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TMR Mixing Goals and Principles

IDFD –Dubai 2018

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Total Mixed Ration (TMR) Mixer Function and Operations



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TMR Mixer Goals



- All ingredients in the mix
- Uniform Mix Throughout
- Uniform Distribution
- Optimum Moisture
- No Sorting
- Always Maintain Freshness

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TMR = TOTAL MIXED RATIONS



“THE SINGLE MOST INFLUENTIAL FACTOR INCREASING MILK PRODUCTION IN NORTH AMERICA IN THE LAST 20 YEARS”*

*Jake Tamminga –Pres. JAY•LOR.

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Size Does Not Matter! From 1.5m³ to 36m³ Size



The Function of the Mixer remains the same!

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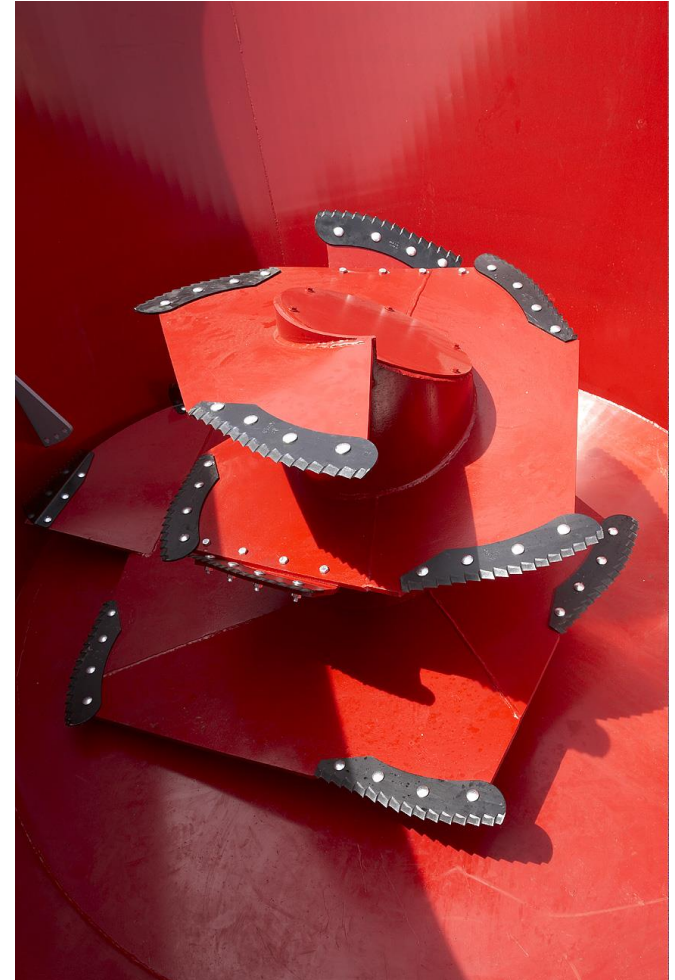


Auger Design For Processing

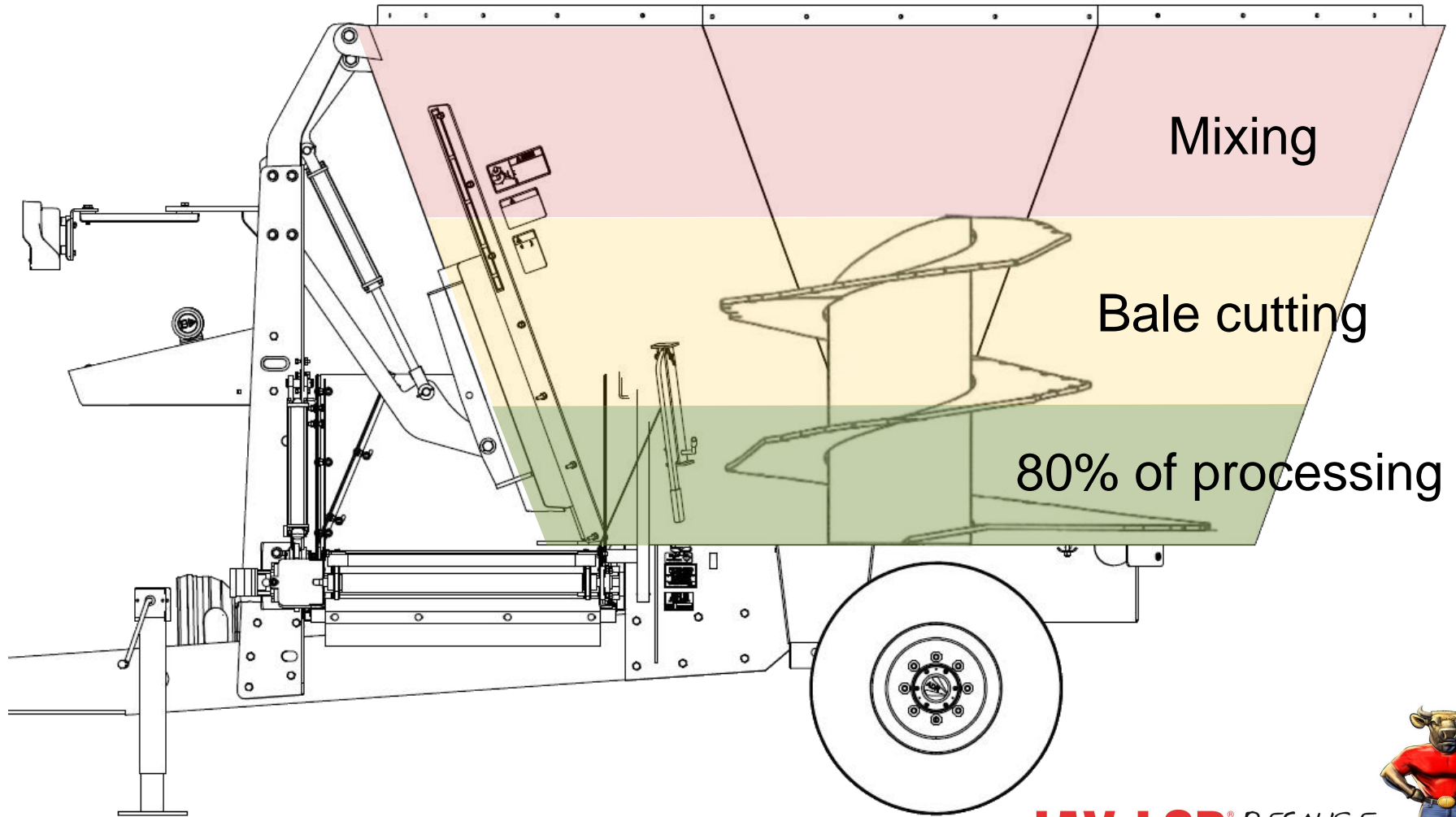
- Top knives cut bale open
- Bottom knives 80% of processing
- Slope, pitch and width of auger
- Square cut auger design
- Knife shape and settings

