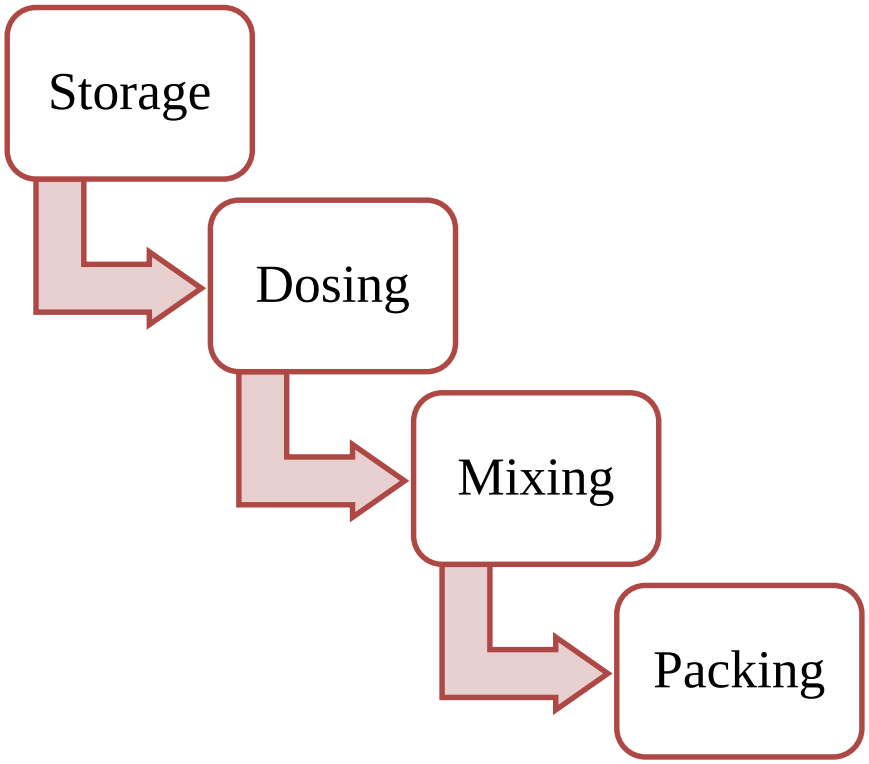
تولید کننده مکمل، پریمیکس، کنسانتره و خوراک طیور

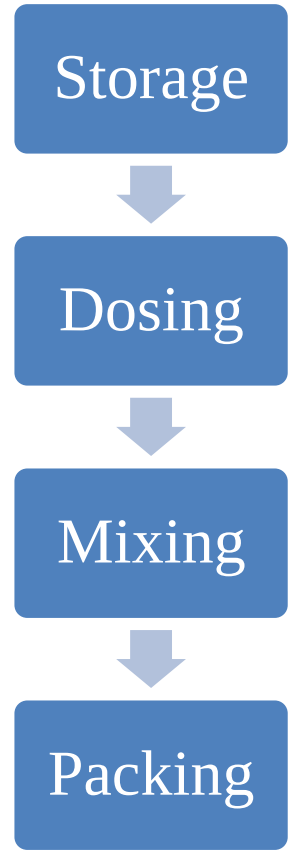
Since 1994

تکنولوژی نوین ساخت مکمل و پریمیکس :

- استانداردهای خط تولید مکمل
- شرایط نگهداری
- عملیات توزین
- عملیات مخلوط کردن
- بسته بندی

Preface


Storage
Dosing
Mixing
Packing


Storage
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Storage
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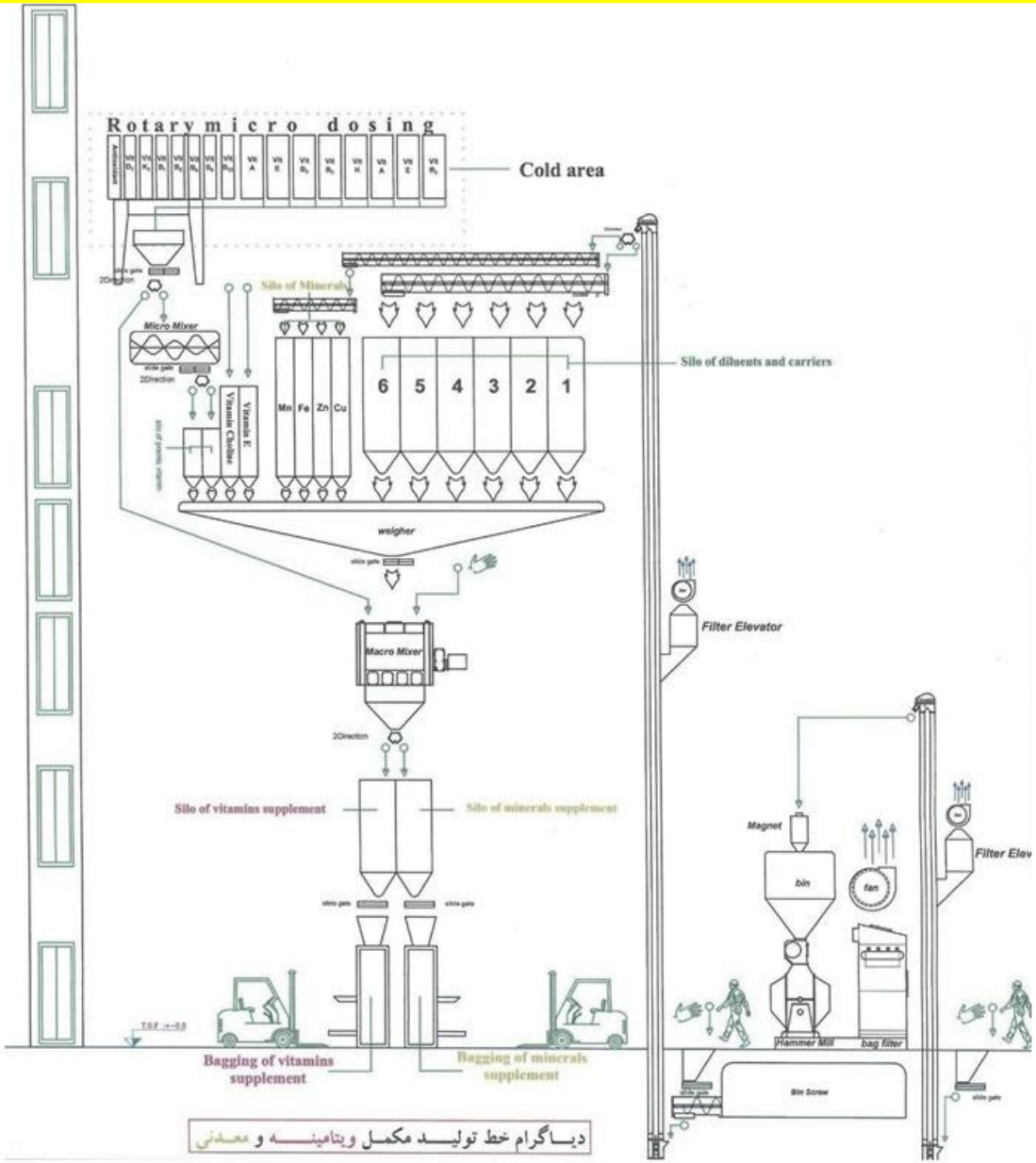
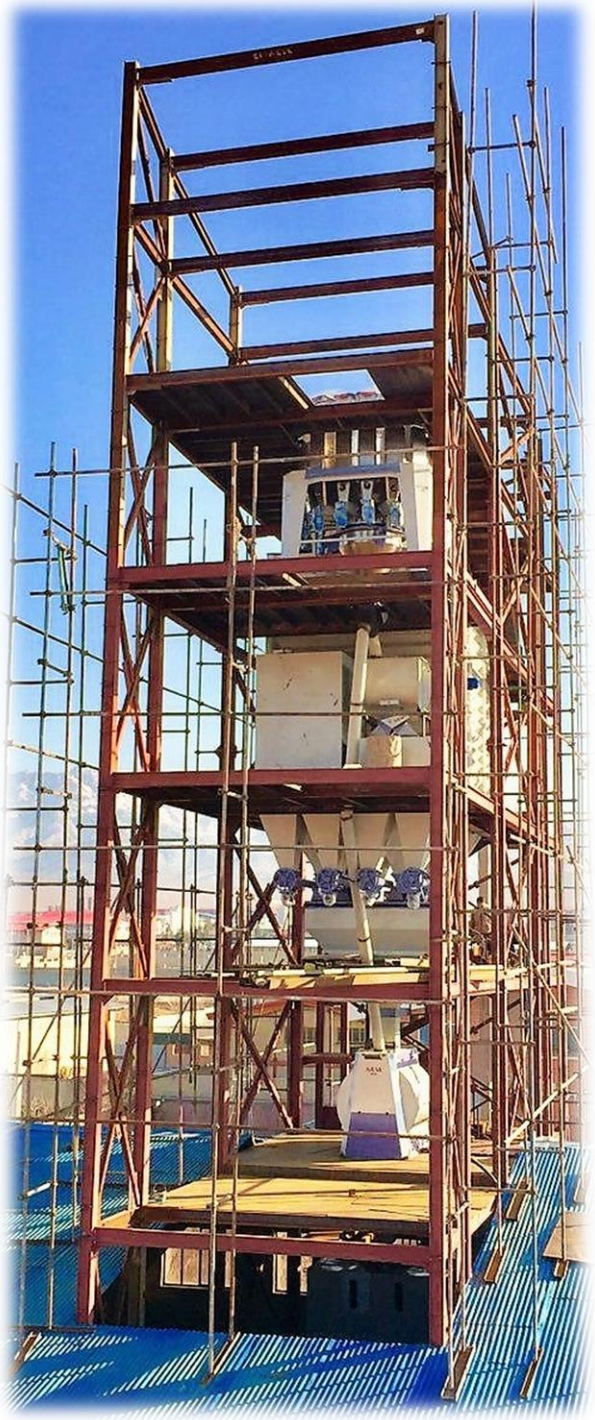

Rotary micro dosing
Cold area
Silo of Minerals
Micro Mixer
Silo of dilsents and carriers
6 5 4 3 2 1
Mn Fe Zn Cu
Vitamin E
Vitamin Choline
weigher
Filter Elevator
Macro Mixer
2Direction
Silo of vitamins supplement
Silo of minerals supplement
Magnet
bin
fan
Filter Elev
Hammer Mill
bag filter
Bin Screw
Bagging of vitamins supplement
Bagging of minerals supplement
دیاگرام خط تولید مکمل ویتامینه و معدنی



