



## SE Minnesota Dairy

2023



**Background:** This farm in southeast Minnesota milks 1400 cows. The feed center provides feed for all mature cows and heifers. Animals are located on two separate sites as indicated in the picture below. The feed center is centrally located with plans for expansion.

**General Layout:** The farm utilizes a stationary mixer with automated bin setup and has a partially enclosed commodity bay building. Forages are stored in drive-over piles on a concrete base within close proximity to the loading shed. Normally, there is one large corn silage pile and four separate piles for haylage crops. Haylage is stored by crop, which provides flexibility at feedout. If one crop tests poorer, they can blend with a higher quality crop. The current concrete footprint is larger than shown on the map and covers the area outlined in blue, which equates to an area of 345' x 445' (105 m x 136 m). There is a simple leachate collection system located next to the drive-over piles.

A FeedFIT Feed Lean analysis showed that the cost of feeding was \$4.37 per ton of feed delivered with an annual cost of approximately \$150,700. This includes ownership costs (all equipment used for feeding process), maintenance (filters, tires, oil, grease, etc.), fuel, and labor costs. The assessment showed that this feed center makes feed using noticeably less fuel compared to traditional setups, and potentially reduces the carbon footprint by using an electric motor to power the mixer. Another finding was that this feed center could be fully operated by one person. Two people currently feed, which works for this dairy because feeding gets done faster and labor is used in other places on the dairy such as the shop and cropping operations.

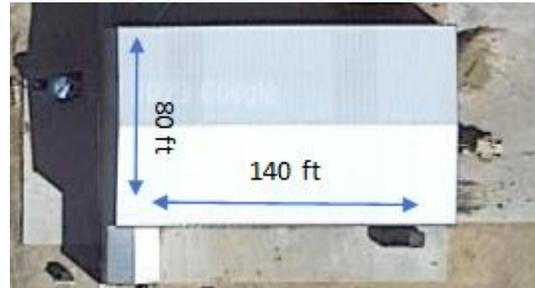


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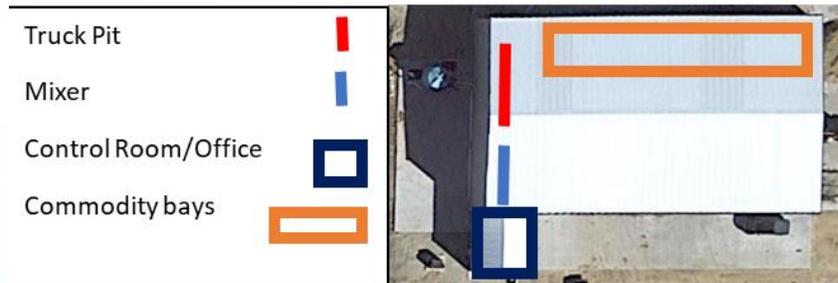


**Commodity Shed/Loading Area:**

**Photo:** Dimensions of commodity shed (80 ft x 140 ft or 24 m x 43 m)



**Photo:** Commodity shed layout





**Left photo:** Side entrance from drive-over forage piles

**Right photo:** Openings for delivery trucks to back directly into bays for quick and easy unloading of ingredients.



**Left photo:** View of bays and mixing area.

**Right photo:** Another view of bays. Ingredients with higher inclusion rates are housed closer to mixing area.

The bays holding home-grown forages are located closest to the mixer, while lower inclusion ingredients are located progressively further away. There is also one bay utilized for bag ingredient storage.

**Commodity Shed Dimensions:**

- Forage bays are 19' (5.8 m) wide x 30' (9.1 m) deep by 10' (3.1 m) tall
- Commodity bays are 15' (4.6 m) wide x 30' (9.1 m) deep by 10' (3.1 m) tall
- Shed Sidewalls are 22' (6.7 m) tall and pitched to the center
- Note the 5' (1.5 m) high steel plate covered end walls for durability

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**Stationary Mixer/Truck Loading Pit:** The farm uses a Supreme International 1200T vertical mixer. Bin socks are positioned to hit the center of the stationary mixer. Once feed is mixed, it travels up a 4' (1.2 m) wide belt that is driven by a 20hp electric motor to the Roto-Mix delivery truck. Feed is discharged to the delivery truck in less than 5 minutes. The truck is parked so that the driver can exit the truck and have direct access to the stairs. This design is a non-drive through pit, requiring the truck to pull in and back out. It also has a flat approach, which is much easier on equipment than if the loading pit had a ramp.

Loading pit dimensions:

- 47' (14.3 m) long for truck (for reference, the delivery truck measures 36.5' (11.1 m) long)
- 18.3' (5.6 m) wide
- 4' (1.2 m) deep pit with a 15" (38 cm) curb



**Left photo:** Stationary mixer with bin socks

**Right photo:** View of auger that carries feed from stationary mixer to delivery truck.



**TMR Electric Room:** The room is ventilated with a side overhead door to control temperatures in the summertime. A 200 hp electric motor runs the PTO driven mixer, a 3-phase power system. The blue hydraulic pump shown runs the doors on the mixer and was added after initial installation as the 2hp pump that came with the mixer opened the doors extremely slowly.