Results in:

- **Efficient circulation**
- **Low HP use**



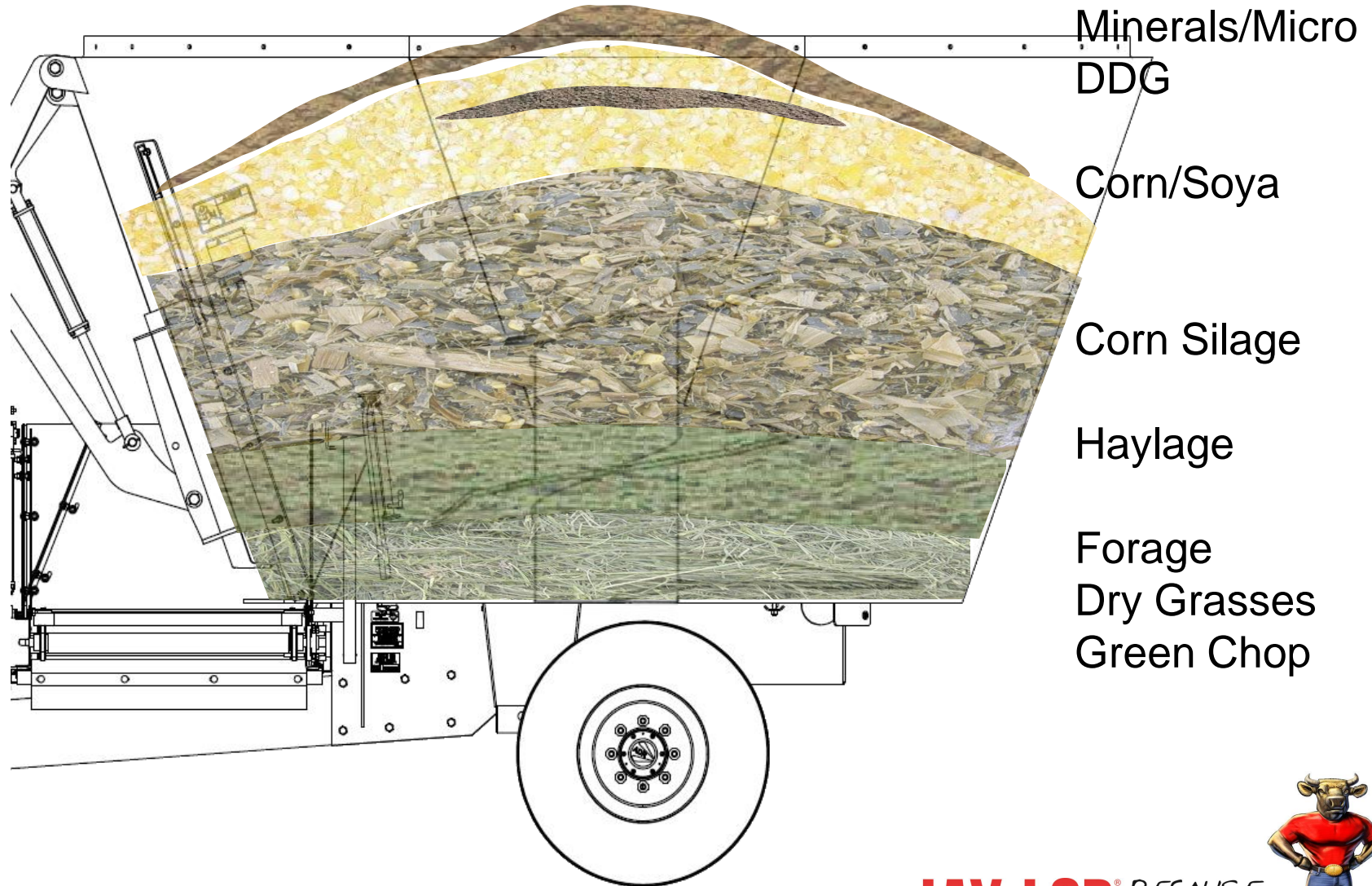
Forage Processing in The Mixer



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Vertical Mixer Loading

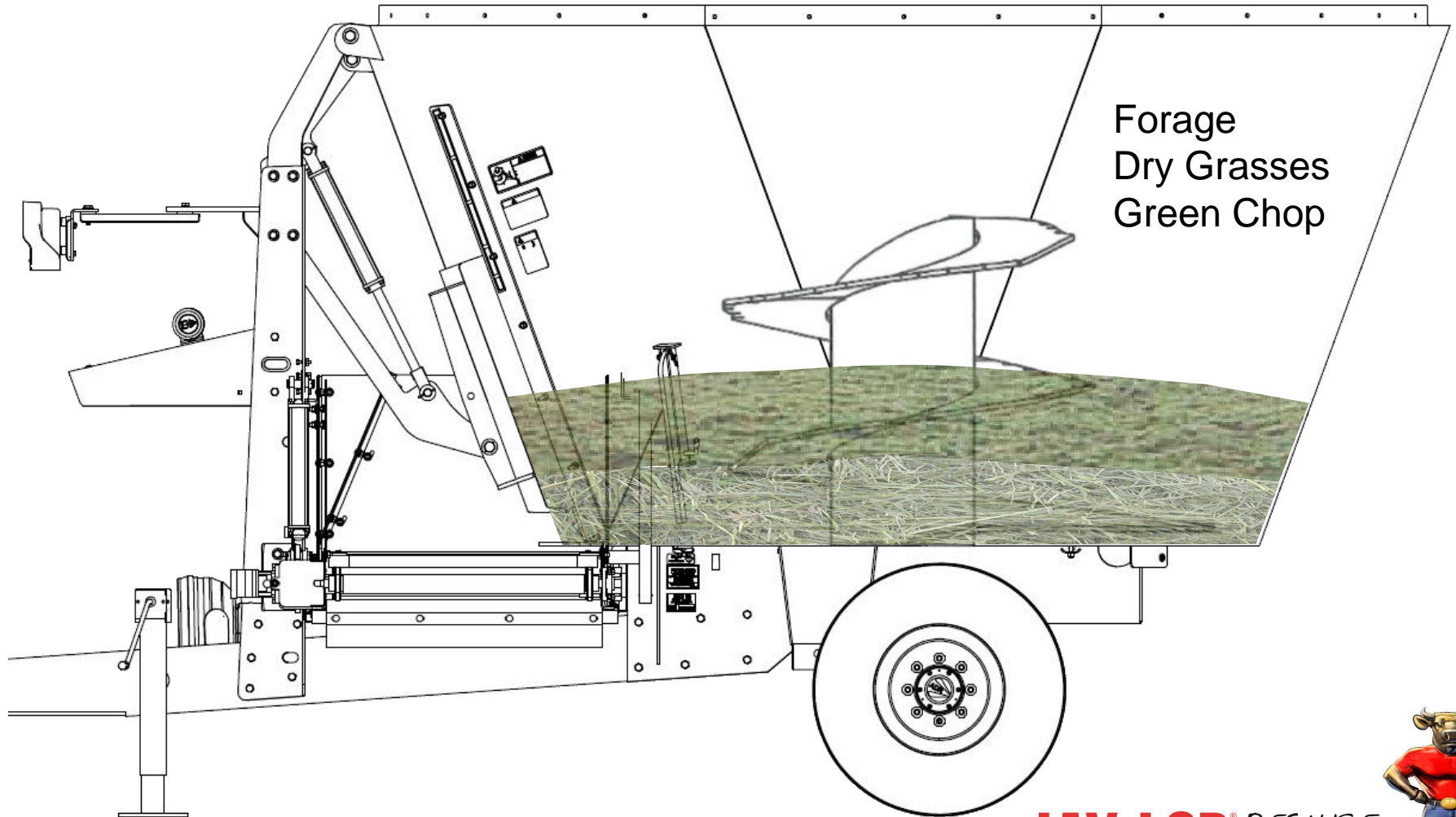