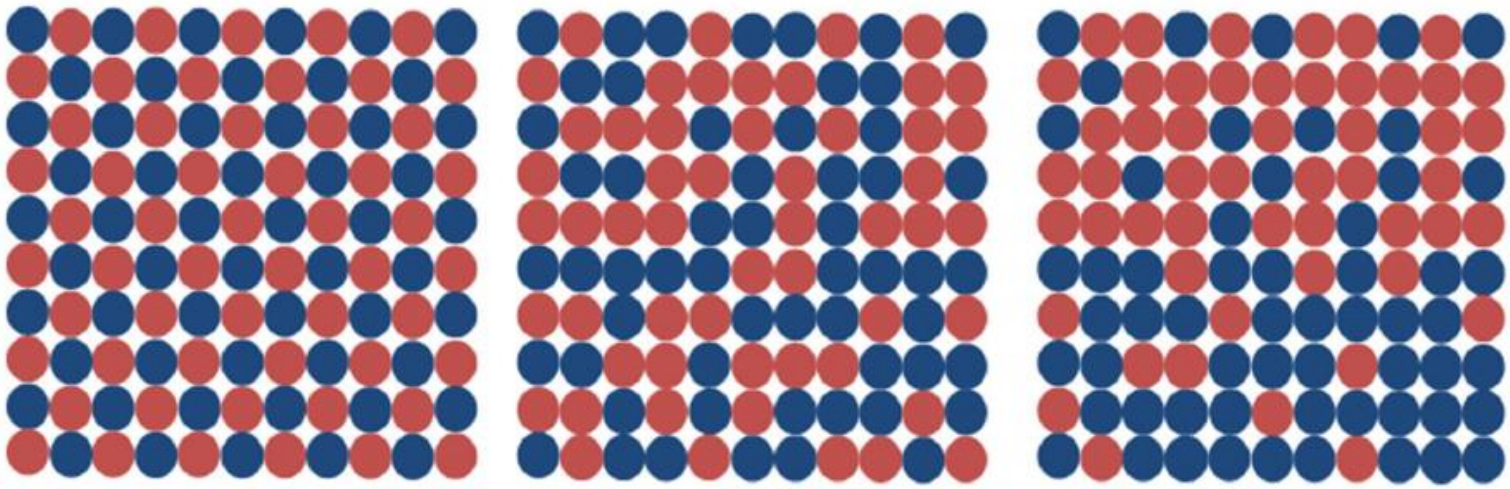
26 m


Storage

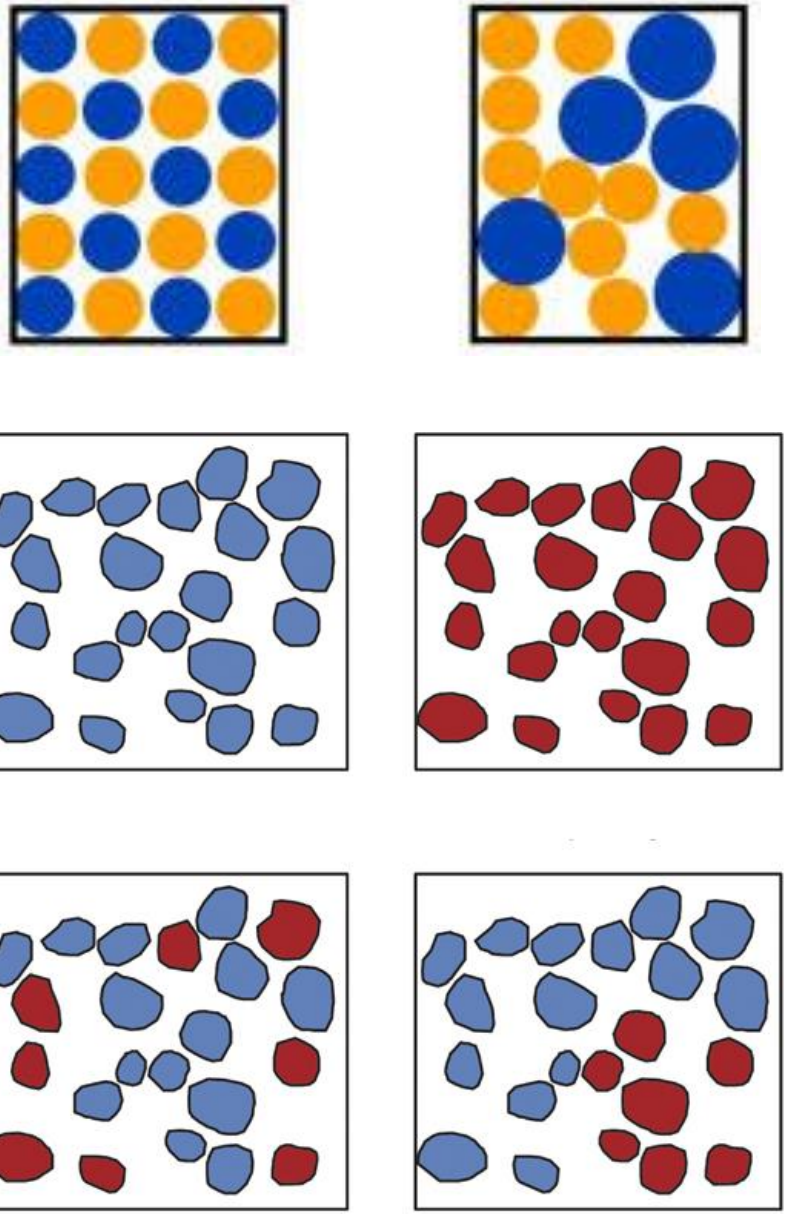

Vit E
Vit B6
Vit B1
Niacin
Microvit E Promix 50


Dosing


Mixing



Perfect mixture *Random mixture* *Segregated mixture*

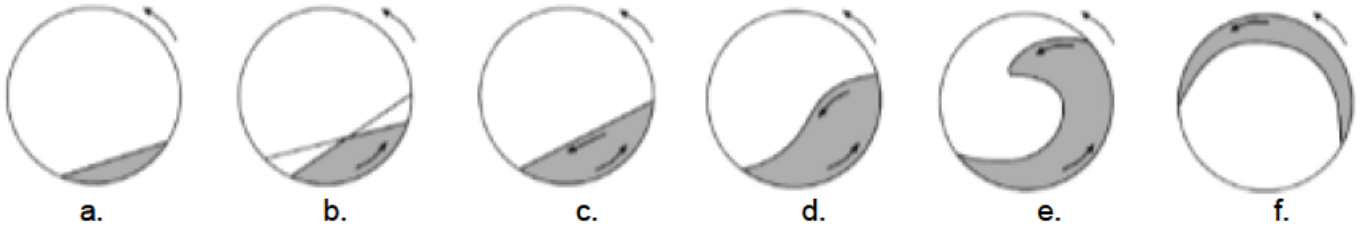



Mixing concept

Spontaneity of mixing

- Positive
  - proceeds spontaneously without external action
  - e.g. diffusive mixing of gases in a vessel
- Negative
  - segregation proceeds spontaneously, without external action the components will separate
  - e.g. suspension settling
- Neutral
  - nothing happens without external action
  - e.g. powder mixture

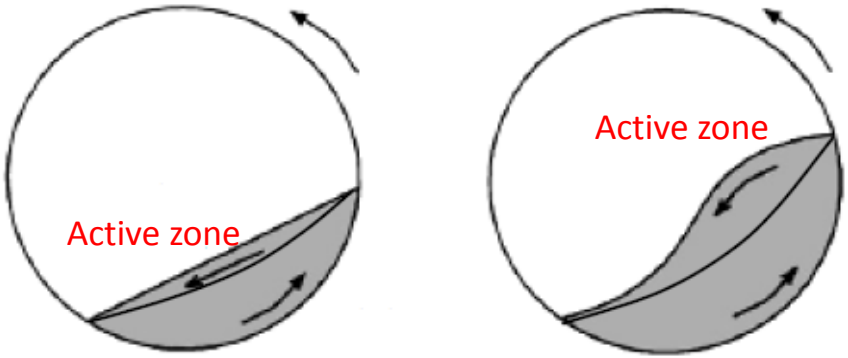
Powder movement in blender



- Powder movement regimes
  - a. sliding
  - b. slumping (0 - 3 % f_c)
  - c. rolling (3 - 30 % f_c)
  - d. cascading (3 - 30 % f_c)
  - e. cataracting (30 - 100 % f_c)
  - f. centrifuging

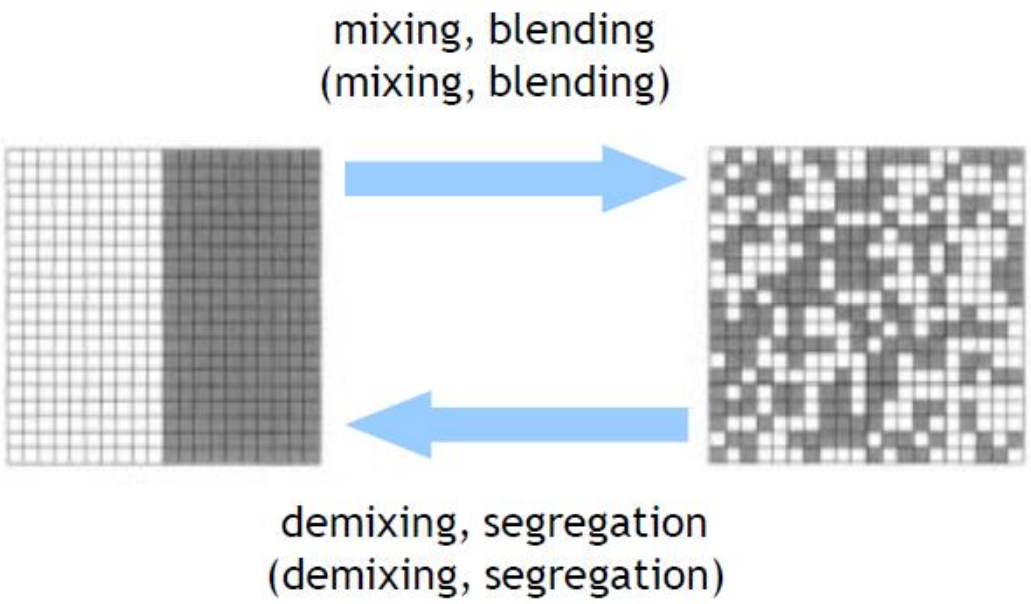
Powder movement in blender

- Rolling and cascading motion



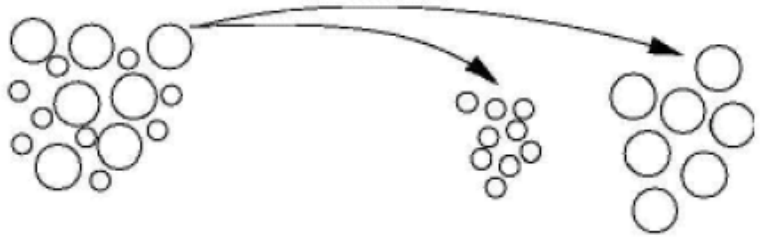
- Depends on the filling ratio
- Mixing proceeds only in the active zone

Mixing is reversible process

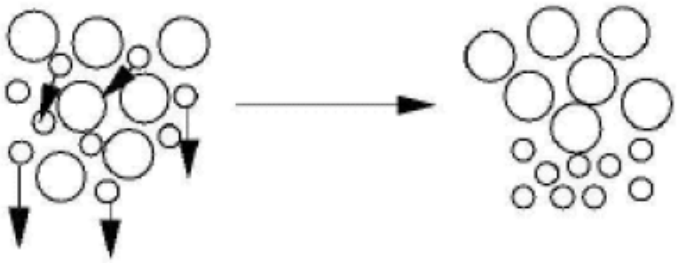


Segregation mechanisms

- Trajectory



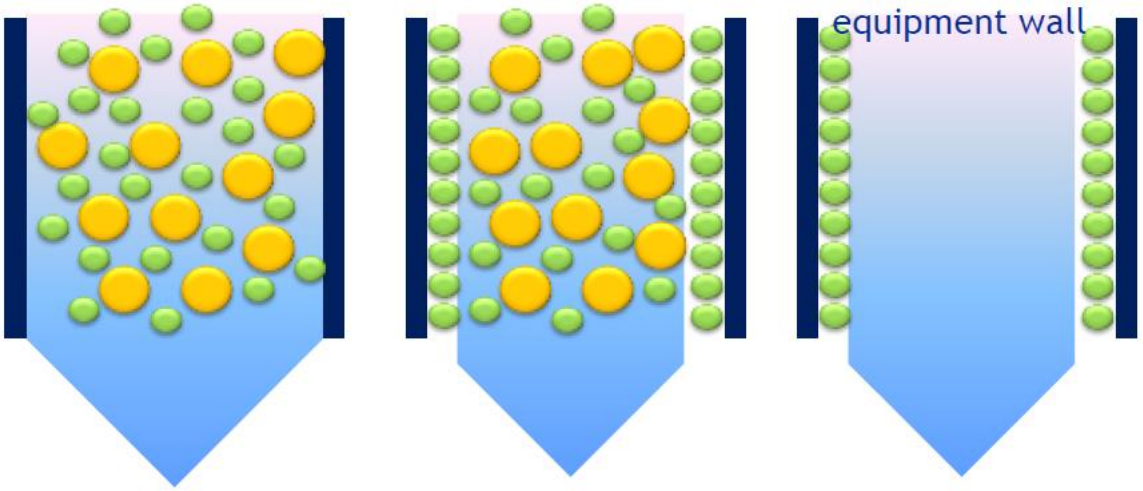
- Percolation



- Fluidization

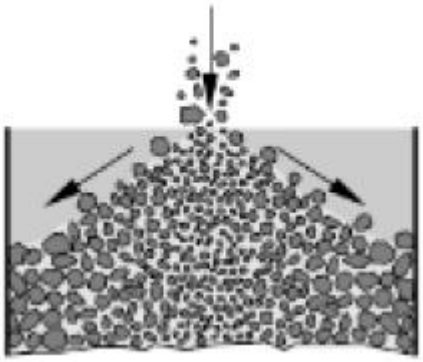
Wall segregation

- Flow of particulate solid near wall
- Adhesive discrimination between particles
- Some particles possess higher affinity to equipment wall

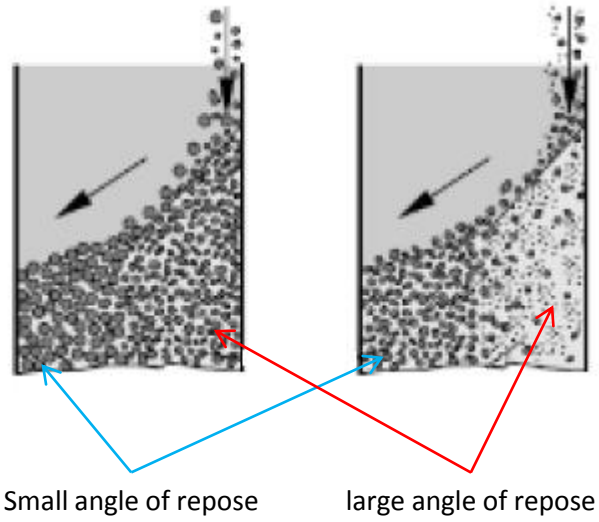


Segregation examples

Larger particles are heavier and are subjected to higher inertial forces

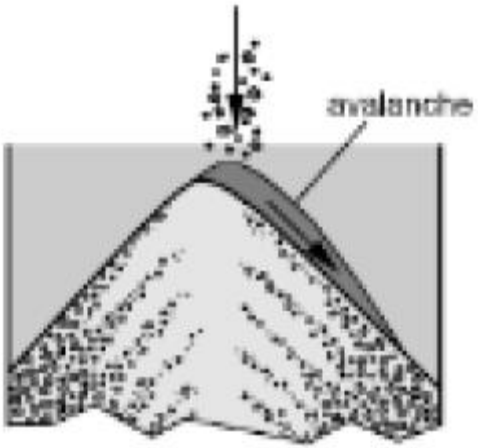


Different angle of repose

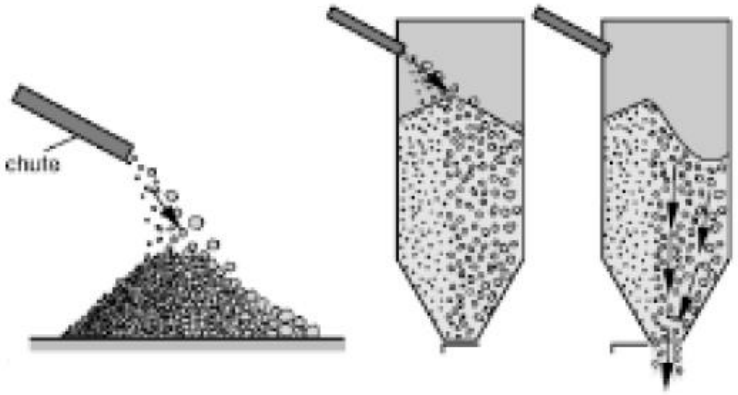


Segregation examples

Larger particles may trigger an avalanche

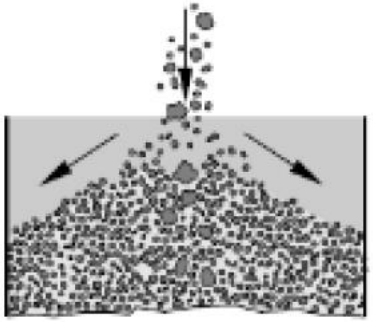


Trajectory segregation in aerodynamic conditions

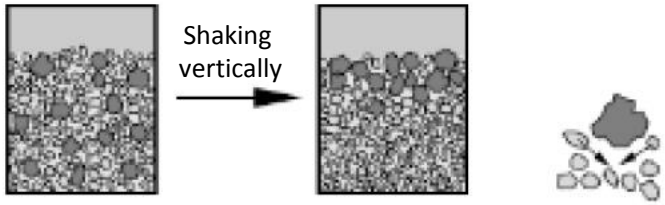


Segregation examples

Larger particles are heavier and fall into the "crater"

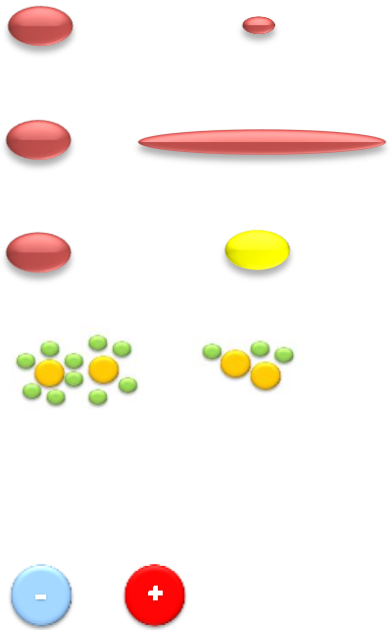


Sifting - large particles cannot pass through the small ones, but the opposite is possible



