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Mixer Performance



Mixing Equipment



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Factors that should be considered when selecting and sizing a mixer are:

- Production capacity requirements
- The bulk density of the mixed feed
- The amount of liquids to be added
- Area (space) restrictions
- The degree of cleanout
- The desired mixer performance criteria

Mixing Equipment



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Single Shaft Mixer



Mixing Equipment



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Ribbon Mixer



Mixing Equipment



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Paddle Mixer



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Twin Shaft Mixer



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Twin Ribbon Mixer



Mixing Equipment



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Twin Paddle Mixer





Mixer Uniformity



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Equipment should be selected to produce a consistently uniform feed.

- Procedures should be established to ensure that maximum uniformity is obtained.
- Personnel should be trained and educated to understand the concept of uniformity.
- Appropriate testing should be conducted to ensure that uniformity objectives are met.

MIXER CYLCE TIMES



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<input type="checkbox"/> Major and Minor scale Discharge Time	<u>30 sec</u>
<input type="checkbox"/> Micro Addition Time	<u>15 sec</u>
<input type="checkbox"/> Dry Mix Time	<u>30 sec</u>
<input type="checkbox"/> Liquid Addition Time	<u>45 sec</u>
<input type="checkbox"/> Wet Mix Time	<u>90 sec</u>
<input type="checkbox"/> Mixer Discharge Time	<u>10 sec</u>
<input type="checkbox"/>	TOTAL: 220 sec



Determining Mix Times



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- Minimum dry mix time is 25% of mixer's design test time.
- Minimum wet mix time is 75% of mixers design test time.
- Longer mix times will result in lower CV's



Determining Mix Times



EXAMPLE: Single shaft ribbon mixer. (Two minute mix)

- The “minimum” dry mix time is 25% of two minutes or 30 seconds.
- The “minimum” wet mix time is 75% of two minutes or 90 seconds.



Determining Mix Times



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EXAMPLE: Twin shaft mixer. (One minute mix)

- The “minimum” dry mix time is 25% of one minute or 15 seconds.
- The “minimum” wet mix time is 75% of one minute or 45 seconds.

Improve Cycle Time



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- Faster Liquid Addition
- Faster Scale Discharge
- Correct sized surge hopper



Mixer Profile



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TESTING





Mixer Profile



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- Mixer profiles are conducted to determine the appropriate mixing times for various formulations.
- A mixer profile should be conducted for each feed type produced.
- Records of your mixer profiles should be maintained in the Master Record File.
- Operation protocol should be set to ensure the maximum uniformity is obtained.



Mixer Profile



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- All personnel running the mixer should be trained in the concept of uniformity of feed mixing and of appropriate testing.
- Procedure for conducting a mixer profile involves taking samples at specific time intervals.
- Assay for an ingredient, nutrient or chemical that comes from a single source (Evonik Amino Acids)
- 10 samples should be taken from a batch of feed.



Mixer Profile



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- Samples can be taken from the mixer discharge conveyor. When taking stream samples from the surge conveyor, divide the mixer surge discharge time by 10 to determine the wait time between samples.
- Each sample should weigh approximately 8-12 oz. to allow for adequate analysis requirements.
- Each sample bag should show formula type, date, mix time, and be numbered 1 thru 10 as the samples are taken.
- The CV can be used to evaluate the results of the mixer profile. The acceptable CV for feeds is 10% or below.



Mixer Profile



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Check for Proper Sequence for Ingredient Addition:

- Major and minor scales should be completely discharged before adding micro ingredients. ***If your mixer is equipped with an air displacement vent, the air pressure from these scales discharging can cause micro ingredients to be blown thru the vent thus bypassing the mixer.***
- Micro ingredients should be added as close to the center of the mixer as possible.
- Liquids should be added after the dry mix time has expired and should be injected through several openings along the up side of the mixer, if possible, preferably through spray nozzles for proper dispersion.