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Vertical Mixer Operations

Stage One: Load Forage/Grass/Chop
Process 10-15 Minutes ----Stop the Mixer



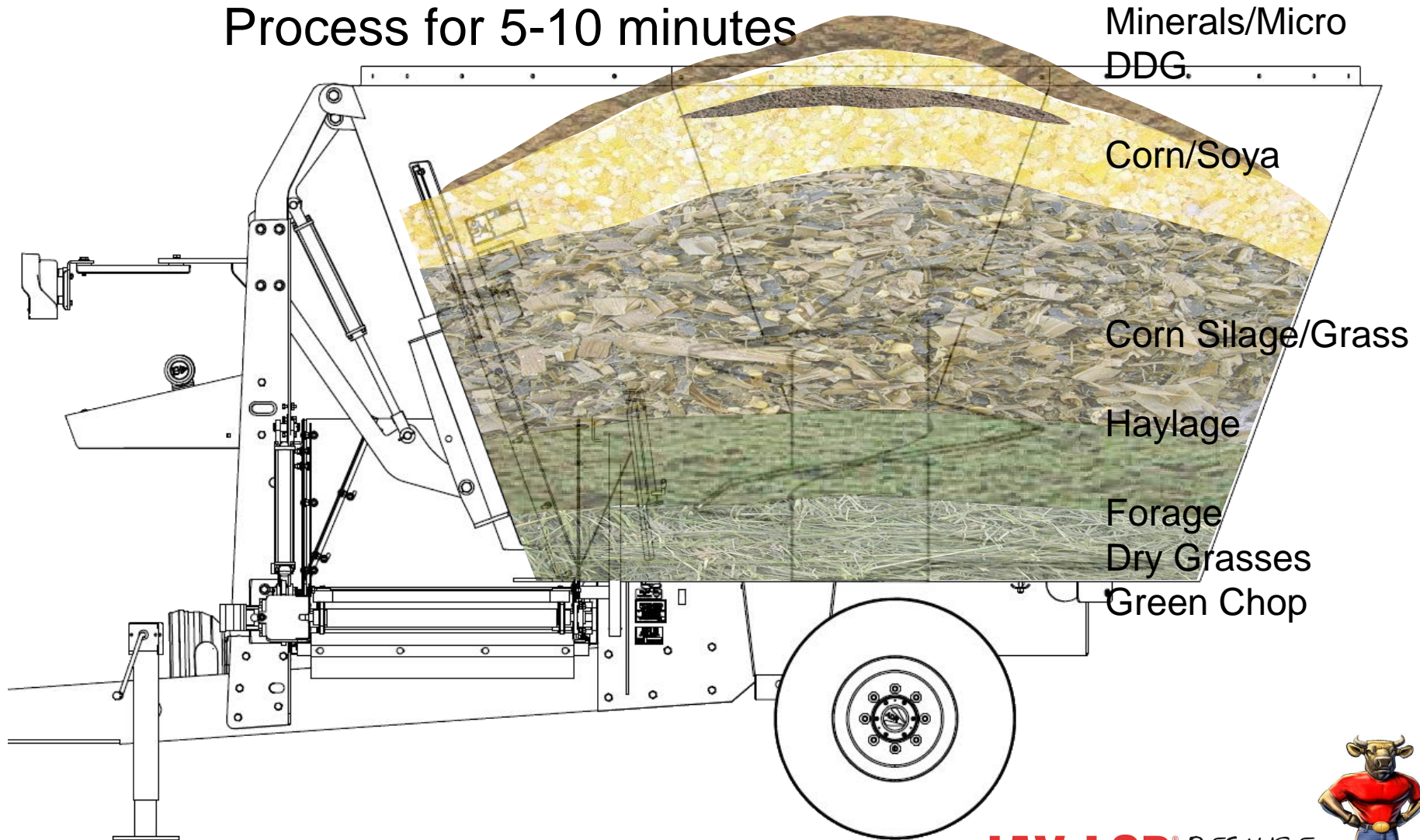
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Vertical Mixer Operations