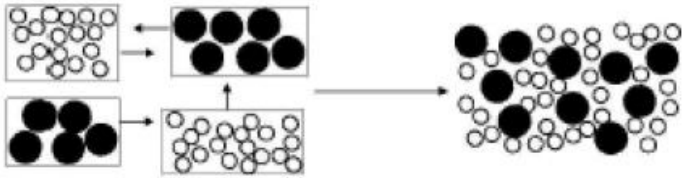
Causes for segregation

- Differences in particle size
- Differences in morphology
- Differences in density
- Components ratio
- Cohesive interactions
  - moisture
  - static charge

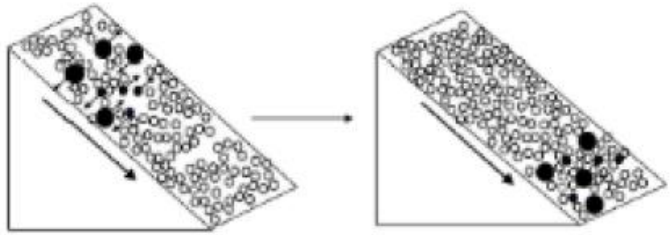


Mixing particulate solids

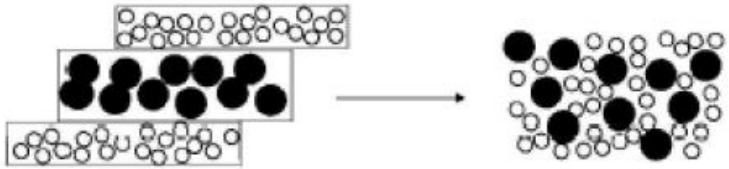
- Mechanisms of mixing
  - convection



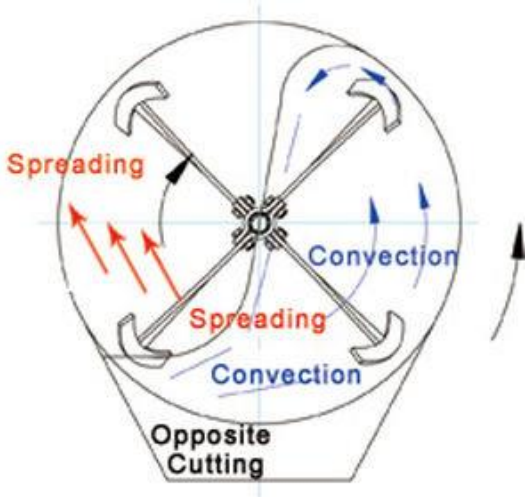
  - dispersion



  - shear
    -



Diffusive

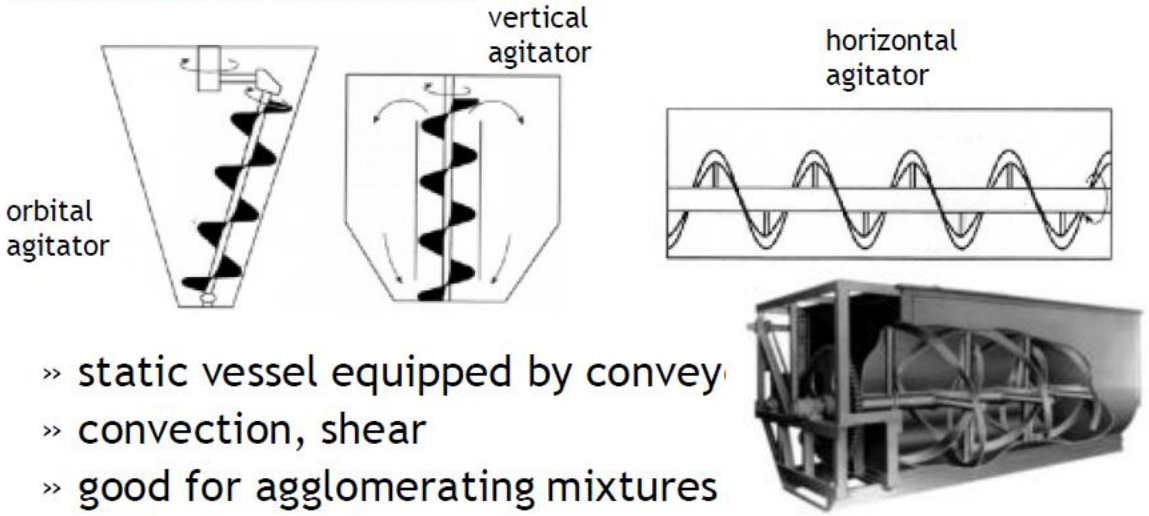


Convective

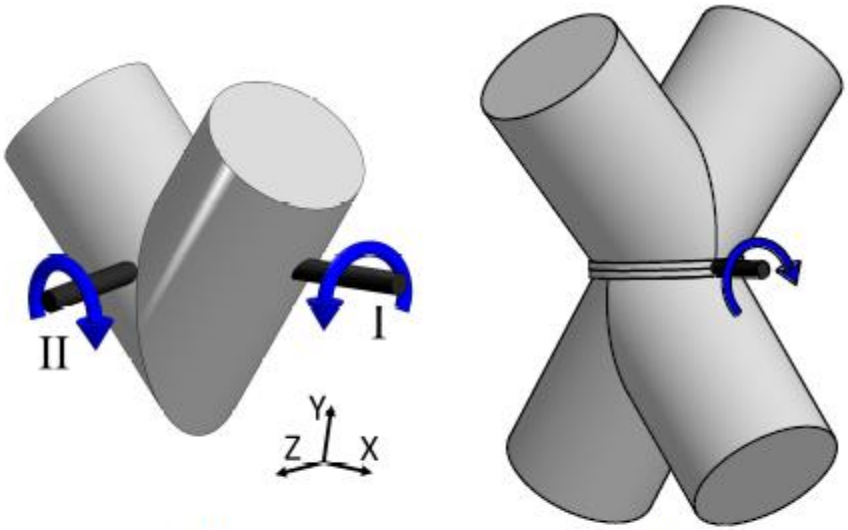
Shear

Mixing particulate solids

» Convective blenders



» static vessel equipped by convey
» convection, shear
» good for agglomerating mixtures
» difficult cleaning



(a) (b)

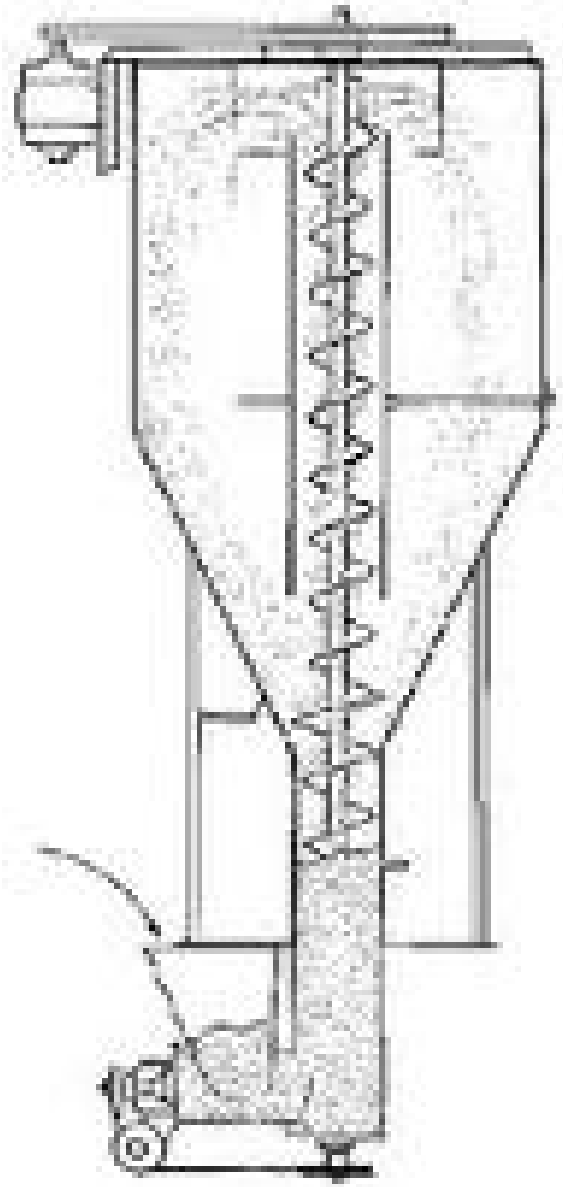
Rotation of (a) the V-blender around two axes and (b) the standard tetrapodal blender.

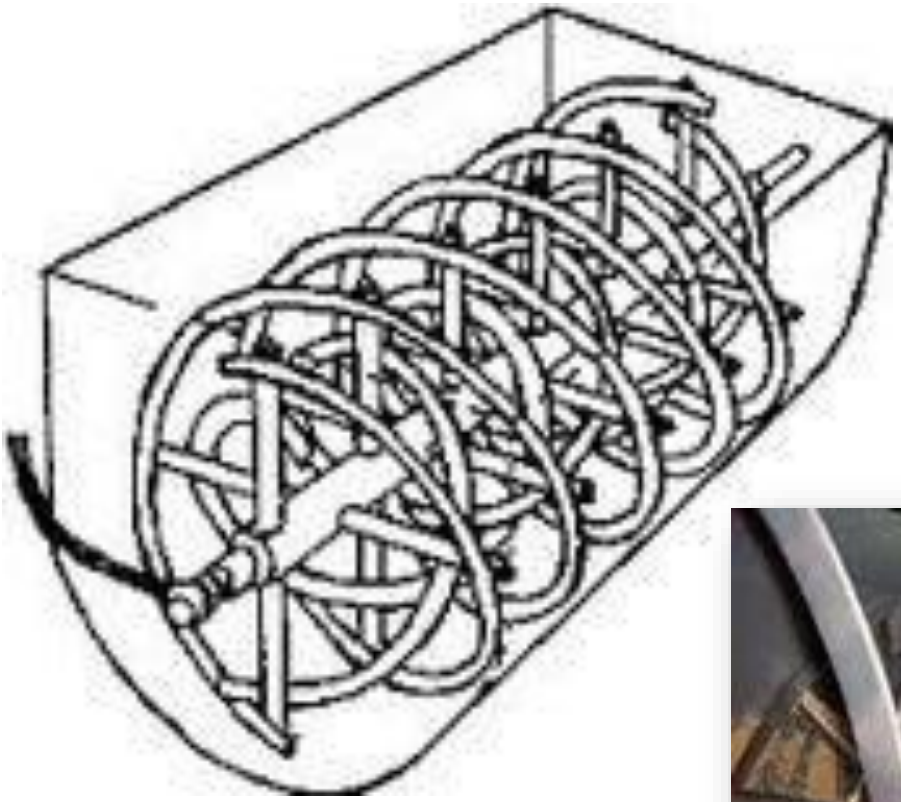
Selected factors influencing the blender choice

- Process requirements
  - Particle comminution during blending
  - Cleaning
  - Continuous / Batch
- Mixing / Segregation relationship
  - Better for convection, worse for dispersion
- Effect of particulate solid flowability

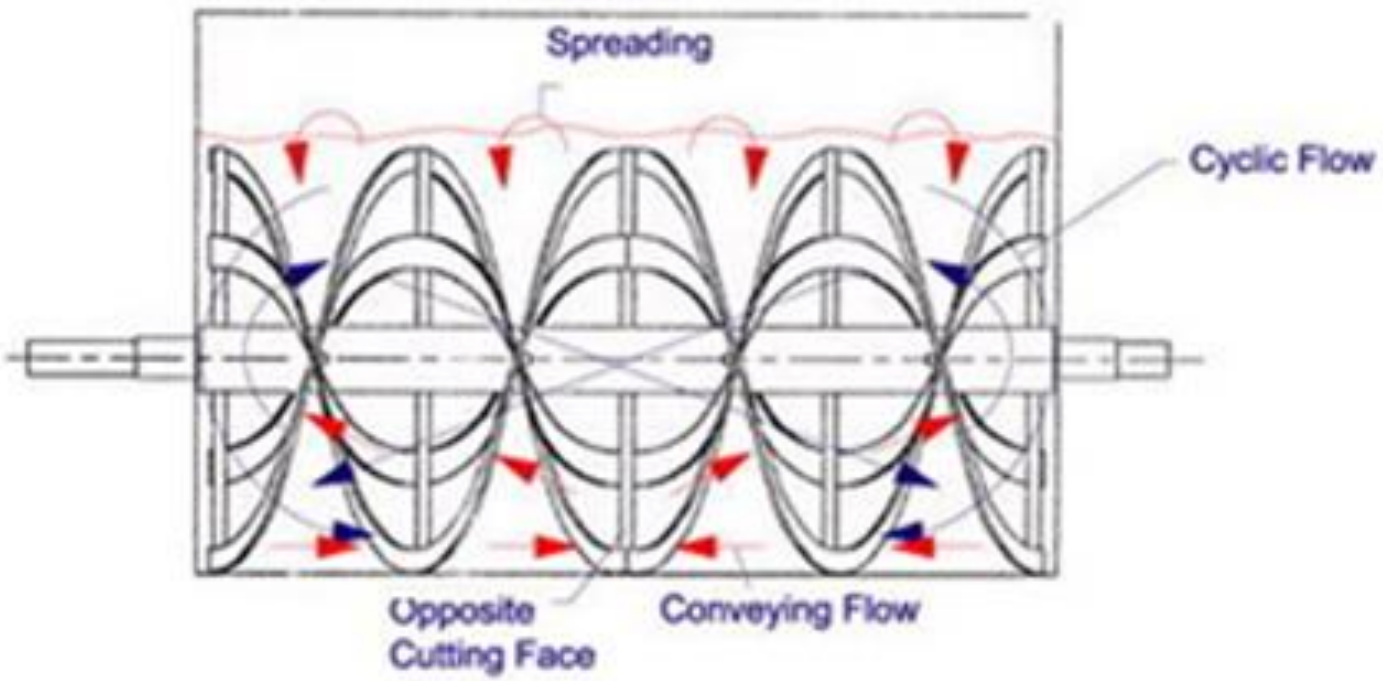

Mixer types

- ✓ Affords good homogeneity with the component included at lowest possible content
- ✓ Short mixing time
- ✓ Variable degree of filling, with no loss of mixing efficiency
- ✓ Complete emptying
- ✓ Easy cleaning
- ✓ Provision for adding liquids
- ✓ Absence of heat during mixing
- ✓ Provision to break the lumps
- ✓ Easy to operate
- ✓ Less consumption of energy
- ✓ Less maintenance cost
- ✓ Cost effective

