Essentials for Better Silage in 2005

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KSU Silage Website

http://www.oznet.ksu.edu/pr_silage

KSU Silage Team Members

1972-2005 MS and PhD Graduates under Keith Bolsen

Recent Articles and Presentations by the KSU Silage Team

Silage Team | Silage Team Alumni | Publications | Silage Basics | Silage-L | Links

Basic Principles of silage

Instructions to join the listserv Silage-L and links to the archives

Links to other university and commercial forage websites

Silage Triangle

Dairy Producer

Crop Grower

Silage Contractor

What have we learned from the 2003 and 2004 silages?

Management is the KEY!

... and *ATTENTION to DETAILS* and *TEAM WORK!*

Four 'Big Ticket' Issues for 2005 …



1. Shrink is *'out-of-control'* on too many Dairies!




"Silage Shrink" *Economics* for the Dairy Cow


1. 85 lbs of milk/cow/day
2. 55 of DMI/cow/day*
3. Milk price = $15

*20 lbs haylage and

*45 lbs of corn silage

Corn Silage " Shrink" $: "Very Good" vs "Average"

+ 1% unit in "forage in *vs.* silage out"
= 0.25 lb increase in milk / cow / day.
= $11.40 per cow per year.

"Very Good" vs. "Average" (90% vs 80%)
+ 10% units x 0.25 lb
= 2.5 lbs increase in milk / cow / day.
= $114.00 per cow per year!!
x 100 cows = $11,400

Density …

Do not assume it.

Measure it!

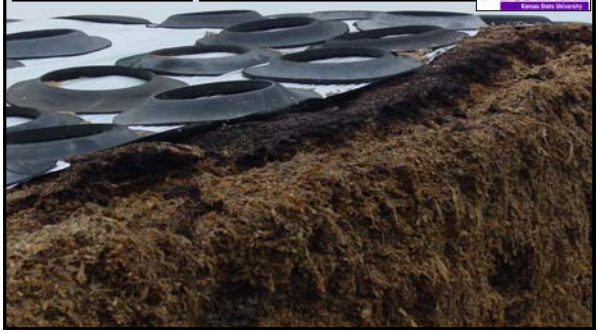



Do you believe these three are *"keeping up"*?


Two forage harvesters delivering 240 tons per hour, so the packing time per ton was *"less than 45 seconds"*.

Case Study Dairy's 7,000-ton drive-over pile of corn silage in April, 2004.

11.5 lbs of DM/ft³ = 22.5% shrink in 2003.
15.8 lbs of DM/ft³ = 15.0% shrink target in 2004.
An est. 525 tons of silage "saved" x $30/ton = $15,750



Spreadsheet Calculations of the Average Silage Densities in Drive-over Pile of Corn Silage on the Case Study Dairy.[1]

Component	Actual: 2003 corn silage	Predicted: 2004 corn silage
Bunker silo wall height, ft (0 for silage pile)	0	0
Bunker silo maximum silage height, ft	16	14
Forage delivery rate to bunker, fresh tons/hr	75	90
Forage DM content, %	0.32	0.34
Est. forage packing layer thickness, inches	8	5
Tractor # 1	35,000 (80)[2]	35,000 (80)[2]
Tractor # 2	0	35,000 (95)[2]
Proportioned total tractor wt, lbs	28,000[3]	61,250[3]
Avg silage height, ft	8.0[3]	7.0[3]
Estimated average DM density, lbs/cubic ft	**11.5**	**15.8**

[1] Values in **bold** are user changeable. [2] Estimated packing time as a percent of filling time is shown in parenthesis. [3] Values are the result of intermediate calculations.

An explanation of the spreadsheet calculations of the average silage density in drive-over pile of corn silage on the Case Study Dairy.

The 2003 drive-over pile of corn silage had a measured density of 11.5 lbs of DM per ft³ and an estimated silage DM recovery of 77.5% (i.e., a 22.5% 'shrink' loss).

The following changes were made for the 2004 corn silage:

1) The maximum pile height was lowered from 16 to 14 ft.
2) The forage delivery rate increased from 75 to 90 tons per hr.
3) The avg. pre-ensiled DM content of the forage was increased from 32 to 34 percent.
4) A second tractor was added to assist in packing.
5) The estimated forage layer thickness during the filling operation decreased from 8 to 5 inches.

These changes resulted in a predicted silage DM density of 15.8 lbs per ft³ and an estimated silage DM recovery of 85.0% (i.e., a 15.0% 'shrink' loss) for the 2004 corn silage.