Stage 2: Finish Loading the Mixer (Mixer off)

Process for 5-10 minutes

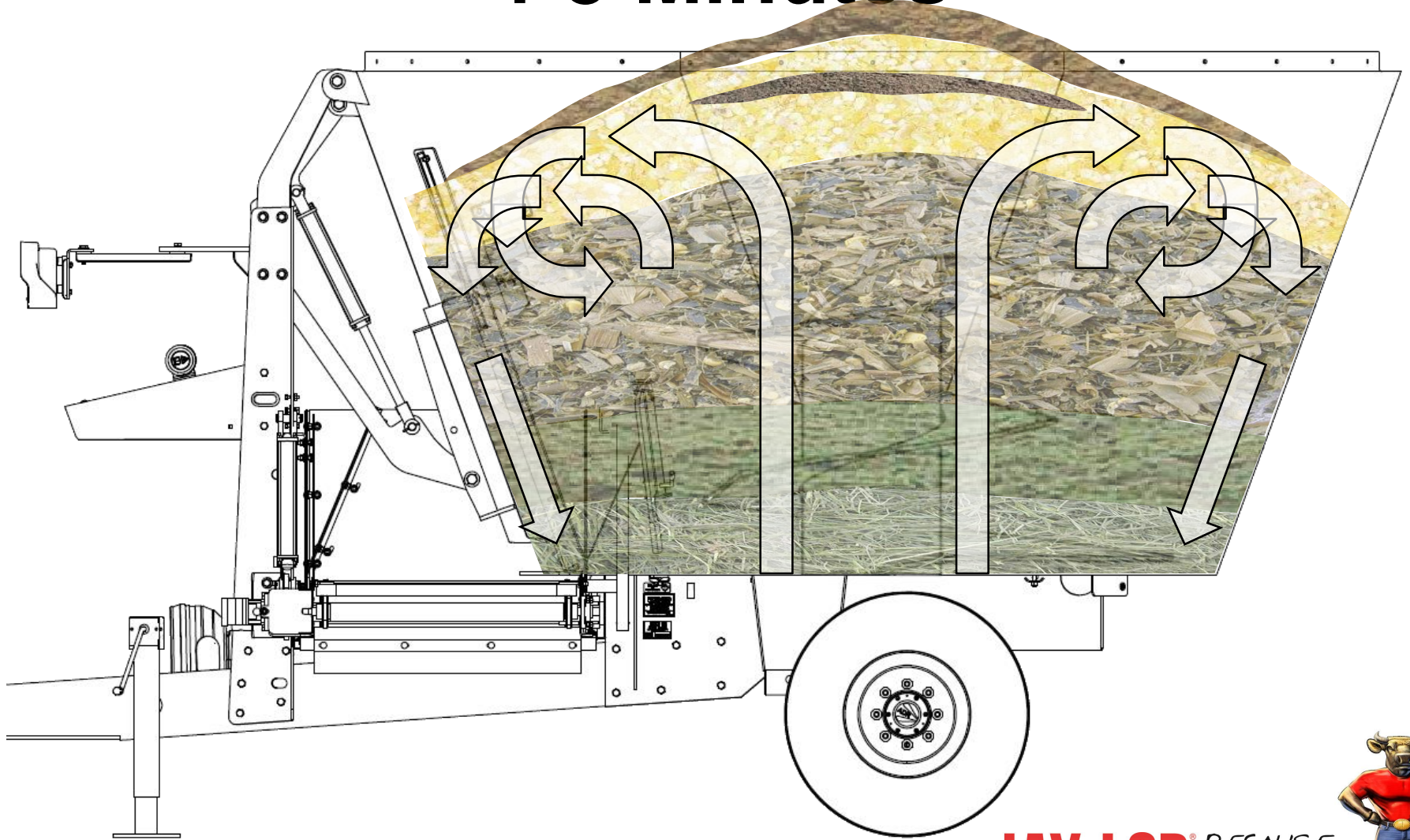


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Vertical Mixer Final Mixing

-4-5 Minutes



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Volcano Effect = Efficiency

Front to back mixing below, back to front above



5275 Mini Mixer

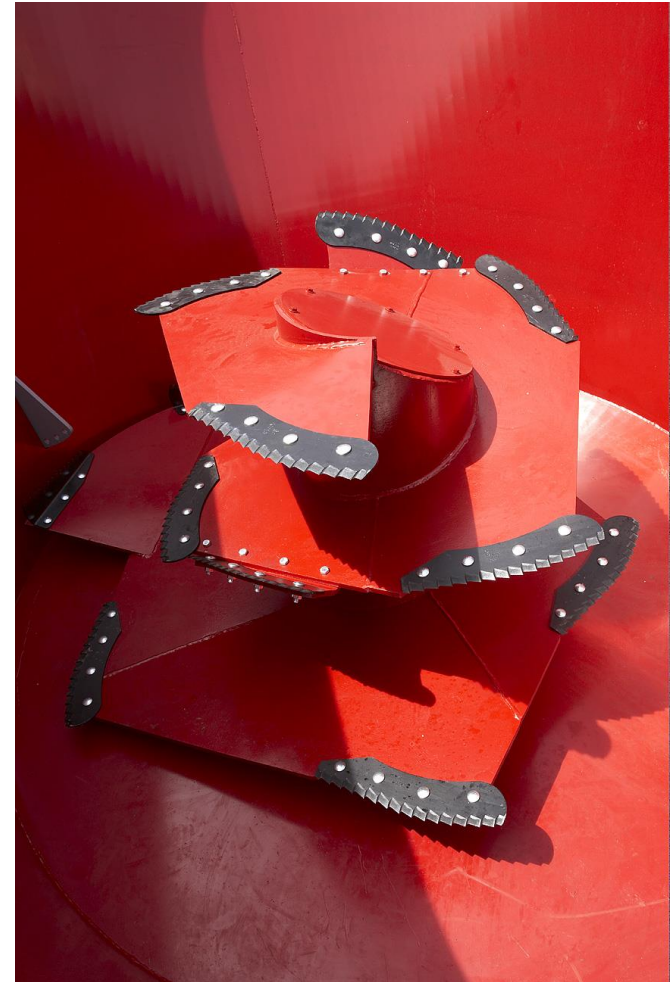


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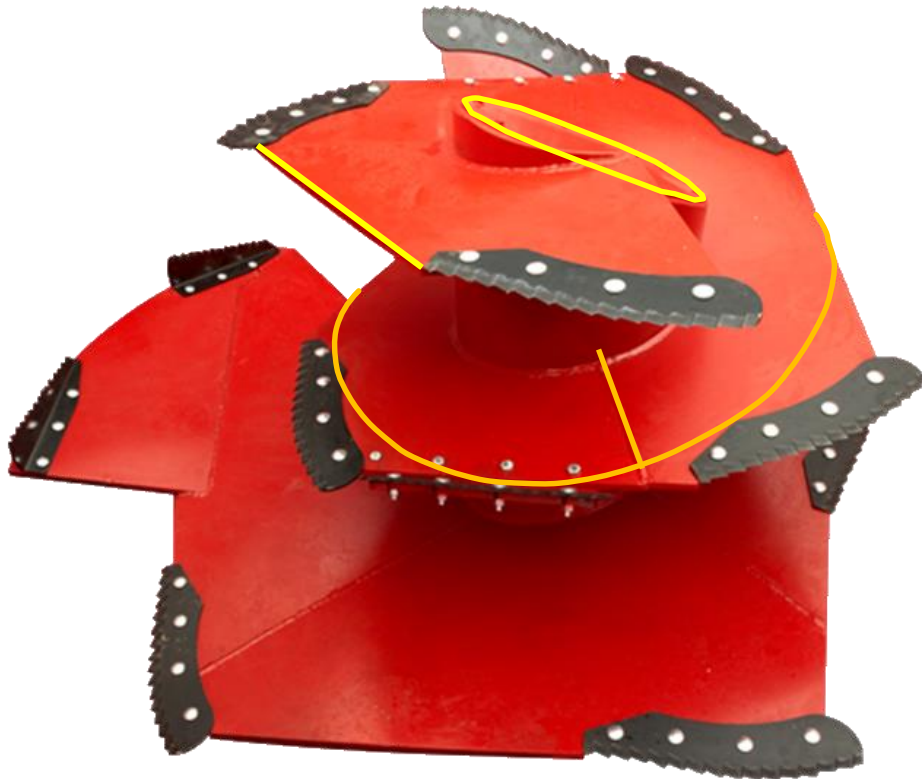
Auger Design For Processing

- Difference between mixers is auger
- Sloped top,
- Slope, pitch and width of auger
- Square cut auger vs Round auger
- Knife shape and position
- Uniqueness of 'flight'



Jaylor “square-cut” auger

Designed for optimal bale processing



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Auger For Feed Processing

- Slide plate folds feed into auger,
- 20% reduction in power consumption (HP)
- Patented Alexander knives under cut bales/green chop
- Reduce time to process long feed ingredients
- Vertical blades help cutting and feed out.



“The Evolution of the Revolution”



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Long Forage Processing Needs



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Size Does Not Matter! From 1.5m³ to 36m³ Size



The Function of the Mixer remains the same!

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Must be Adaptable to Processing Local Ingredients-King Grass



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Expected Mixing Times

Jaylor	Time
No processing*	3-5 min
1 st [round] bale** 25% Fresh Grass	+6 min
2 nd [round] bale** 35% Fresh Grass	+10 min
3 rd [round] bale** 50% Fresh Grass	+20 min

* All ingredients preprocessed; time after last ingredient added.