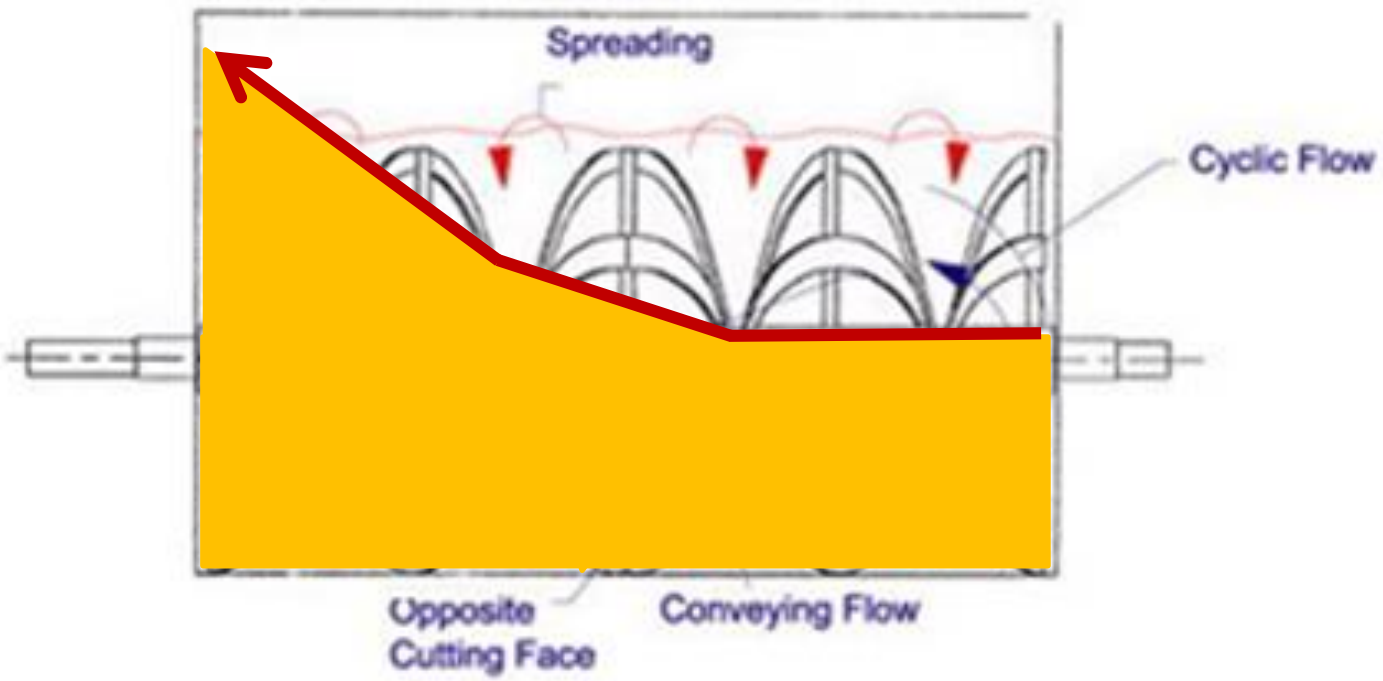


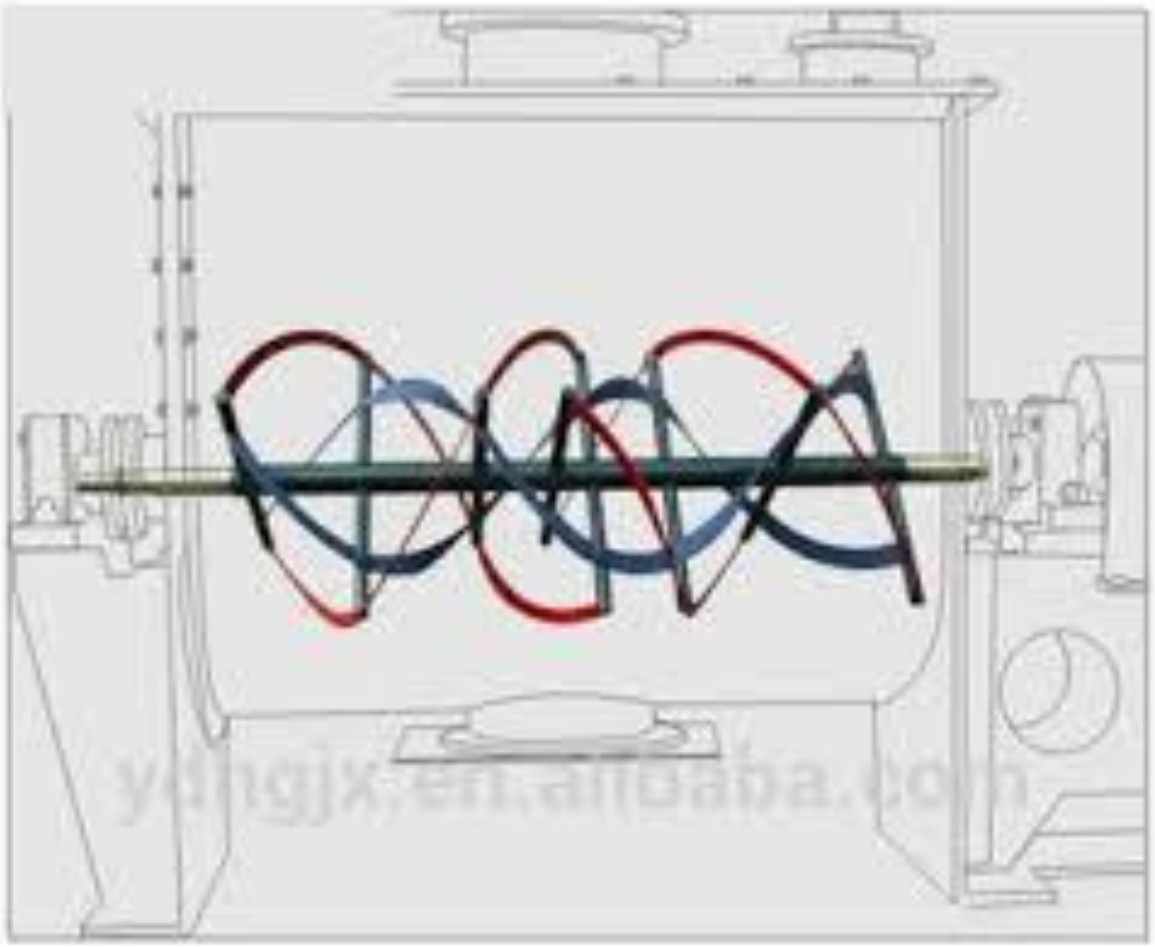


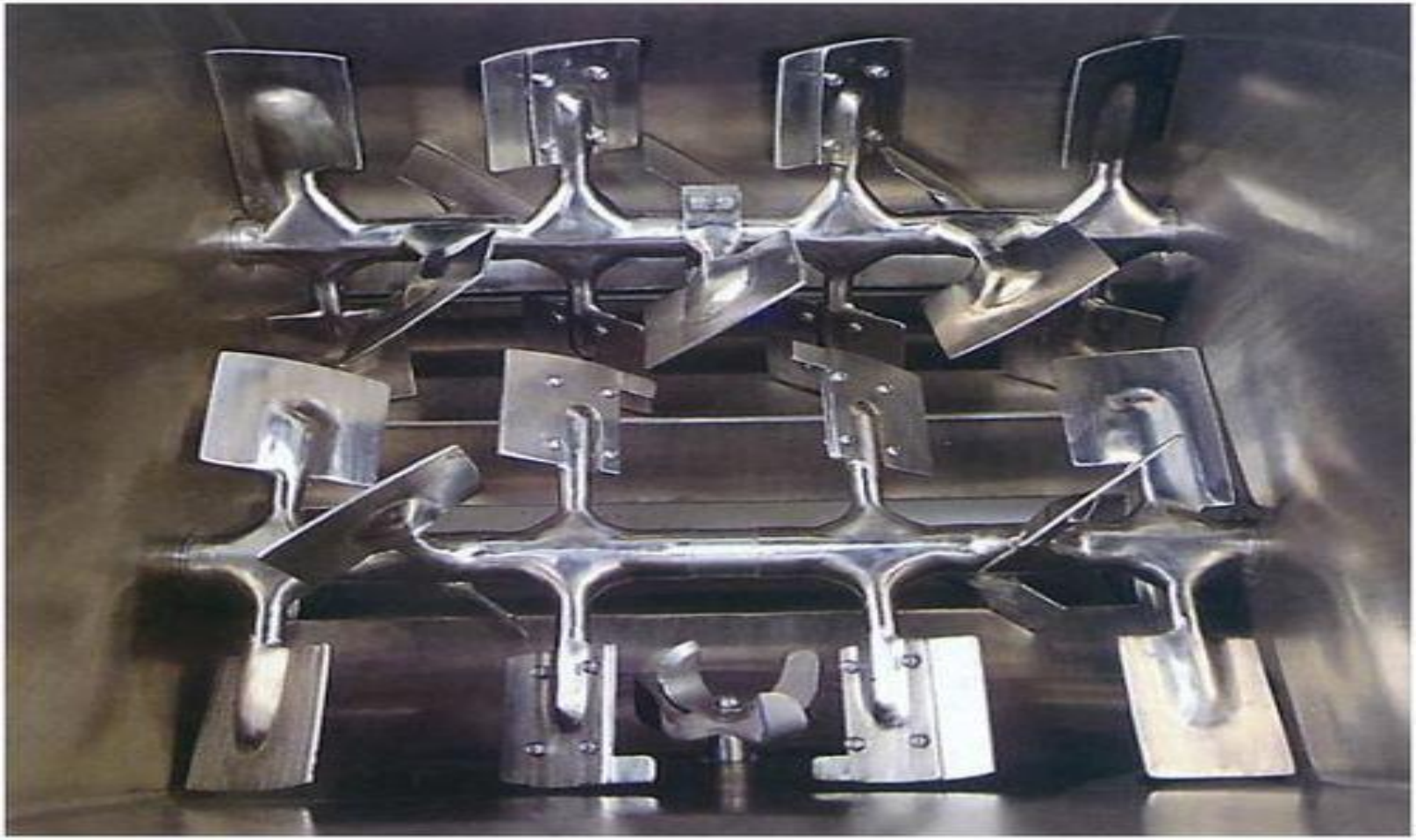
Ribbon Mixer

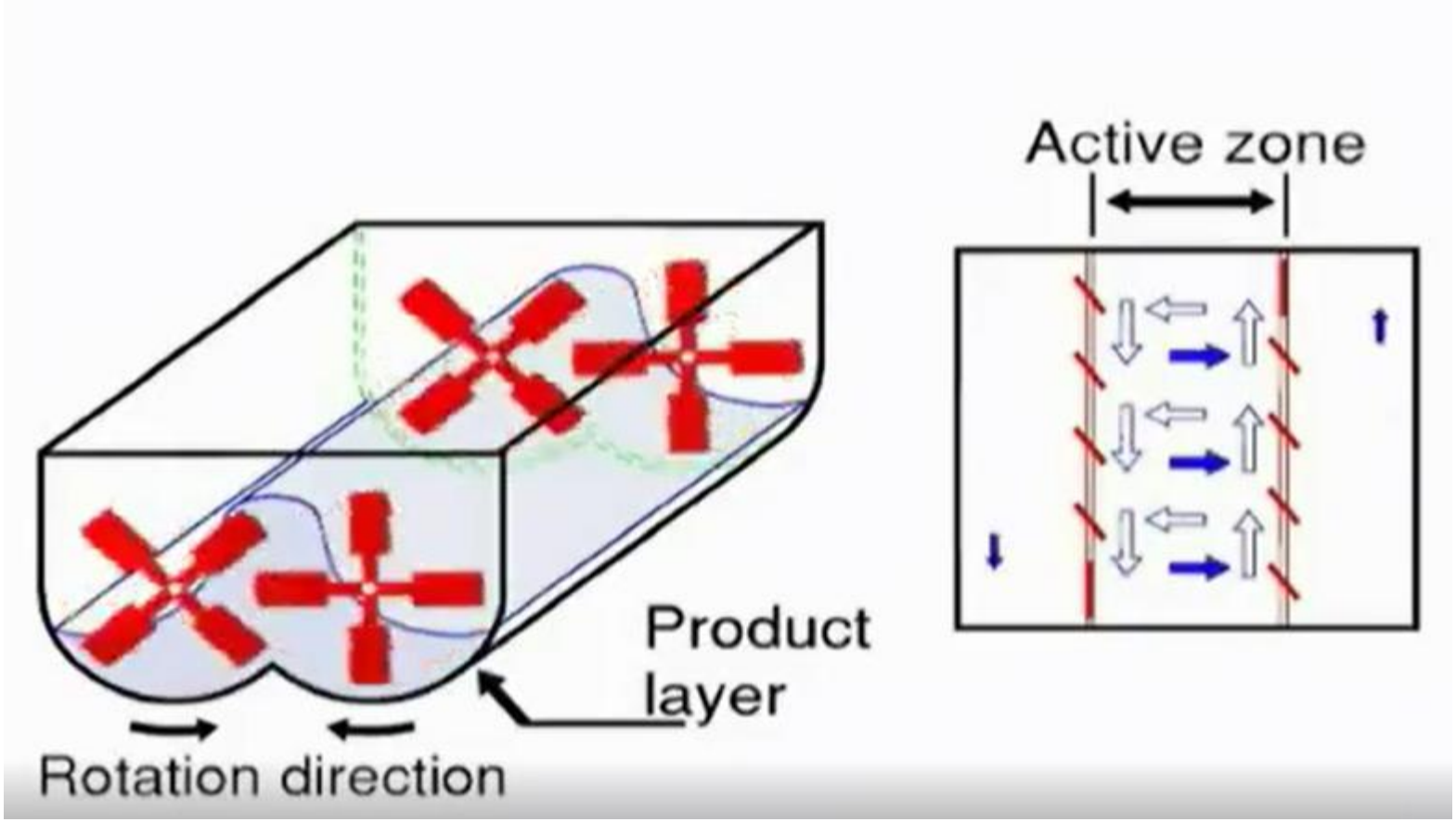


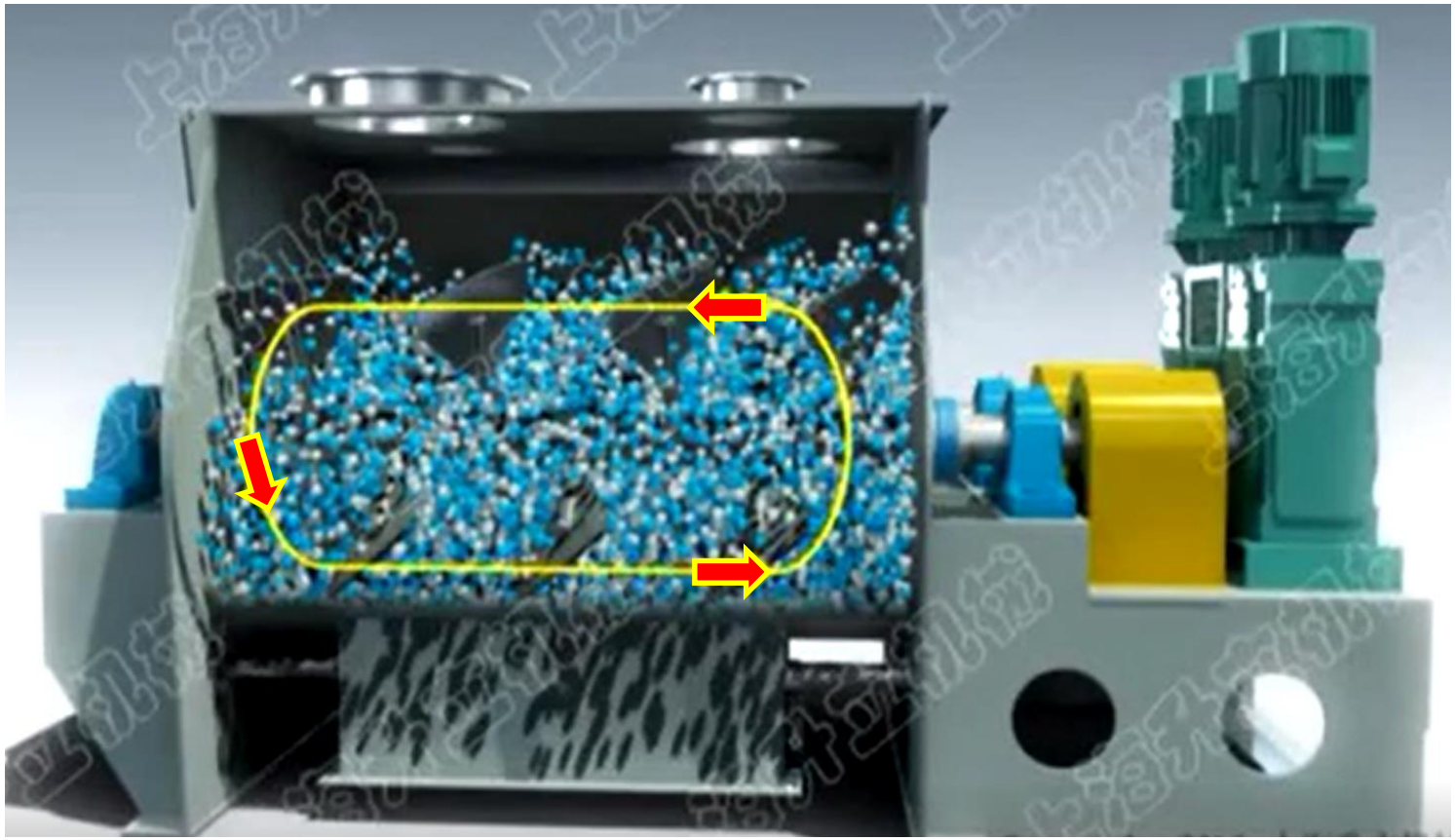
Ribbon Mixer

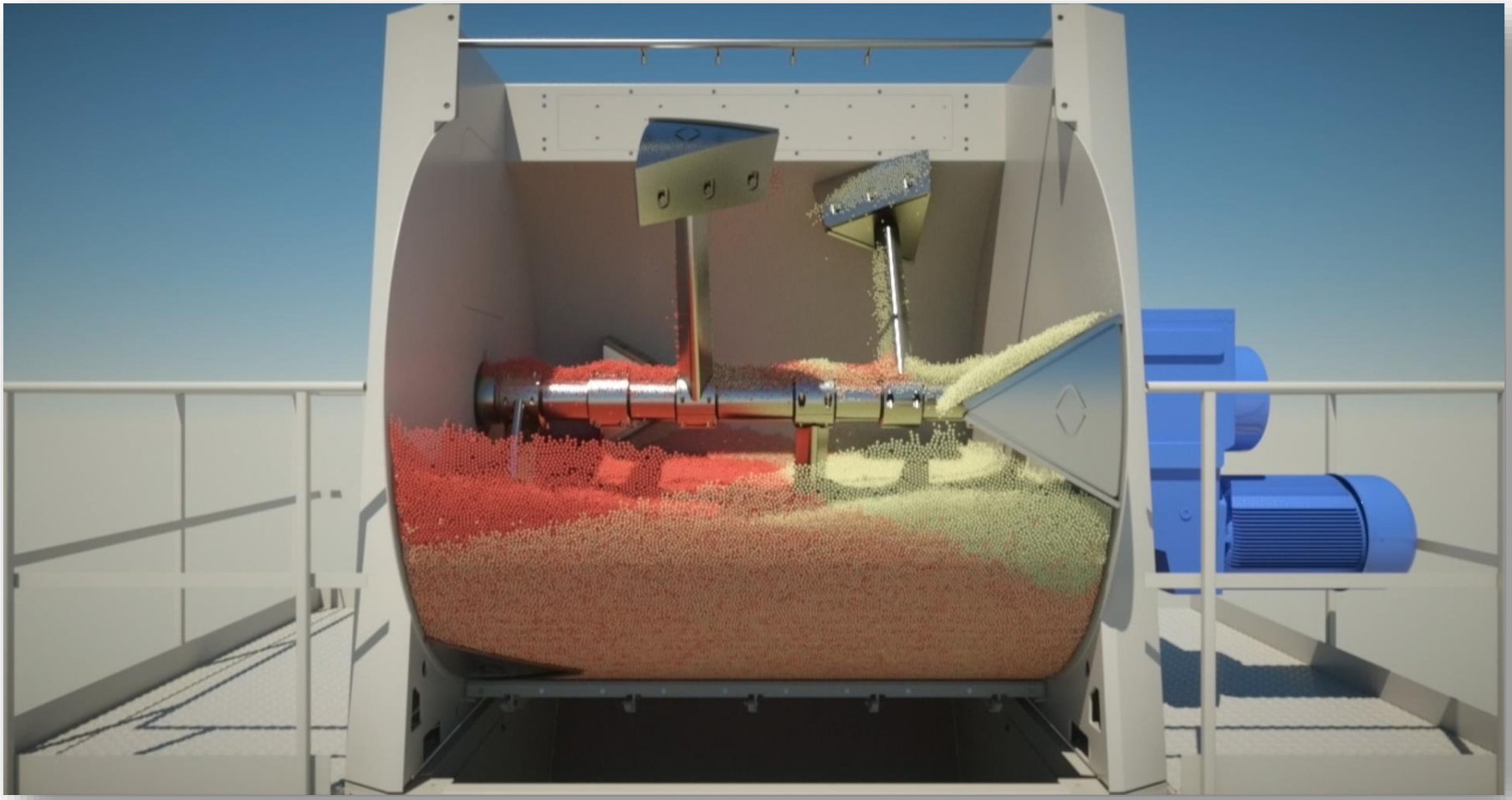


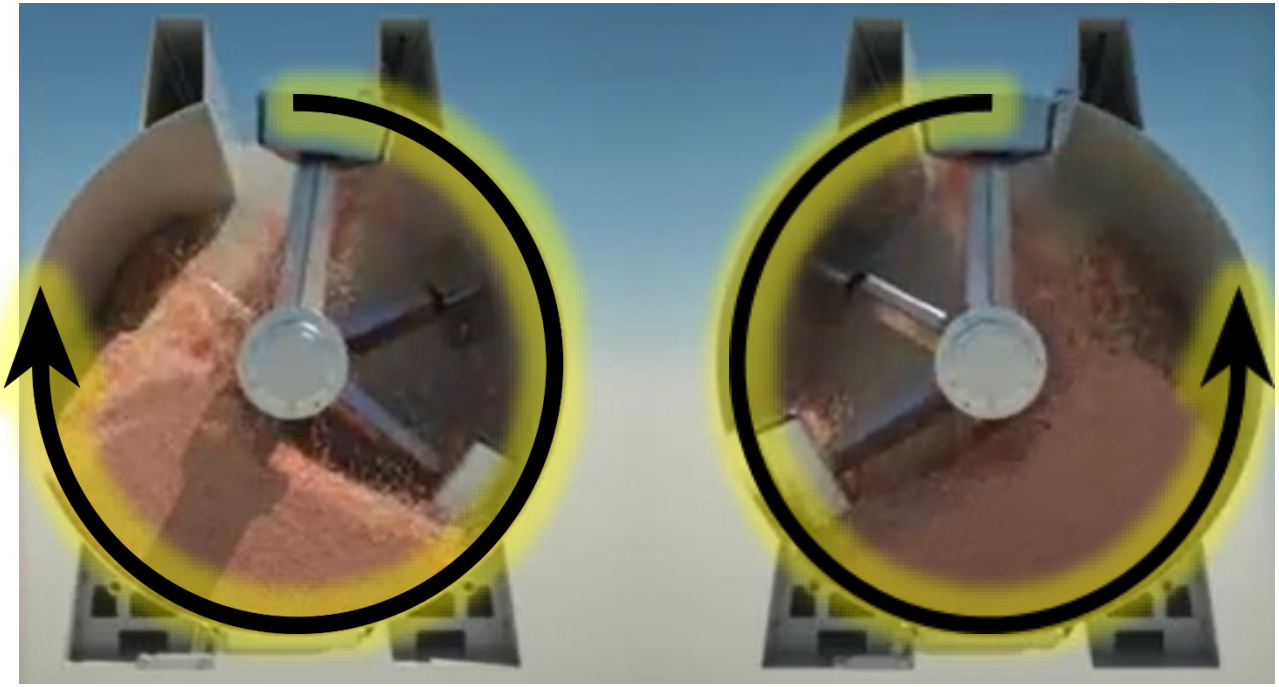


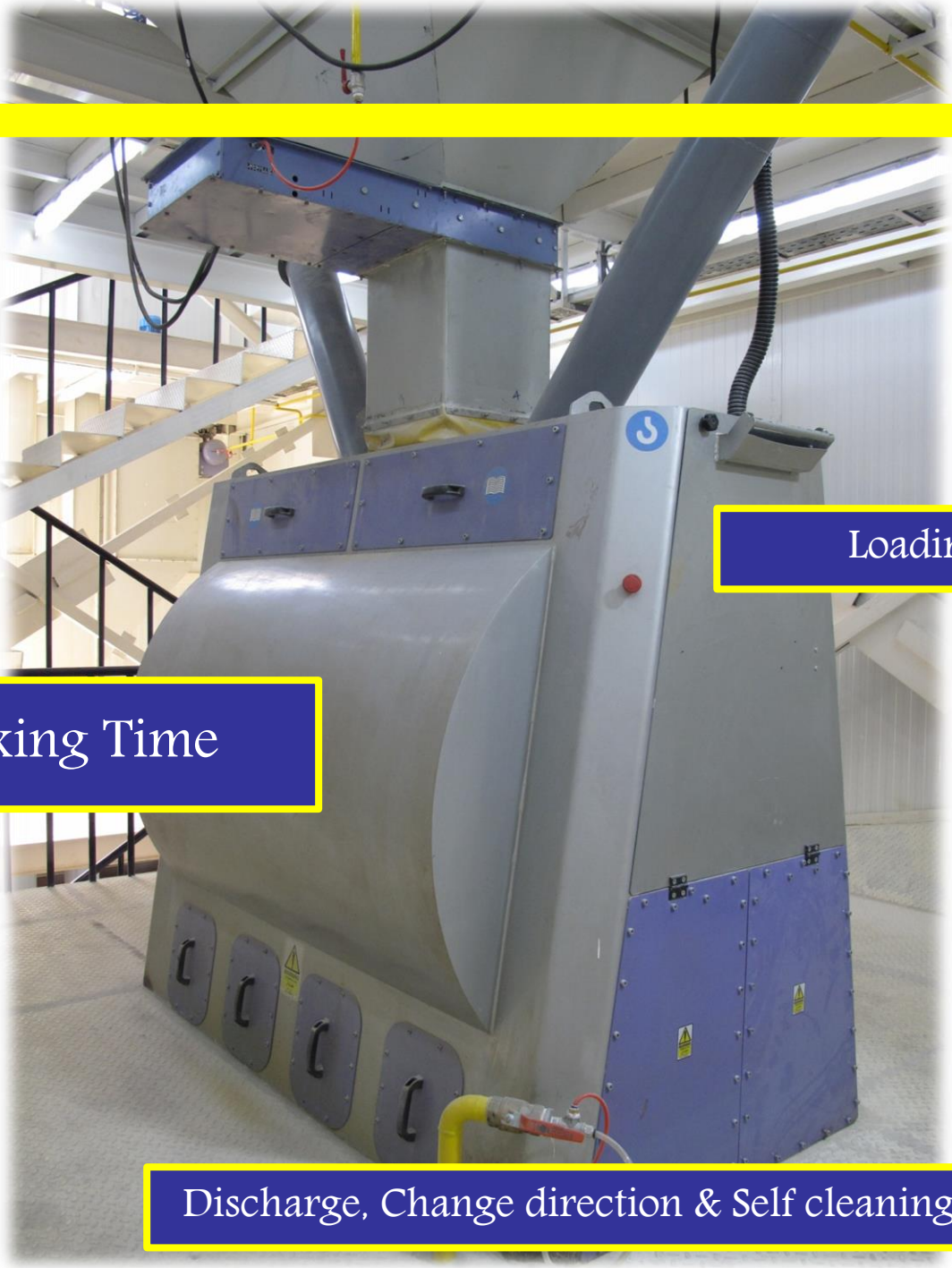



Active zone
Product layer
Rotation direction









Loading Time

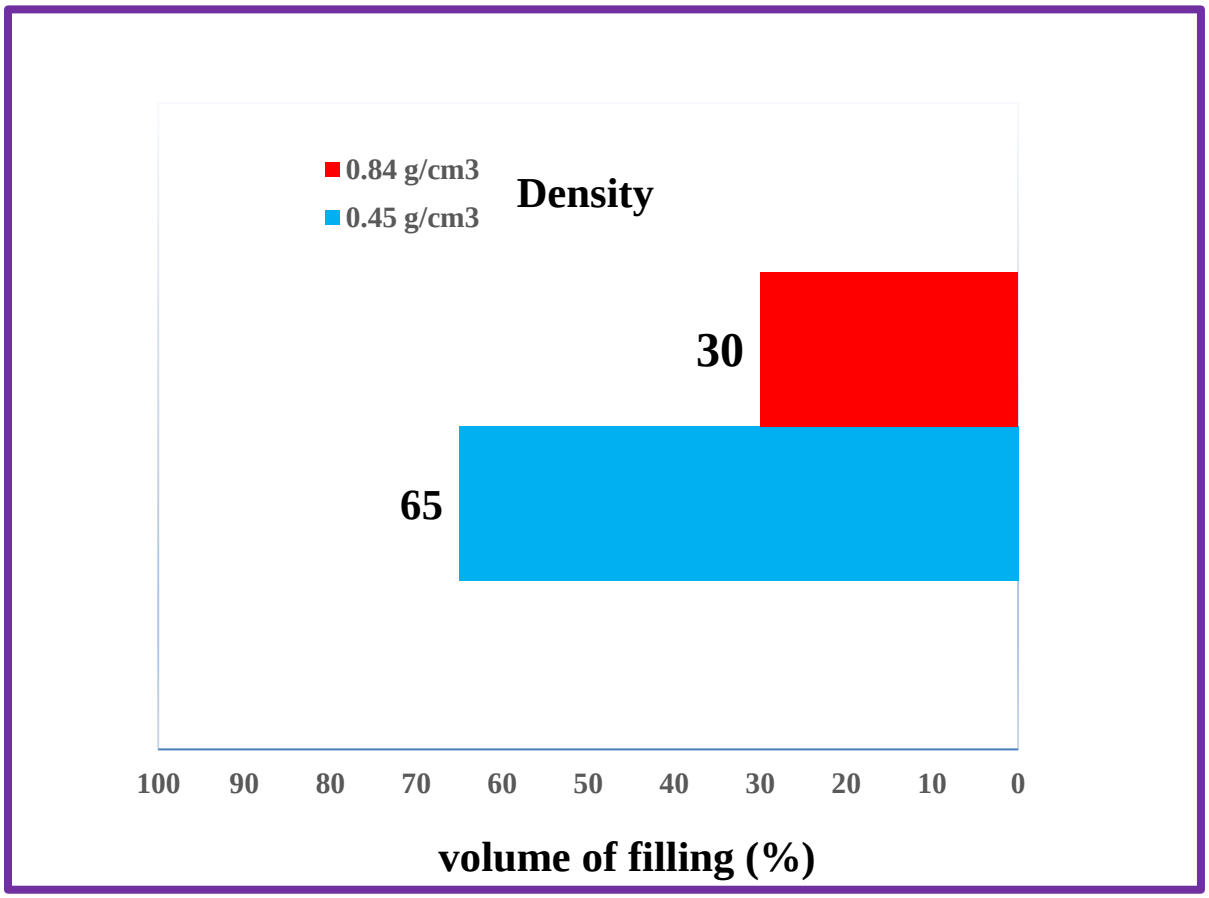
Mixing Time

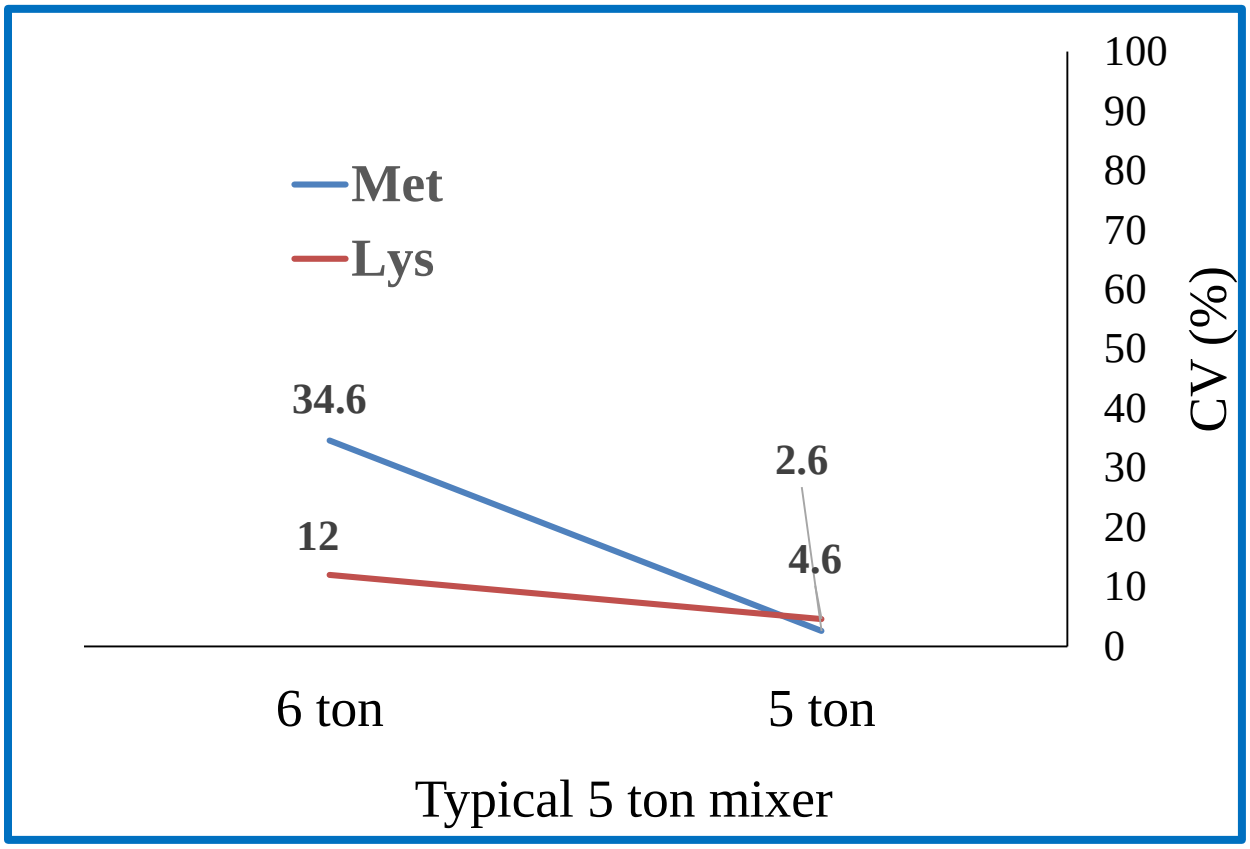
