NINE THINGS YOU SHOULD KNOW WHEN CONSIDERING A 3D SHAKER MIXER

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In the arena of various types of blenders available in the market, 3D mixers are capturing their share with new applications and overcoming limitation of so called 2D blenders. Current applications suffering by high time of blending, non uniform mixing or blender cleaning validation or human exposure to ingredients have now better alternative in 3D mixer.

There are nine things one should know while considering 3D-shaker mixer which are discussed as follows:

1. What is a 3D Shaker Mixer?

It is a mixer blender moving in 3 dimensions rotating on 2 axis. Unlike to conventional blenders like V or Double cone or barrel type blenders, which rotates only on single axis, 3D mixers rotate in all 3 planes. It is called shaker mixer because it makes 2 rotational and 2 linear motion in every cycle of revolution. Inversion is the main principle for mixing particles – solid or liquid or suspensions in removable container or bin. Ingredients to be mixed are filled in a sealed container (steel or glass or other special material) and fitted in the shaker mixer.

2. What are the main advantages of the 3D shaker blender?

3D blenders are ideal homogeneous mixer with zero shear force. They are called mixer with 'Impossible to perfection' mixing capability.

Shaker blenders are suitable for thorough blending of powdery material like dense powders, fragile solids, and abrasive materials as well as liquid and suspensions. They are commonly used for making precise blends when trace components are present (<1%), or when ingredients are vastly dissimilar in size and density.

The biggest advantage is flexibility of using customer choice of container shape, size and material of construction. Since, the container is separate part of mixer and it is removable; variety of shapes and volume combination can be explored. Also, no rotating blade or agitator inside the container – and so they are called zero shear force mixers. There is no particle shearing or breaking as there is no rotating member inside the mixer.

3. Can a 3D blender break up agglomerates / lumps?

It is true, that excessive mixing or ingredients with hygroscopic nature form lumps while mixing. Though its a gentle blending device and ideal for free flowing material, a 3D shaker mixer can be used for such applications by adding lump breaking elements (like balls) or inserting static blades.

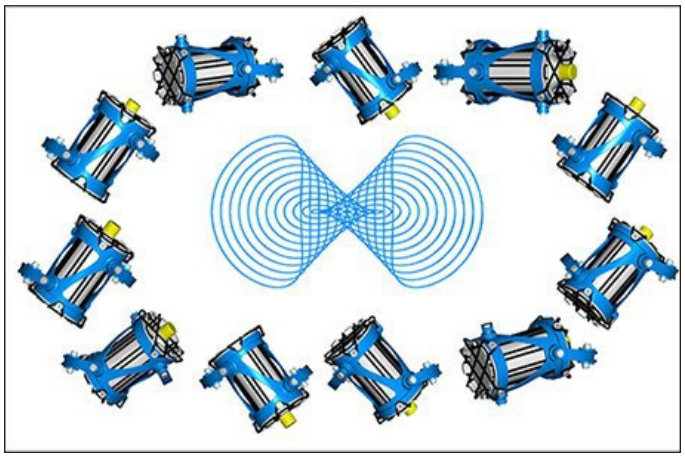

Figure 1 : Motion of 3D-Shaker Mixer Drum Changes its position in all three planes making inversion rotation.

JIGAR TALATI, CEO and Principal Designer at Hexagon Product Development holds various patents on 3D-Shaker Mixers along with few other products developed and sold by Hexagon. Hexagon is one of the largest manufacturers of 3D-shaker mixer with focus on customization. Hexagon produces Alphie mixer in range from 3 litres to 1000 litres and above with installations worldwide (URL: www.alphiemixer.com).

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4. Can it be used for solid-liquid mixing?

Yes, the 3D mixers can be used for mixing low-viscosity slurry-type applications where both liquids and solids are added in the container before loading into the mixer. There can be also a design, where the liquid can be constantly fed into from top.

5. What other factors can contribute to blend quality in a 3D blender?

The level of filling in the container is crucial in getting correct blend. As a rule, min 20% of the space should be kept empty in the container so the ingredients get sufficient space to move around. Of course, in some applications involving liquid, the filling can be as high as 90% and still best results can be obtained.

For hygroscopic characteristic nature powder mixing applications, pre sieving of such powder before blending helps a lot in breaking lumps and quick mixing.

6. How to scale up the laboratory capacity 3D blender to pilot and production size?

The most challenging part after research is to reproduce similar results in larger or production scale operations. As a rule, the relation between speed – time combination to capacity are not linear. In 3D or for that case any kind of blender, Froude Number theory is applied in arriving at new time and speed. The key factor in deciding this is consideration of peripheral or tangential velocity and not simply the rotating rpm of drum. As it can be understood, with larger the diameter of rotating vessel, surface area also increases and so ingredient particle has to travel longer path in one revolution. We have developed a scale up utility, which can quickly give data on higher size volume based on trial result data.

Figure 2: Alphie 3D-Mixer Laboratory Model can accommodate any smaller shape / size of container

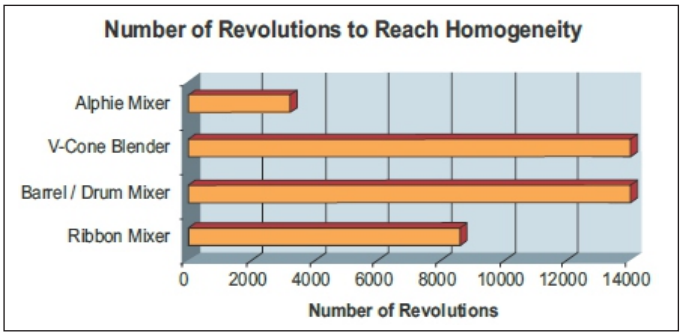

Figure 3: Comparision shows that Alphie 3D-mixer gives 3 to 4 times faster homogeneous mixing result than conventional mixer

7. What are the disadvantages?

Since 3D shaker mixers mixing parameters are much different than the conventional mixers, operator need to validate its mixing time and speed combination for the optimum results. It is not always true that mixing at highest speed and for longer time yields good result. Over mixing results in churning effect and generates problems of local heating and agglomeration.

Also, these blenders are not very versatile when sticky or tacky solids, or paste-like materials are present.

8. What types of blender control parameters are available?

The most basic controls are capability to change speed and time of mixer. Further, our shaker mixer can rotate in both forward and reverse direction. So, both direction change and their individual time can be set for specific mixing application. We also offer Recipe concept commonly used in microwave oven which has pre loaded speed and time combinations. User can also set their own recipe. Controls also include for starting, stopping, and inching / jogging the rotating drum. A variable frequency drive is used for softer start and controlled torque output. For specific customer needs, we offer 21 CFR compliance panels also.

9. Is it possible to arrange a laboratory free trial?

Hexagon offers pre purchase trial option to prospect buyers. Customer can come with their own product and various trials with speed and time combination can be conducted in our laboratory. In certain cases, we offer on site trials also, where our testing engineer carries the blender to customer end and gives trials. Cases needing trials for longer duration needs trial mixers to be kept at customer site is also available.