وبعدين مباشرة بينزل ال powder على الجهاز اللي بيعمل tablets or capsules

- **Intermediate bulk containers (IBCs)** are containers used both as mixing bowl and to either feed the hopper of a tablet or capsule machine or as the hopper itself.

الحركة الدورانية مش دوران بسيط

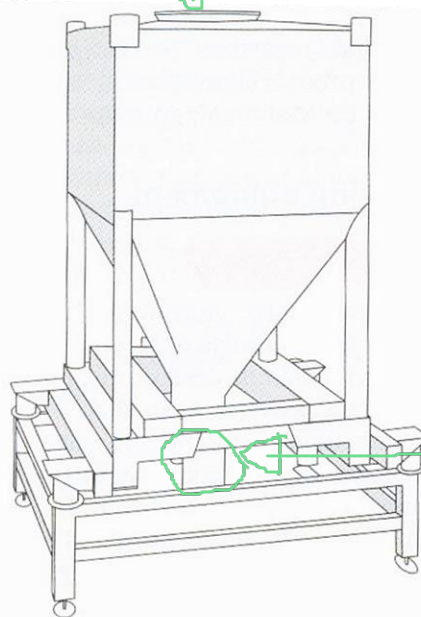
- **The Turbula shaker mixer (WAB, Switzerland)** لكن اعقد من هيك بتكون على شكل هيك  $\infty$  is a more sophisticated form of tumbling mixer that uses inversional motion in addition to the rotational motion leading to more efficient mixing.

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ملاحظة في فيديو عن هاذ الجهاز الدكتور نزلوا على المودل ما شغلوا بالمحاضرة

بفوت بالباودر من هون

IBC



بيزل الباور هون وبنعمل tablet

Fig. 13.7 Typical intermediate bulk container.

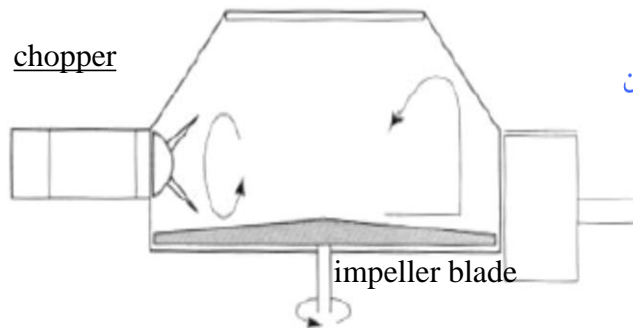
٥٤

# Powder mixing equipment

## High speed mixer granulators

- They are used both for mixing and granulation.
- It contains centrally mounted impeller blade that rotate at high speed throwing the material towards the mixing bowl.
- The side-mounted chopper blade helps in granulation.
- Care if material fractures easily.
- Not normally used for blending lubricants. ٥٥

عكس ال mixer tumbling ، هناك كنا بنستخدم لل lubricant with granules



**Fig. 13.9** Diagrammatic representation of a high-speed mixer-granulator.

بتكون عنا شغلتين مسؤولين عن  
شغل الجهاز ال chopper  
اله عالقة بال granulation  
وال Impeller ، وهو المسؤول عن  
ال mixing

# Powder mixing equipment

**Agitator mixers** في تشابه مع ال high speed mixer وفي اختلاف بالسرعة بتكون اقل

- These types of mixers depend on the motion of a blade or paddle though the product, and hence the main mixing mechanism is convection.

- There are three main designs of agitator mixers:

- Ribbon mixer
- Planetary (Orbital) mixer
- Nautamixer

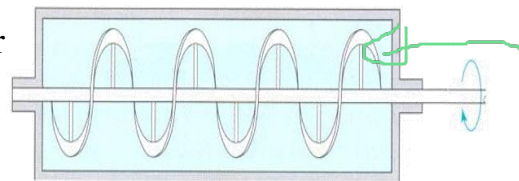


Fig. 12.10 Ribbon agitator powder mixer.

ribbon  
helixal  
blades

دوراتها  
بخلط  
المواد

# Powder mixing equipment

## Ribbon mixers

- Mixing is achieved by the rotation of helical blades in a cylindrical tank.

### *Advantages*

للمواد الي بتحتاج اشي يجبرها

- Suitable for mixing of poorly flowing materials. تتحرك
- Segregation is less likely to occur than in tumbling mixer

### *Disadvantages*

الزوايا تاعت الجهاز هاي مناطق ما

- Dead spots are difficult to eliminate. بوصلها الخلط
- The shearing action caused by movement of the blades may be insufficient to break up drug aggregates.

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# Powder mixing equipment

## planetary mixers

- The rotational path of paddle is similar to that of a planet.
- It is used:
  - for mixing powders and semisolids
  - Wet massing (granulation)

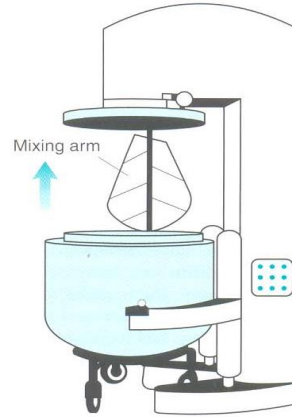


Fig. 12.11 Planetary mixer for powders and semi-solids.