Discharge, Change direction & Self cleaning


Promix 3D Powder Mixer
can mix several ingredients
of different crystal size
and density


Short mixing time

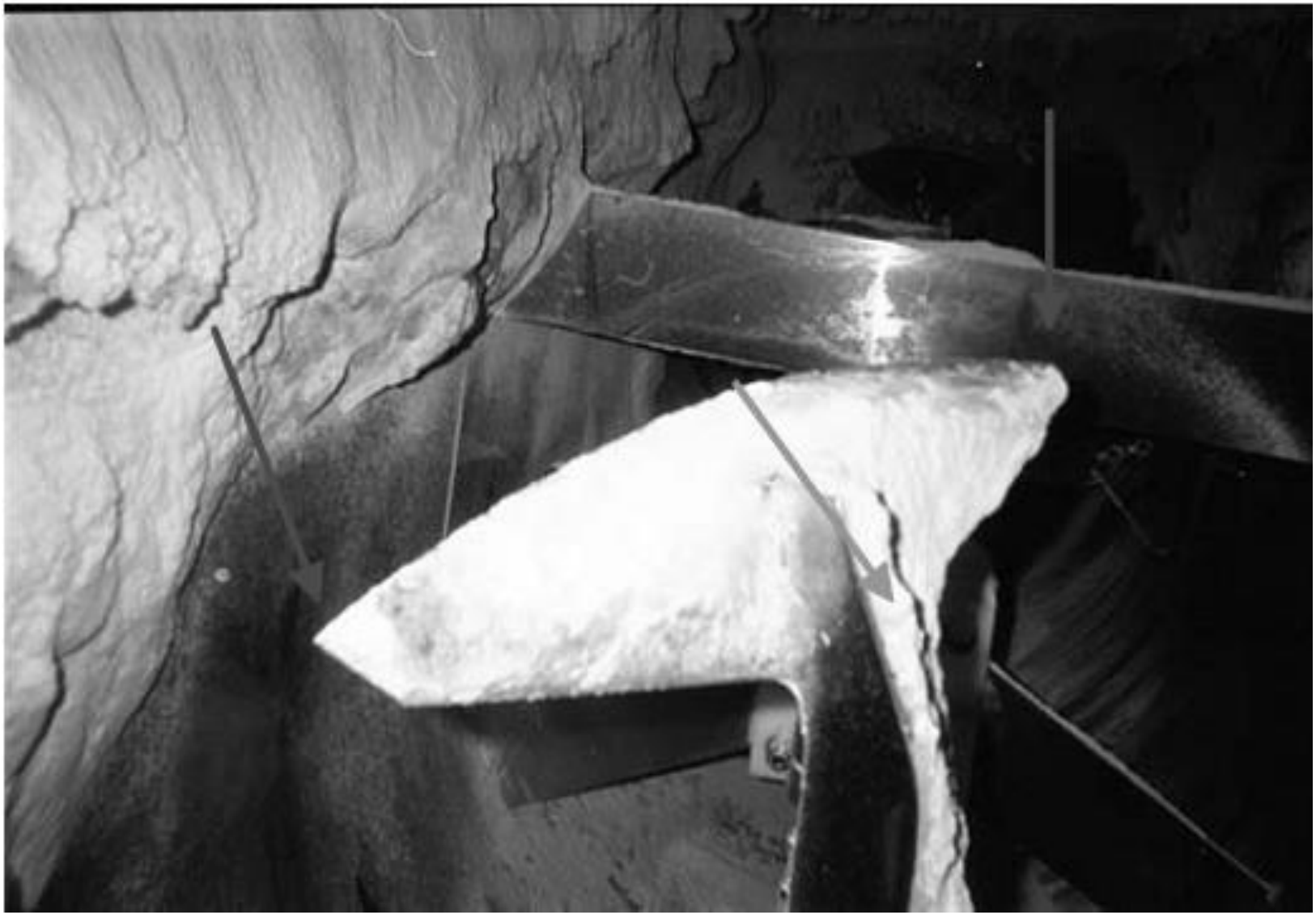

Mixer capacity


0.84 g/cm3
0.45 g/cm3
Density
30
65
100
90
80
70
60
50
40
30
20
10
0
volume of filling (%)



Typical 5 ton mixer


Mixer elements

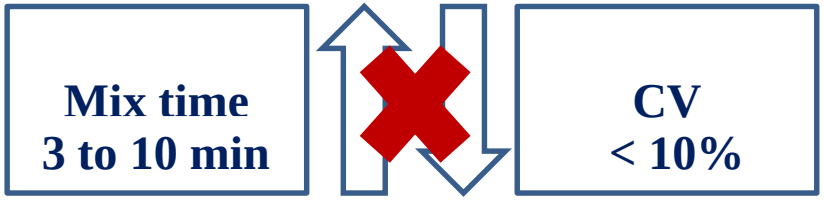


Jared R. Froetschner,2005: Mixing: A detailed look at the factors that influence mix uniformity.

Maintenance management