** Bale weight (hay equivalent) equals 1.5x mixer volume (cu. ft.).

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Simple TMR water system



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TMR water application system



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TMR Water Addition

- Add water after all ingredients have been added, during the final mixing phase.
- For lactating dairy cows:
 - Add 10 lbs. water per cow. Then observe for a minimum of 4 days for improvements in feeding behavior, intake, and/or manure consistency.
 - If there are improvements, add additional 5 lbs. water per cow, and observe again.
 - Continue cycle as long as improvement continues.
 - When last add has no benefit, go back one step.
- Use half dairy rate for beef cows.

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Dairy cow feed-bunk displacement



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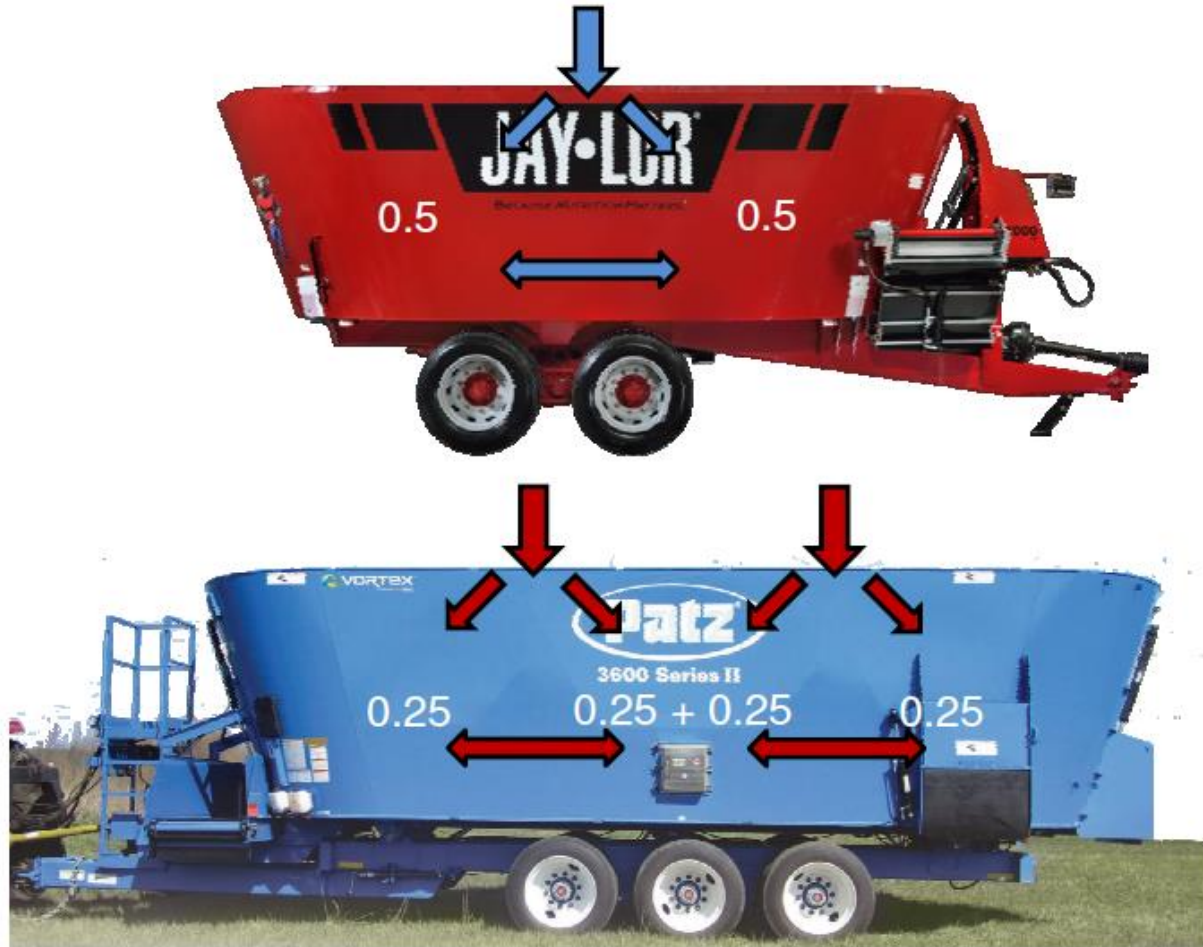
Efficiency Of Single Vs. Twin Augers

- There should be No difference in Efficiency with Twin Augers vs Single Auger
- An efficient auger
 - Allows twins to run two singles
 - AND Need front to back mixing too