Mixer Profile



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Check for Proper Mixing Cycle Time

- Major and minor scale discharge time _____ seconds
- Micro ingredient addition time _____ seconds
- Dry mix time (Starts after all dry ingredients are in the mixer) _____ seconds
- Liquid addition time _____ seconds
- Wet mix time (Starts after all liquid ingredients are in the mixer) _____ seconds
- Mixer discharge time _____ seconds
- **Total mixer cycle time** _____ **seconds**



Mixer Profile



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Before You Start Check:

- Is equipment cleanout adequate
- Are scales operating correctly
- Ingredients weighing within tolerance
- Is the mixer being filled correctly
- Are the liquid manifolds discharging evenly
- Adequate dry/wet mix times
- Confirm mixer surge cleanout time



Mixer Profile



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Before You Start Check:

- Is there excessive build up in the mixer? Build up on tub walls, ribbons or paddles and their support arms will have a negative impact on mixing efficiency. The mixer should be clean prior to taking samples.
- Is there proper clearance between the ribbons or paddles to the mixer tub? The ribbon assembly or paddles should be adjusted as close to the bottom of the tub as possible. Typical clearance is less than 1/4" from the bottom of the tub.



Mixer Profile



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Before You Start Check:

- Is the mixer rotation **correct**? Check the rotation tag, the ribbon or paddle cross arms (attachment arms) should be behind the ribbons or paddles as they move through the product.
- Is the mixer being overfilled? Visually check the fill level. On a single shaft mixer, the tops of the ribbons or paddles should protrude approximately 3-4" above the level of the ingredients at the center of the mixer. Over filling will inhibit mixing.



Mixer Profile



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Before You Start Check:

- Is the mixer discharge properly sealing. Check to see if the mixer discharge is leaking.
- Is shaft speed correct? Consult the factory for assistance when increasing shaft speed.
- Are any ribbons or paddles missing or bent?
- Establish sample intervals
- Prepare sample bags



Mixer Profile



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Sampling:

- Confirm feed type being produced
- Select sample point
- Take samples from batch two of run (cleanout)
- Take samples from third batch (retest back-up)
- Check batch report for possible production errors
- Prepare and send samples to the lab



Mixer Profile



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Out of Tolerance Investigation:

- Look for trends in numbered samples
- New ingredients used?
- New ingredient suppliers?
- Ingredient inventory issues?
- Grain grinding problems?
- Batch scale issues?
- Recent mixer problems?



Mixer Uniformity



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Factors that can affect the mixer's ability to uniformly blend ingredients.

- ❑ Ingredient characteristics
- ❑ Mixer design and operation
- ❑ Mixer condition
- ❑ Down stream flow
- ❑ Delivery system design
- ❑ Plugged liquid nozzles



Mixer Problems



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Vertical Screw Mixers:

- Over filling
- Worn vertical screws and screw housing
- Build-up on the vertical screw or in the mixer shell
- Improper clean-out, particularly the lower section.



Mixer Problems



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Horizontal Ribbon Mixers:

- Bent, broken, or missing ribbon sections
- Over filling/under filling
- Build-up on the center shaft (s) and/or ribbons
- A build-up of feed at one end or the other during mixing (often an indication of improper rotational speed)
- Excessive clearance between the outer ribbon and the mixer shell (a source of cross-contamination as well as poor mixing performance)
- Rotational speed too fast or too slow
- Incomplete clean-out after the batch is discharged



Mixer Problems



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Horizontal Paddle Mixers

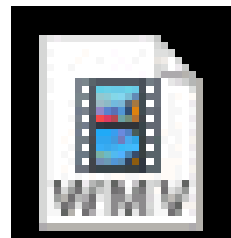
- Bent, broken, or missing paddles (plows or shoes)
- Inappropriate paddle alignment or adjustment
- Rotational speed too fast or too slow
- Build-up on the center shaft(s), on the paddles, or on the paddle spokes(arms)
- Excessive clearance between the paddles and the mixer shell
- Incomplete clean-out after a batch is discharged

Mixing Equipment



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Mixer Video



Website-ind twin ribbon_NEW.wmv



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THANK YOU