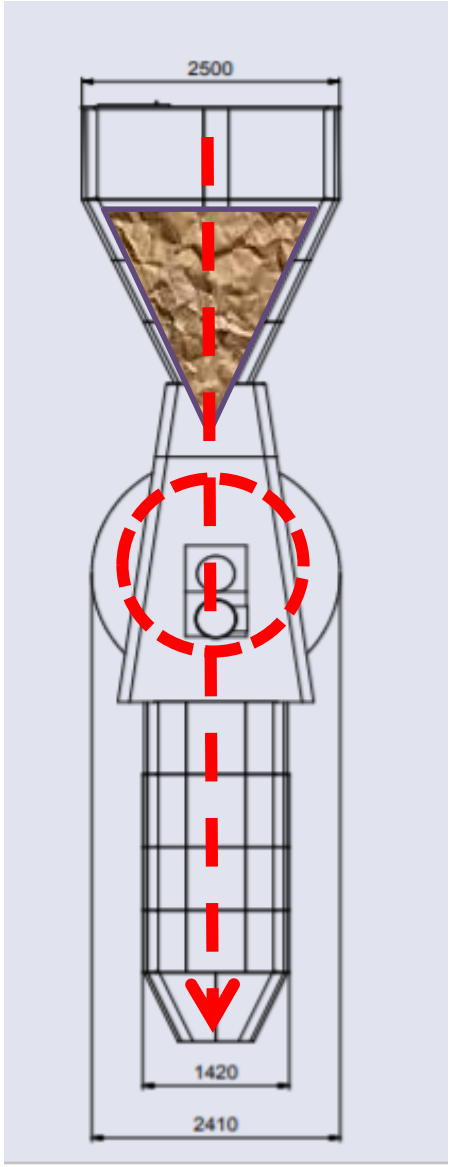
important management tool

worn or improperly adjusted mixer



Do's	Don'ts
Clean the mixer before and after use.	Collection of first few bags after mixing
Area must be free of remains of previous batch	Collection of premix in unlabeled bag
Addition of Ingredients when the mixer is on	Collection of premix when the mixer is on.
Note the mixing start and end time	Collection of premix before the specified mixing time
Strict adherence to the mixing order	Addition of reactive materials in the beginning.