Same Principles for 1.5m³ to 30m³ Mixers



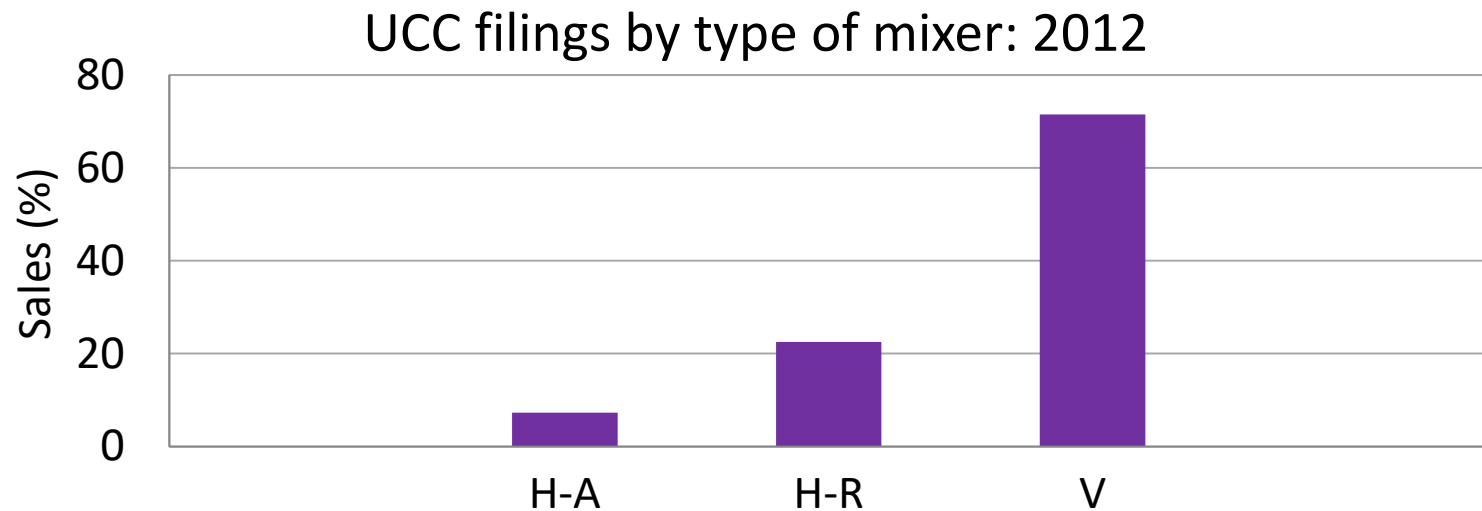
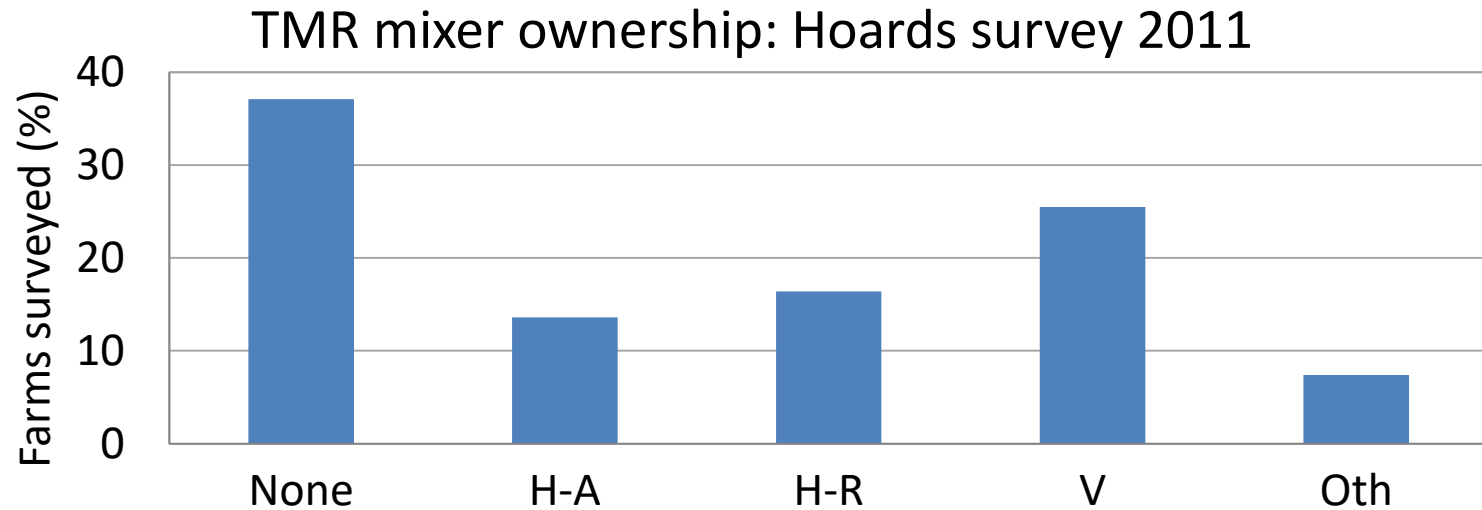
The challenge of 3 auger mixers



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Characteristics of Mixer Demand



*H-A = Horizontal auger, H-R = Horizontal reel, V = Vertical

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Ideal Ration Composition

Consider both particle size and moisture content



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Proof of Performance

- Several tests are readily available:
 - 1) Coefficient of Variation
 - 2) Penn State Shaker Box
 - 3) Sorting Behavior
 - 4) Observation