2. Silage Inventory is *'out of control'* on too many Dairies!

***Silage Inventory Control* … These five Dairies have It!**

3. Clostridial, butyric acid alfalfa silage is a '*problem*' on too many Dairies!

The target is 40 to 45% DM … *Period!*
Error DRY; NEVER error WET … *Period!*

4. Too many 'over-filled' bunkers and drive-over piles like these four, which are also NOT SAFE!

We MUST start taking Silage Safety Seriously!

And SAVE LIVES!

Please …
be careful!

… and don't do something stupid … avalanches and tractor roll-overs happen!

… It's
'not a perfect world',
so dairy and beef producers and their nutritionists know problems occur in
every silage program.

A TROUBLE-SHOOTER FOR COMMON SILAGE PROBLEMS IN 2005*

Kansas State University Silage Team

****For many problems, the solution is the 'opposite' of the cause!***

Four Phases to Control for Every Silage!

1. AEROBIC
2. FERMENTATION
3. STORAGE
4. FEEDOUT

Remember: One (or more) of these can fail and lead to PROBLEMS!

EIGHT COMMON SILAGE PROBLEMS … and what you need to know.

1. EFFLUENT (seepage or run-off)
2. LARGE VARIATION IN THE DM CONTENT AND NUTRITIONAL VALUE OF THE ENSILED FORAGE.
3. MISSING THE OPTIMUM TIME TO MAKE CORN OR SORGHUM SILAGE.
4. HIGH BUTYRIC ACID AND NH_3-N LEVELS, PARTICULARLY IN "HAY CROP" SILAGE.
5. HIGH ACETIC ACID CONTENT, PARTICULARLY IN "WET" CORN SILAGE.
6. HEAT-DAMAGED HAYLAGE OR SILAGE.
7. AEROBICALLY DETERIORATING CORN SILAGE DURING FEEDOUT.
8. EXCESSIVE "SURFACE-SPOILED" SILAGE IN SEALED BUNKERS AND DRIVE-OVER PILES.

1. EFFLUENT.

Causes:

Forage was ensiled too wet … period.

Weather did not allow the forage to be wilted properly.

Persons responsible for determining the DM content made a mistake.

Whole-plant corn or sorghum was harvested at an immature stage. Why?

- ✓ **The silage contractor arrived sooner than expected.**
- ✓ **Chopping began too early, perhaps because of the number of acres to be harvested.**

1. EFFLUENT … (cont.).

Solutions:

Use weather forecasts to make forage management decisions.

Take advantage of new equipment technologies.

Coordinate the merging of windrows with chopping time (the team's 'orchestra' conductor).

Monitor the maturing and dry-down rates of each field of corn or sorghum.

***Caution:* Effluent has a very high biological oxygen demand (BOD). It MUST be contained near the silo of origin and NEVER allowed to enter a nearby pond or water course.**

2. LARGE VARIATION IN THE DM CONTENT AND NUTRITIONAL VALUE OF THE ENSILED FORAGE.

Solutions:

Use multiple silos and smaller silos, which improves silage inventory control.

Ensile only one cutting of "hay crop" forage per silo.

Minimize the number of corn or sorghum hybrids per silo.

Shorten the silo filling-time, but do not compromise packing density.

3. MISSING THE OPTIMUM TIME TO MAKE CORN OR SORGHUM SILAGE.

Causes:

Warm, dry weather speeds the dry-down rate of the grain and forage components.

Rainy weather keeps harvesting equipment out of the field.

Difficulty in scheduling the silage contractor.

Solutions:

Plant multiple corn or sorghum hybrids with different season lengths!!

Improve communication between the dairy producer, crop grower, and silage contractor.

4. HIGH BUTYRIC ACID AND NH_3-N LEVELS, PARTICULARLY IN "HAY CROP" SILAGE.

Note: ***Legumes, particularly alfalfa, that are rained on after mowing have a much higher risk of clostridia growth. Why? Rain leaches soluble CHOs from the forage.***

Solutions:

Ensile all forages at the correct DM content … period.

Achieve a minimum packing density of 15 lbs of DM/ft^3.

Apply a homolactic inoculant to ensure an efficient conversion of plant sugars to lactic acid.

Avoid soil contamination throughout all field and silo-filling operations.

5. HIGH ACETIC ACID CONTENT, PARTICULARLY IN "WET" CORN SILAGE.

Note: ***Acetic acid indicates that the crop underwent a prolonged, heterolactic fermentation. The silage will have a distinct 'vinegar' smell. It is common to see a 1-to-2 foot layer of bright yellow, sour smelling silage on the floor of a bunker or drive-over pile. This silage is 'brutal' on fresh and high production cows!***

Solutions:

Ensile at the correct DM content, and particularly not too wet.