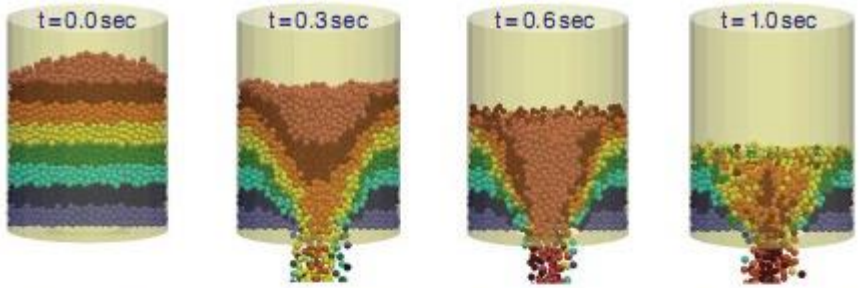

Mixer Loading


2500
1420
2410

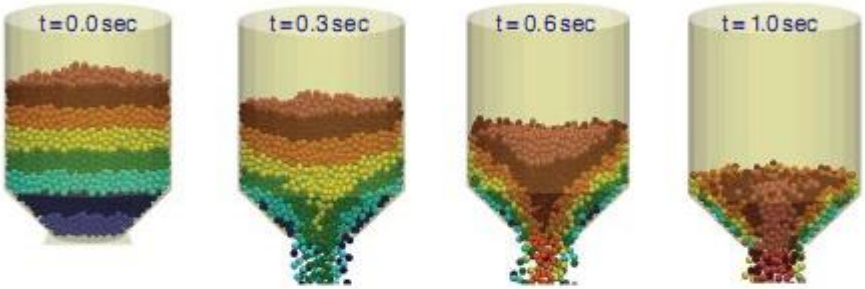

Mixer discharge

Flow Patterns

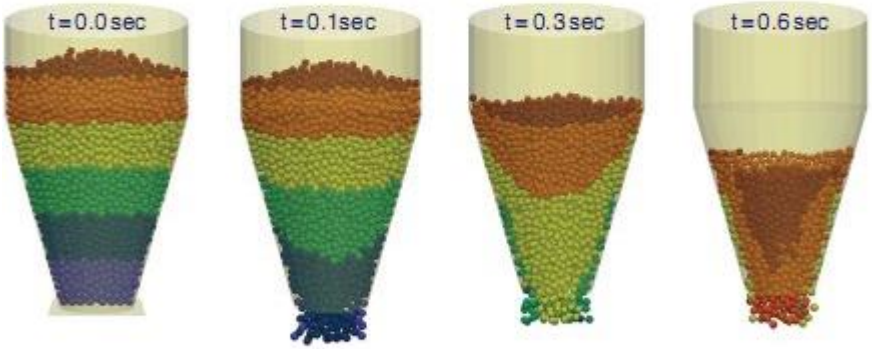
Discharge of particles residence time distribution (RTD)



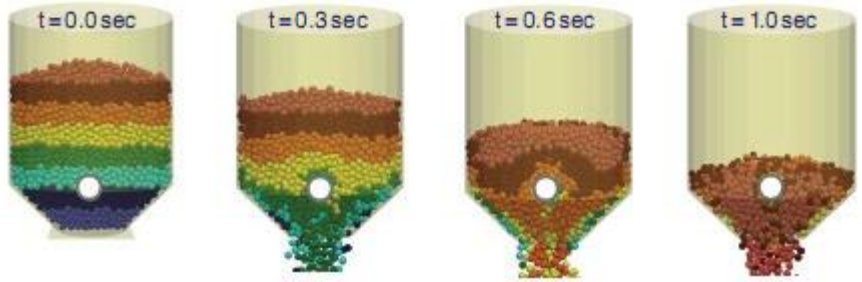
cylindrical hopper



conical hopper with θcone=45°

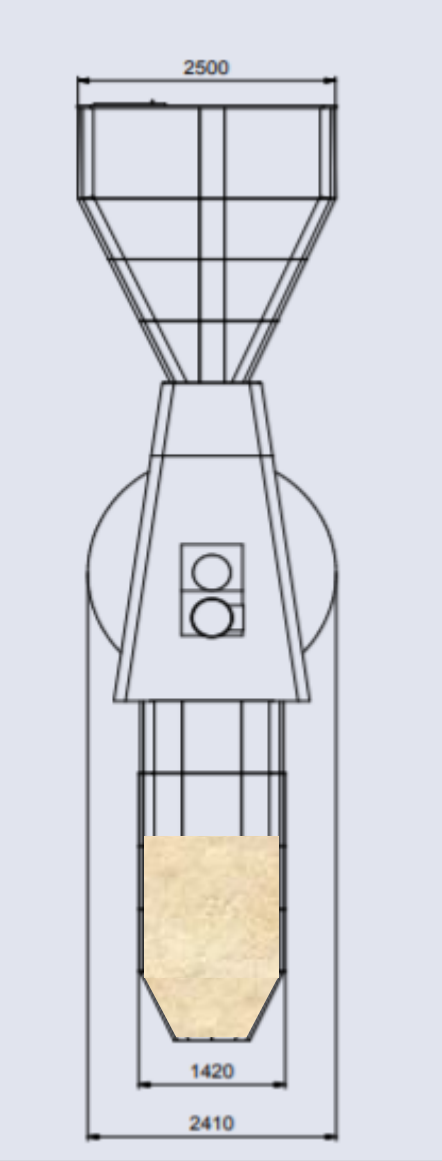


conical hopper with θcone=15°



conical hopper with obstacle

Hamid reza norouzi.,et al , 2016: Coupled CFd-deM Modeling


2500
1420
2410

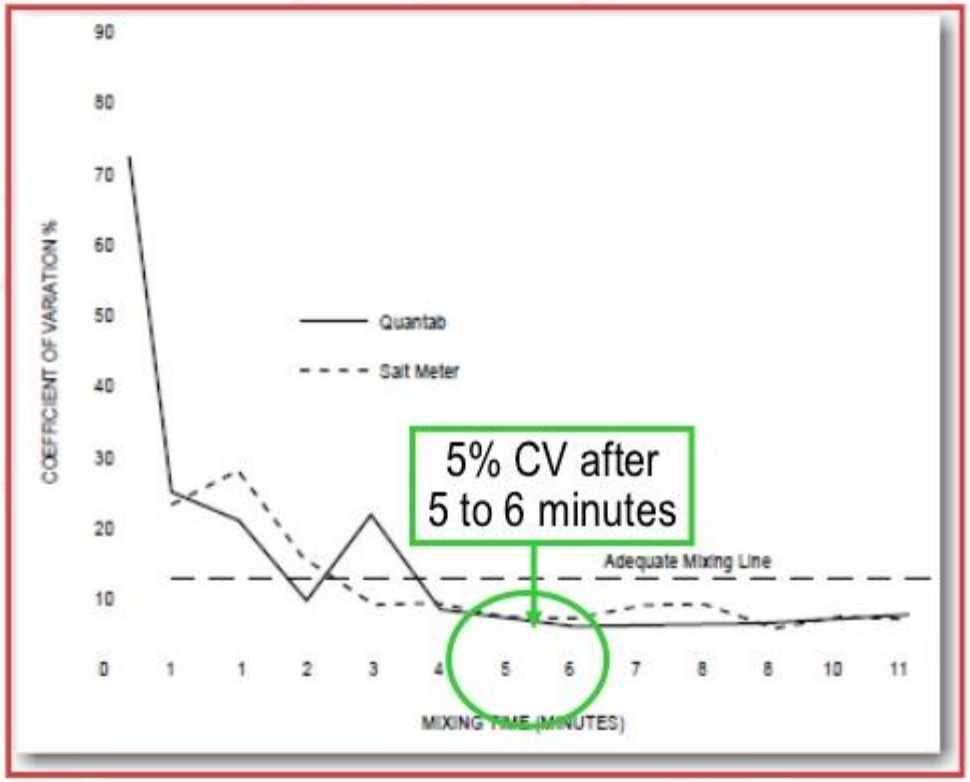

Mixer cleaning

- Cross contamination
- microbial contamination
- Unseal discharge door or gate
- Self cleaning
- Hand cleaning

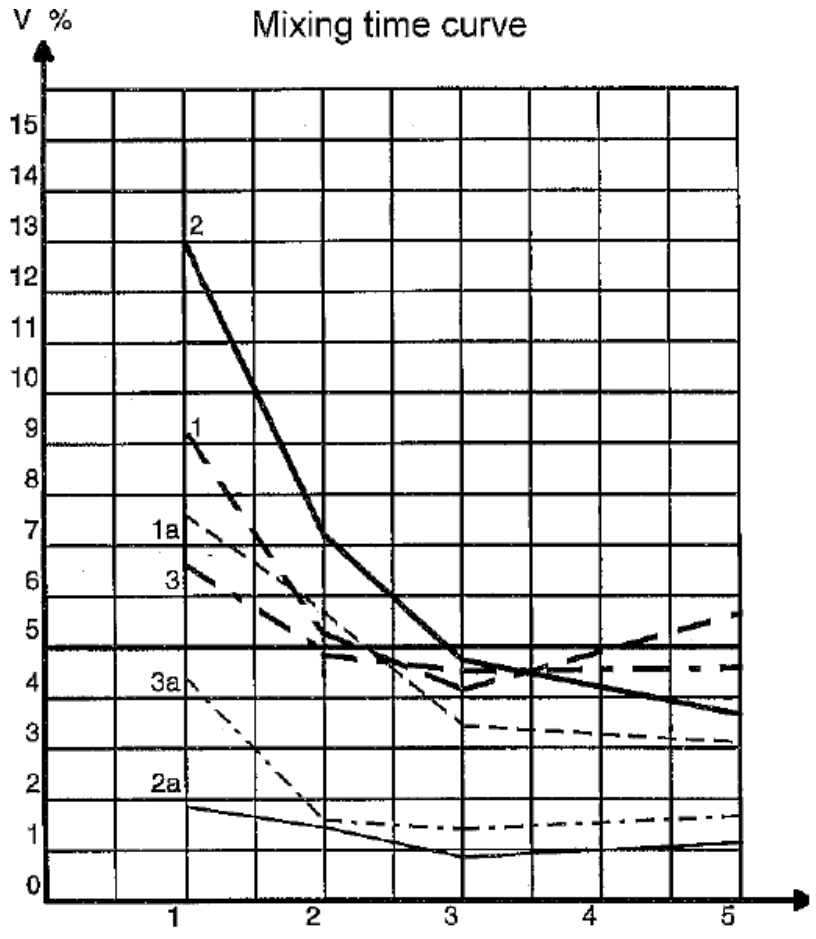

Mixing time

Mixing Time

- Varies depending upon type of mixer used.
  - Under mixing will cause poor dispersion of active ingredients.
  - Over mixing can cause segregation due to the development of static charge of small pure crystalline products.


90
80
70
60
50
40
30
20
10
0
1
1
2
3
4
5
6
7
8
8
10
11
COEFFICIENT OF VARIATION %
MIXING TIME (MINUTES)
Quantab
Salt Meter
Adequate Mixing Line
5% CV after
5 to 6 minutes

Proper Mixing Time Reduces Variation



1 Poultry feed / methyl violet

1a Poultry feed / table salt

2 Pig feed / methyl violet

2a Pig feed / table salt

3 Dairy feed / methyl violet

3a Dairy feed / table salt


Mixing order

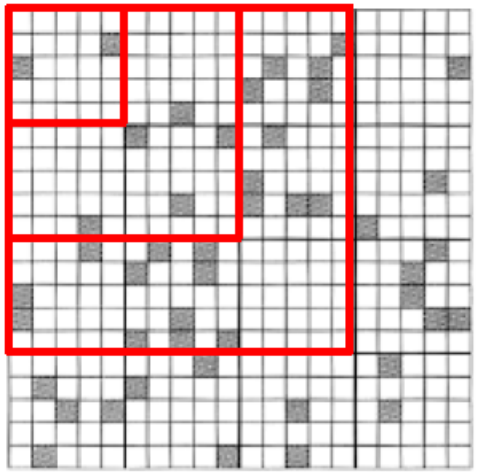
Mixing order

The sequence of addition of various ingredients while loading the mixer can affect the quality of premix. If proper mixer loading sequence is not followed, oil balls, chemical interactions and particle segregation can result in a premix.

Add reactive material at the end


Mixer evaluation

Scale of scrutiny



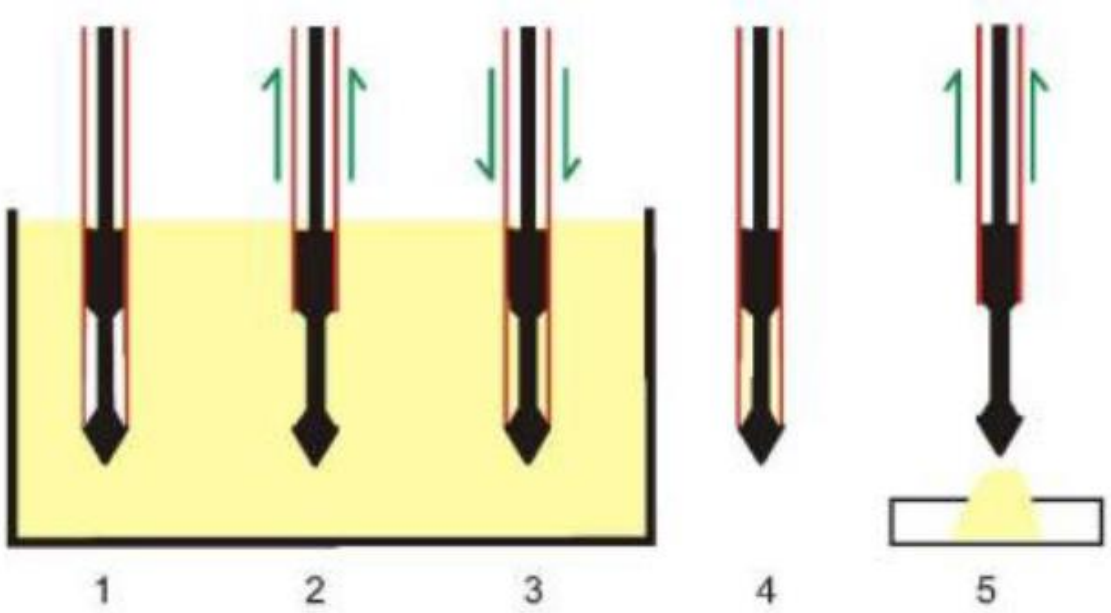
- Homogeneous mixture = samples taken from the mixture have equal properties
- Homogeneity depends on the sample size
  - all mixtures seem being uniform at sufficiently large sample size
- Scale of scrutiny
  - Minimum sample size to be used to achieve the variance of samples below desired limit

Prescribed Critical Limits

The mixer is considered to be producing homogenous feeds when the coefficient of variation for the test batch is:

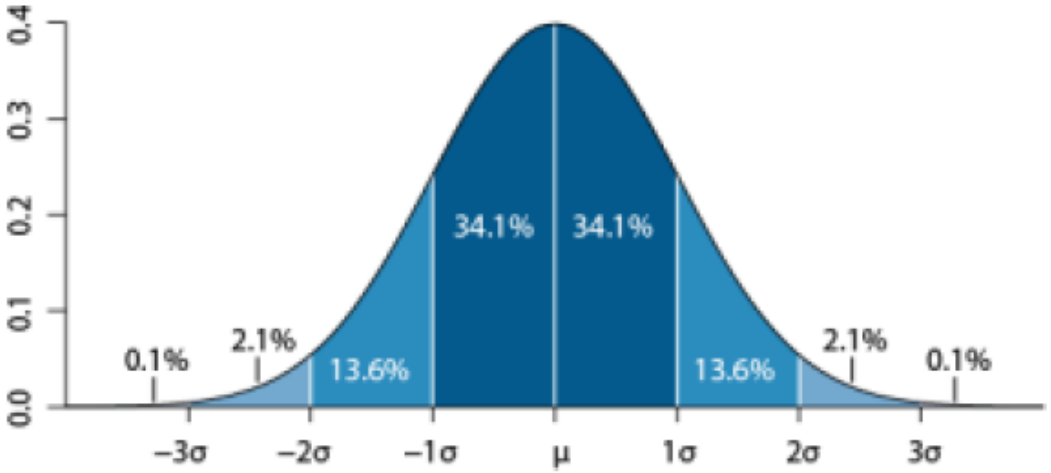
- No greater than **5**% for dilute drug premixes
- No greater than **10**% for micro or macro premixes and supplements
- No greater than **15**% for complete feeds and total mixed rations