**Top left:** Overview of electrical room

**Top right:** Motor for TMR Mixer

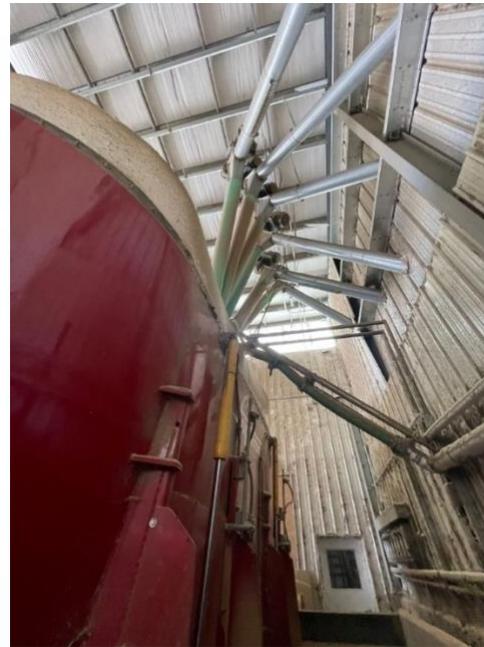
**Bottom left:** Motor for discharge doors on TMR mixer

**Bottom right:** PTO shaft from mixer to power room

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**Bin Setup:** The farm has 6, 52-ton bins for dry commodity storage. Dry commodities and liquids are transferred into the commodity shed and unloaded near the back of the mixer to avoid getting hit by the loader when loading forages. These are 10" (25 cm) augers. The farm has incorporated the Easy Automation system into their feed center to further automate their feeding process. This system automatically adds correct weights from their feeding software (EZ-feed) for automated commodity loading. The program works off the TMR mixer scale head so only one ingredient can be added at a time to get accurate weights. This type of automation system can be set up to integrate with other feeding programs dependent on if the program is willing to interface. It also tracks the remaining inventory left in the bins.

[Grain Handling Automation | Grain Handling Control System \(easy-automation.com\)](#)



**Left Photo:** Bin setup outside of commodity shed

**Right Photo:** Inside view of commodity shed where augers from bins come through.



**Left photo:** Front view of mixers with augers. There is a T-splitter on the liquid manifolds.  
**Right photo:** Molasses tank; whey tank sits underground.

**Grain Unloading System:** In addition to the bin setup, the farm has a drive-over unloading pit that is augured to bins. This allows for delivery with no disruption to the feed center. Corn is dried and stored on site and can then be directed to the roller grinder to be processed and added to bins as needed through legs.



**Top left:** Overview of grain unloading system

**Top right:** Close up of auger system

**Bottom left:** Window for grain unloading system to see grain/belt moving while unloading into dump pit.

**Bottom right:** Upward view of grain bin setup

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**Roller Grinder:** The farm has an IFA roller grinder system. This system is more costly than a hammer mill and costs around \$40,000. The advantage of this system is that it produces an excellent particle size, typically less than 500 microns and generally with less deviation. There is also more throughput than a hammer mill, at processing speeds of 8 tons/hr. Roller grinders can run rollers at variable speeds versus a roller mill where rollers run at the same speed. Overall, it produces a high quality and consistent product.



**Top left:** Outside of grinder system

**Top right:** Inside components of grinder system

**Bottom left:** Debris removal for grinder system

**Bottom right:** Debris collection for grinder system, which produces a cleaner grind

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**Grain Particle Size Determination**

**GRAIN PARTICLE SIZE DETERMINATION**

**TEST RESULTS:**

U.S. SIEVE #	MICRON OPENING	WEIGHT (GRAMS)	PERCENT	PERCENT LESS THAN
4	4750	0.10	0.07	99.93
6	3350	0.10	0.07	99.85
8	2360	0.50	0.37	99.49
12	1700	1.70	1.25	98.24
16	1180	4.20	3.08	95.15
20	850	5.60	4.11	91.04
30	600	25.60	18.80	72.25
40	425	32.10	23.57	48.68
50	300	22.30	16.37	32.31
70	212	14.10	10.35	21.95
100	150	10.50	7.71	14.24
140	106	11.50	8.44	5.80
200	75	4.90	3.60	2.20
270	53	3.00	2.20	0.00
PAN	45	0.00	0.00	0.00
TOTAL		136.2		

**ANALYSIS:**

Relative Corn Index (RCI)	466.8
Mean Particle Size (DGW)	381 microns
Standard Deviation (SGW)	2.11
1 Standard Deviation Distribution	181 - 803 microns
Surface Area (CM <sup>2</sup> ) / Gram	157.6
Particles / Gram	167557

RANKING	PARTICLE SIZE UNIFORMITY ( standard deviation )
Excellent	< 2.0
Good	2.0 - 2.2
Average	2.2 - 2.8
Poor	> 2.8

**Leachate Collection:** This farm utilizes a very simple leachate setup. There is a holding pit at the lower corner of the silage pad. During heavy rains, the excess rainwater flows out into the buffer strip. When the holding pit is full, it is pumped out using a 7.5 hp motor.