TMR Mixer Comparison



Jaylor



Vertical X

Source: Gallardo et. al. 2009. Coarse alfalfa hay processing

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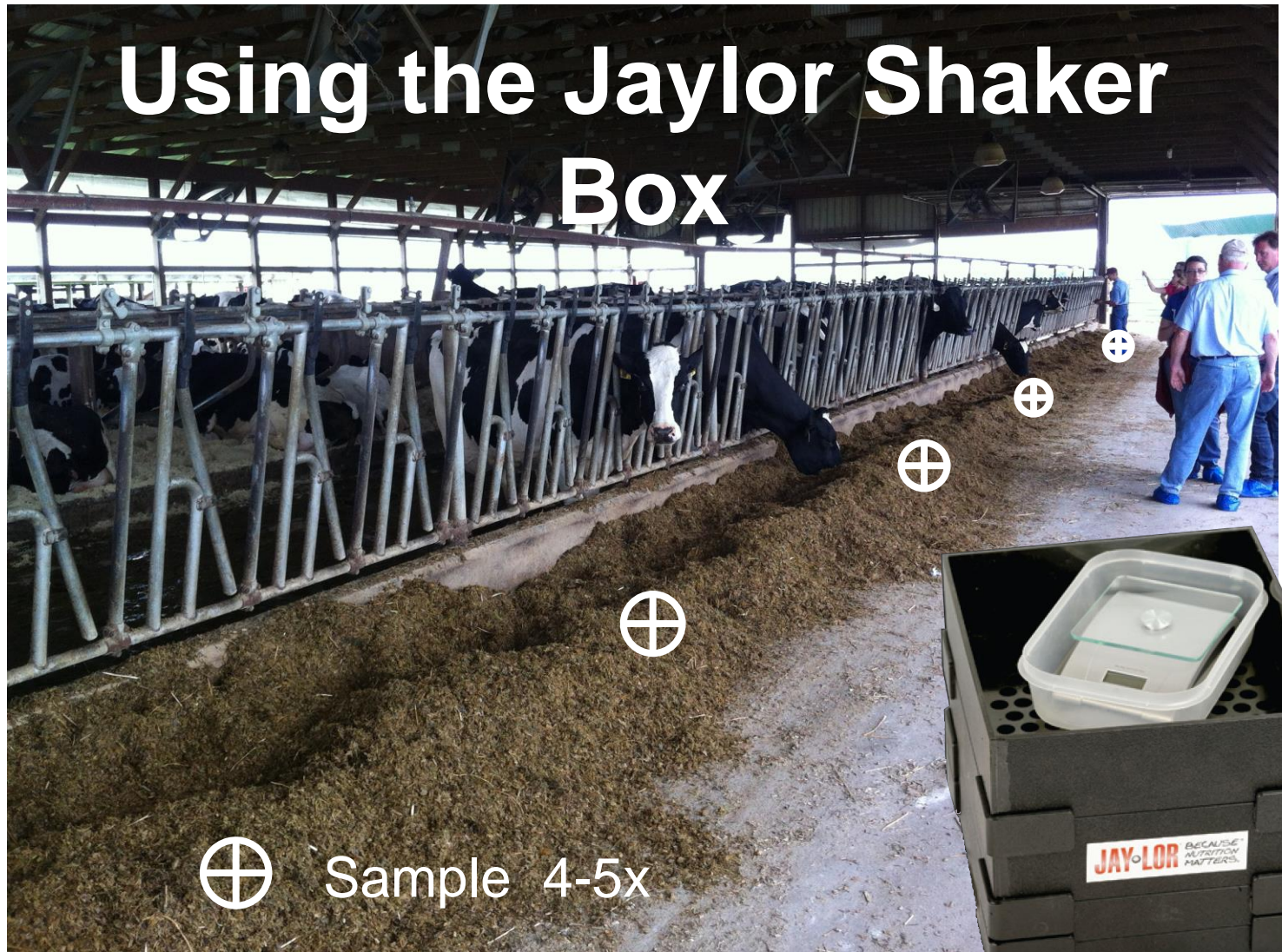


Coefficient of Variation

- Add measurable ingredient (carrots, candy)
- Take samples at 10 locations along the bunk
- Count measurable ingredient
- Compare beginning, middle and end results.
- The mix should be consistent all along the feed alley



Using the Jaylor Shaker Box



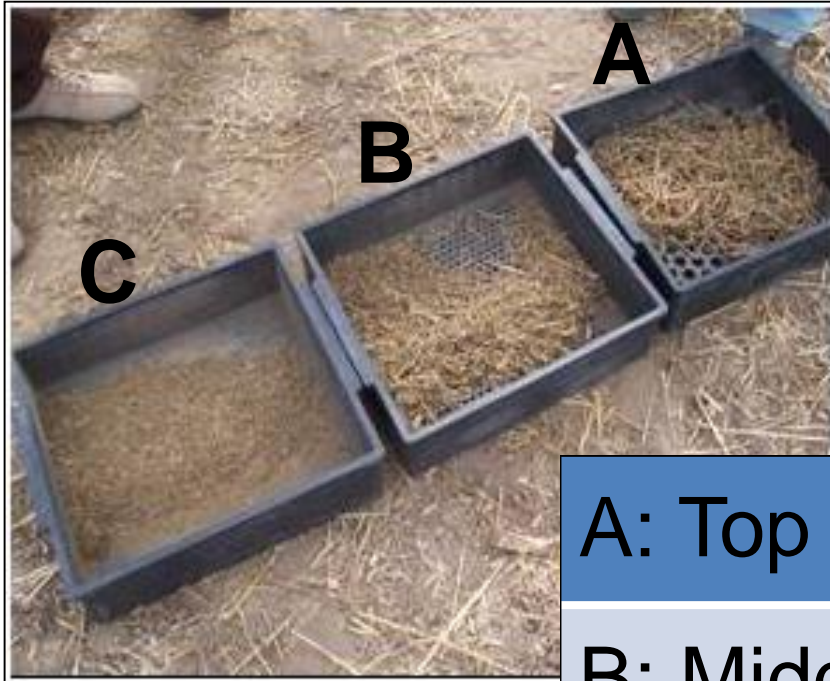
⊕ Sample 4-5x



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Jaylor Shaker Box Recommendation (%)



A: Top (3/4")	+/- 5
B: Middle (5/16")	> 45
C: Bottom	< 50



Shaker Box Included



Every Mixer



Minimized Hay Pre-processing Time (Efficient Use of Equipment)

	JAY•LOR (8 min)	Vertical X (16 min)
PSPS Tray	% Particles	
Top sieve	23	26
Middle sieve	47	41
Bottom pan	30	33

Source: Gallardo et. al. 2009.

PSPS = Penn State Particle Separator

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TMR PSPS Middle Tray CV (%) (Feed Quality and Consistency)

Mixing Time	JAY•LOR	Vertical X
6 min	7.8	28.1
8 min	9.0	23.6
10 min	8.2	18.2
12 min	8.7	15.8

Source: Gallardo et. al. 2009.

PSPS = Penn State Particle Separator

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Dairy Cow Sorting Behavior



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Dairy Cow Good Eating Behavior



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Final Test

**Watch your cows!
That is the true test for every mixer!**

Thank You!





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