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## arm Mixing

بتدور حول نفسها وبنفس الوقت  
بتدور داخل الوعاء  
زي خلاط العجين في البيوت  
وحركتها زي حركة الكواكب

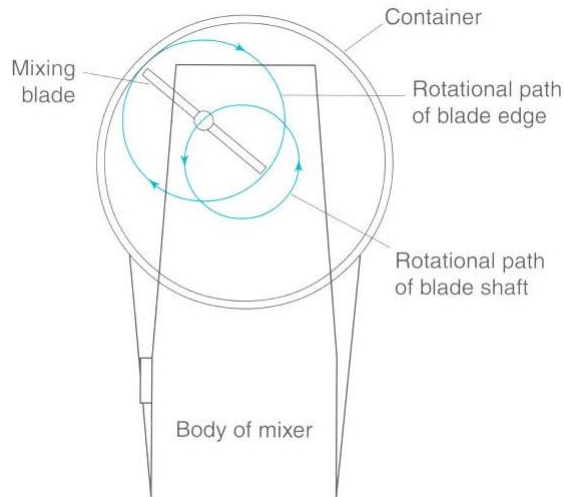


Fig. 12.12 Planetary mixer – top view, showing path of paddle.

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# Powder mixing equipment

## Nautamixer

- It consists of a conical vessel that contains inside a helical conveyor that conveys the material up to near the top where it cascades back into the mass.
- This mixer combines convective, shear and diffusion mixing

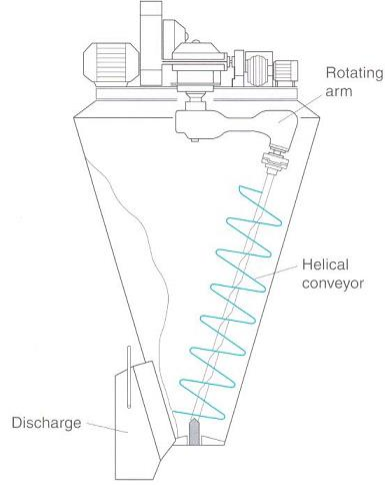
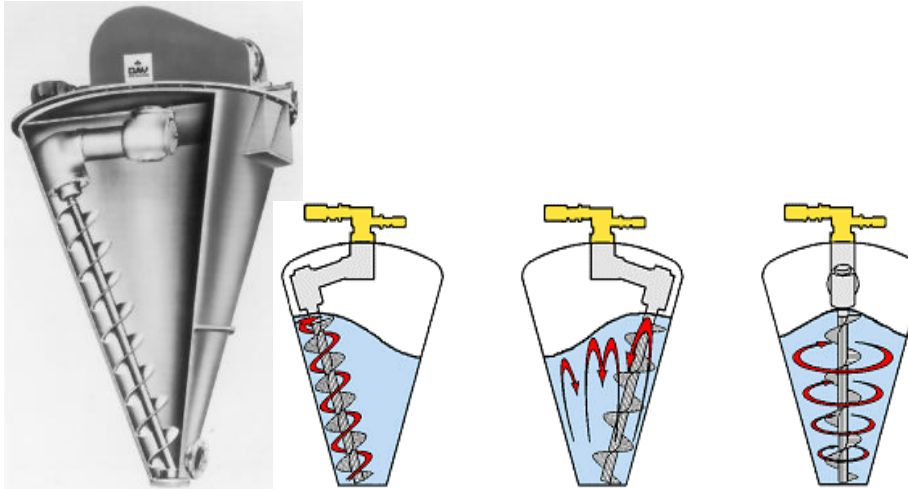


Fig. 12.13 Nautamixer (courtesy of Nautamixer Ltd).

٦١

ف البداية ال powder بحكم الجاذبية سيكون تحت ، والجهاز بيرفعه فوق اثناء دوران ال conveyor helical وبعدين بيسقط ويرجع الجهاز يطلعه فوق وهكذا ال arm rotating بتتحرك بحيث انه ال conveyor helical ما يضل بنفس المكان ، وانما يتحرك داخل الوعاء فنفس الشي ال conveyor بيدور حول نفسها وبرضو بيدور داخل الوعاء

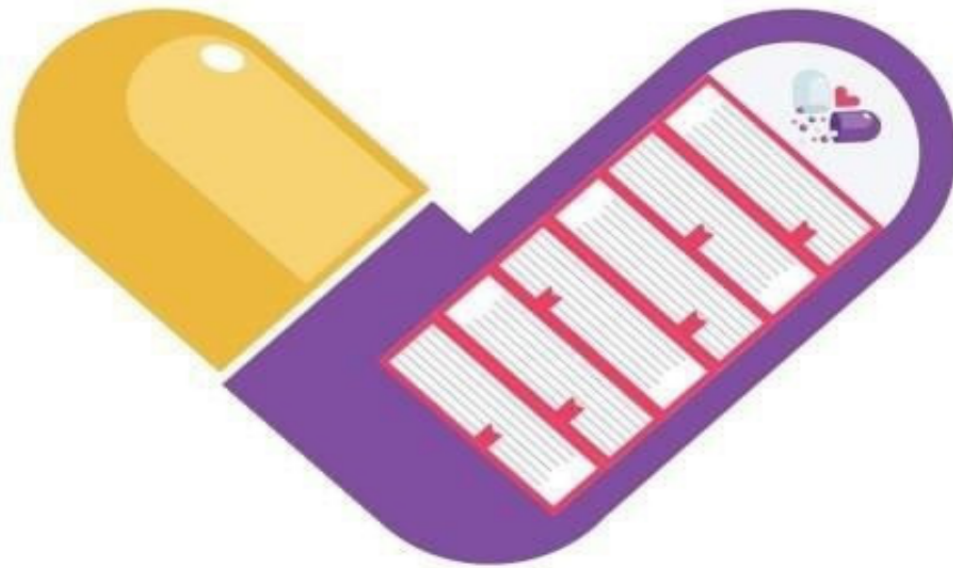
## Nautamixer



٦٢

آخر سلايد بالمحاضرة

بالتوفيق للجميع



**Artery Academy**