Sampling



Standard error of a random variable

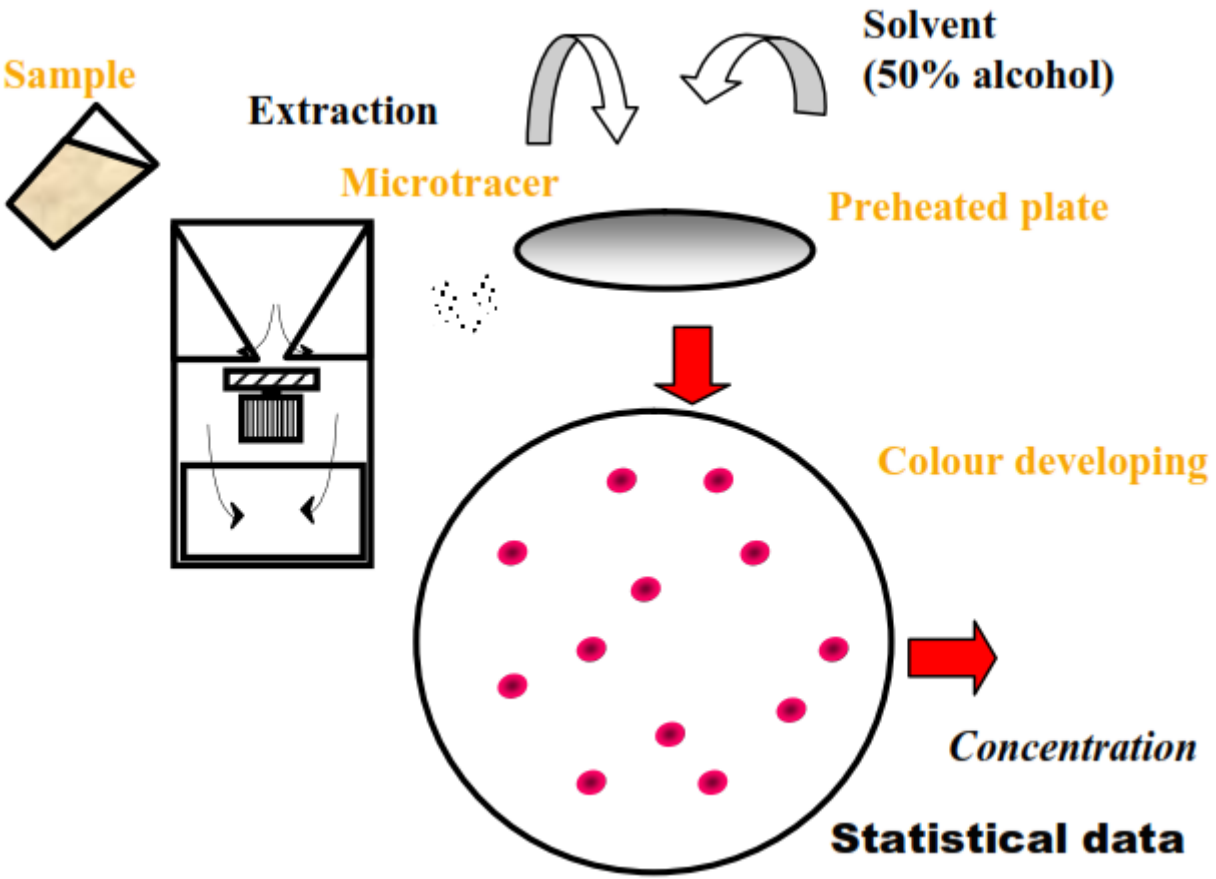
- measure of variability of random variable
  - random variable result will be within +- standard deviation from average with approximately 2/3 probability
  - andom variable result will be within +- 2 x standard deviation from average with with very high probability



$$\sigma_X = \sqrt{\frac{\sum_{i=1}^{N} (X_i - \overline{X})^2}{N}}$$

Evaluation of homogeneity in feed by method of microtracers®

Archiva Zootechnica 12:4, 85-91, 2009


Sample
Extraction
Solvent
(50% alcohol)
Microtracer
Preheated plate
Colour developing
Concentration
Statistical data

Evaluation of homogeneity in feed by Kansas University method

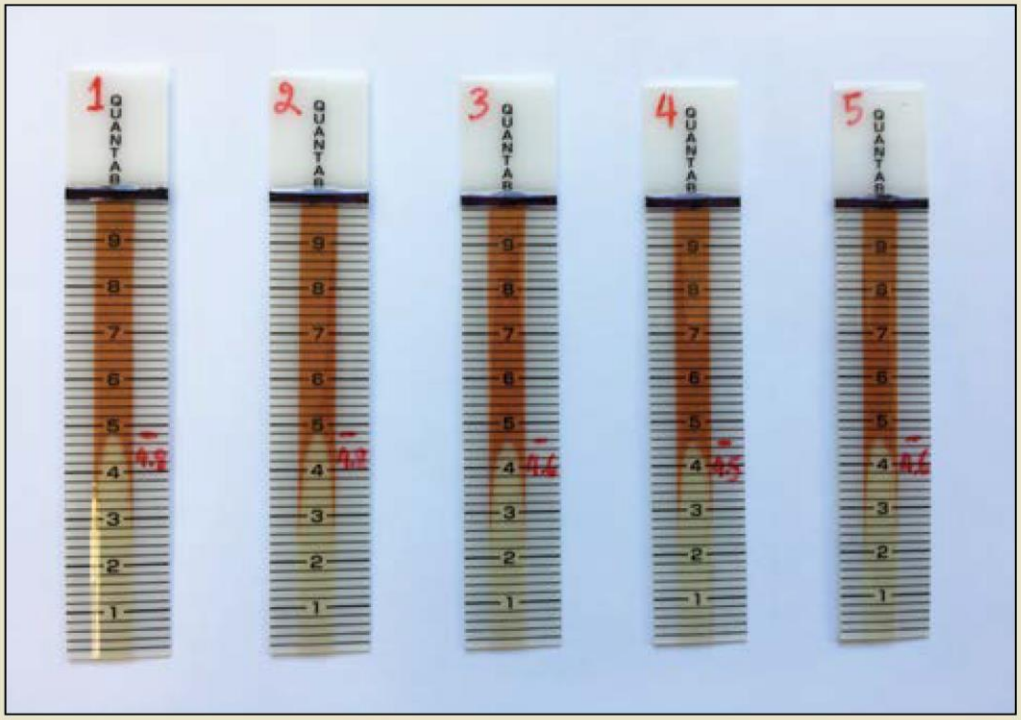
Sampling port near mixer discharge.

Uniformity test using the Quantab® Chloride Titator method

1. Weigh a 10-g sample of ground feed into a cup, then add 90-g of hot distilled water (140°F) to the cup using a 0.1-g readability scale for both sample and water.
2. Stir mixture for 30 seconds, allow to rest for 60 seconds and stir for another 30 seconds.
3. Place a folded filter paper into the cup and then insert a Quantab® strip range 30 to 600 mg/L (Hach Company, Loveland, CO) into the liquid at the bottom of the filter paper. The same lot of Quantab® strips should be used for all ten samples.
4. Read the Quantab® number at the top of the white peak after the color of the top band of the strip has changed from yellow to black, and then convert the Quantab® strip reading to %NaCl using the chart on the bottle.
5. Calculate the %NaCl of the sample by multiplying the %NaCl from the table on the bottle (from Step 4) by 10.
6. Compute a CV from the results of 10 samples within a batch to determine mixing uniformity. The CV for each batch is calculated by dividing the standard deviation by the average value multiplied by 100.

(Right): Quantab in filter paper.

(Below): Quantabs from mixer test.



Interpretation and corrective action of mixer tests (Herrman and Behnke, 1994)

Percent coefficient of variation	Rating	Corrective action
<10%	Excellent	None
10–15%	Good	Increase mixing time by 25 to 30 percent.
15–20%	Fair	Increase mixing time 50 percent, look for worn equipment, overfilling, or sequence of ingredient addition.
>20%	Poor	Possible combination of all the above. Consult extension personnel or feed equipment manufacturer.

Effect of marker selection and mix time on the coefficient of variation (mix uniformity) of broiler feed

Kansas University

Effect of marker selection and mix time on CV in the mixing process			
Marker	Mix time (min)		
	0.5	2.5	5.0
DL Met	23.86a	4.56ab	9.47b
L Lys HCl	19.75a	16.00ab	8.70b
CP	7.73	7.29	6.86
Chloride ion	20.26	12.75	15.08
P	13.72	6.46	6.27
Mn	36.25a	20.80a	17.59b
Microtracer Red #40 (count)	21.77a	11.72ab	10.43b
Microtracer Red #40 (absorbance)	21.13	20.52	16.88
Microtracer RF Blue lake	32.49a	20.09a	18.64
Roxarsone (3 Nitro)	30.42	25.15	25.54
Semduramicin	27.40a	16.11a	11.23b

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Scrutinizing mixer efficiency and poultry feed homogeneity

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Objective of the study

Correct marker selection is very important to accurately calculate the mixing coefficient of variation, and its affect on the accuracy of evaluation. In a study, two sources of zinc oxide were evaluated, for scrutinizing mixer efficiency and poultry premix homogeneity.

Materials and methods

- **Treatments**

Activated ZnO, (HiZox®)

Regular ZnO

- Both source contained 76% pure Zn

- **Sampling**

Premix collected from mixer after 60 seconds mixing. Samples were taken by a special sampling instrument installed at the discharge of a three-dimensional paddle turbo mixer.

- **Measurements**

Particle size
Flowability
Zinc content of (5%) broiler breeder premix samples were measured by atomic absorption spectroscopy.

- **Statistical analysis**

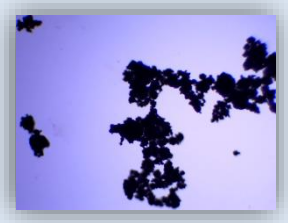
Analysis was carried out by the general linear models procedure of the SAS 9.0 software.
Testing homogeneity of variance was done by Brown-Forsythe test.
Trial was conducted in the feed mill laboratory of the academy of Mina-Toyoor.

Results

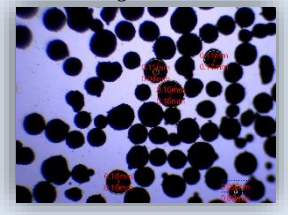
Results indicated that homogeneity of premix was affected by the source of zinc oxide ($P<0.1$).

Physical Properties of Different Zinc-Oxide Sources

Zinc Oxide source	Particle Size (µm)	Shape	Angle repose (degree)	Mixability
Activated ZnO	<100	platelet	28	good
Regular ZnO	100-1000	rod-like	35	poor

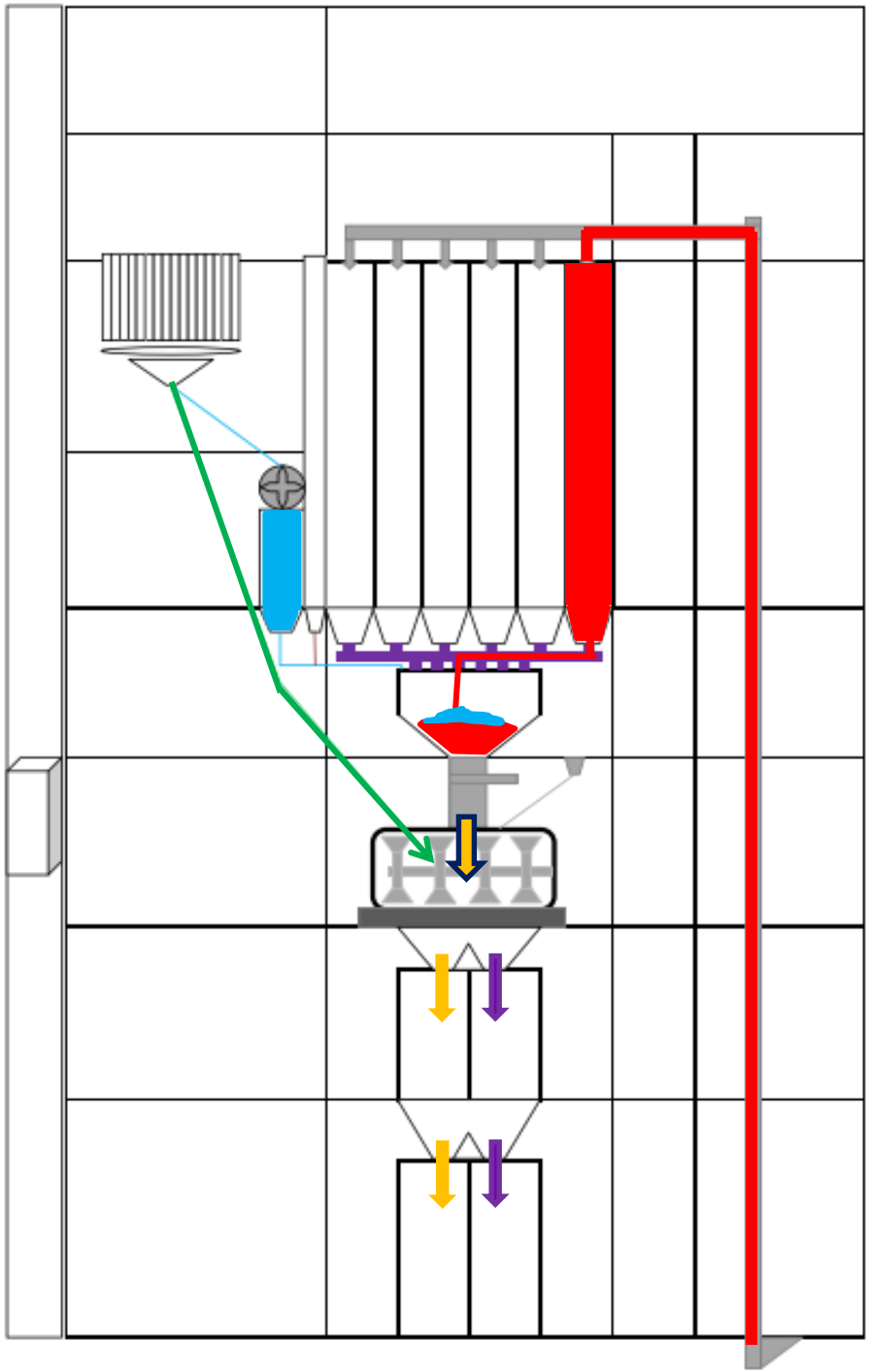


Regular ZnO



Activated ZnO

Coefficient of variation for premix contained activated zinc oxide was significantly better than Those contained regular ZnO (3.65 vs 5.65).




PLC


Sampling


Sampling 1
Sampling 2


Packing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