Apply a homolactic inoculant to ensure an efficient conversion of crop sugars to lactic acid.

6. HEAT-DAMAGED HAYLAGE OR SILAGE.

Note: ***This silage will be dark brown and have a strong burnt caramel/tobacco smell. The concerns are significantly reduced digestibilities of "bound" protein and energy.***

Causes:

The temperature of the ensiled forage should not increase more than 10 to 12° F above the ambient temperature at harvest.

If the temperature of the forage exceeds 115 to 120° F, heat-damage is likely to occur.

Most of this heat is from plant cell respiration, and it continues as long as oxygen is present in the ensiled mass.

6. HEAT-DAMAGE … (cont.).

Solutions:

Harvest at the correct stage of maturity, and particularly not too mature.

Ensile at the correct DM content, and particularly not too dry.

Do not chop forages too long:

- ✓ **no longer than 1-inch TLC for "hay crops".**
- ✓ **no longer than 5/8- to 3/4-inch TLC for whole-plant corn.**

Fill in a timely manner and achieve a minimum packing density of 15 lbs of DM/ft^3.

7. AEROBICALLY DETERIORATING CORN SILAGE DURING FEEDOUT.

Solutions:

Harvest at the correct stage of maturity and DM content, and particularly not too mature or too dry.

Do not chop whole-plant corn longer than 5/8- to 3/4-inch TLC.

Achieve a minimum packing density of 15 lbs of DM/ft^3.

7. AEROBICALLY DETERIORATING CORN SILAGE … (cont.).

Solutions:

Maintain a uniform and rapid progression through the silage face:

- ✓ 6 to 12 inches in cold weather
- ✓ 12 to 18 inches in warm weather.

Avoid feeding from large silos during warm weather months.

Minimize the length of time corn silage stays in the commodity area before it is fed.

Be prepared to add 2 to 4 lbs of buffered propionic acid per ton of TMR in warm weather.

8. EXCESSIVE "SURFACE-SPOILED" SILAGE IN SEALED BUNKER AND DRIVE-OVER PILE SILOS.

Solutions:

Achieve a high packing density within the top 3 feet.

Slope the surface so water drains off the bunker or pile.

Seal with polyethylene sheets immediately after filling.

8. EXCESSIVE "SURFACE-SPOILED" SILAGE … (cont.).

Solutions:

Overlap the sheets by 4 to 6 feet.

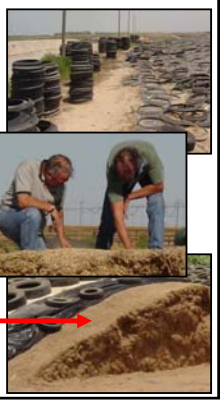
Put uniform weight on the entire surface.

Use truck tires that touch to weight the overlaps.

Whole tires are preferred to tire walls.

Truck tire walls are preferred to car tire walls.

Prevent damage to the seal during the *entire* storage period.



New Idea for Sealing 'Pits'?

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Typical Seal *Economics* for Corn Silage in a 40 x 100 x 12 ft Bunker Silo (~1,150 tons; @ 48 lbs/ft³) 288 tons in the top 3 ft @ $30 = $8,640

- **Typical Seal Economic Inputs:**
  1. **$30/ton of silage**
  2. **3.0¢/ft² x 4,000 ft² = $150 (20% overlap)**
  3. **Weight = zero cost**
  4. **$20/hr x 10 hrs = $200**
- **Sealing cost = $150 + $200 = $350**

Typical Seal *Economics* for Corn Silage (cont.)

Value of silage in the top 3 ft = **$8,640**

A. Typical seal: 288 tons x 78% saved x $30 = $6,750

B. Typical seal cost: = 350

Net value of corn silage saved with typical seal = $6,400

Silage saved with "no" seal = $3,400

Silostop *Economics* for Corn Silage in a 40 x 100 x 12 ft Bunker Silo (~1,150 tons; @ 48 lbs/ft³) 288 tons in the top 3 ft @ $30 = $8,640

- **Silostop Economic Inputs:**
  1. **$30/ton of silage**
  2. **10.0¢/ft² x 4,000 ft² = $500 (20% overlap)**
  3. **Weight = zero cost**
  4. **$20/hr x 10 hrs = $200**
- **Sealing cost = $500 + $200 = $700**

Silostop *Economics* for Corn Silage (cont.)

Value of silage in the top 3 ft =	$8,640
A. Silostop seal: 288 tons x 90% saved x $30 =	$7,780
B. Silostop seal cost: =	700
Value of corn silage saved with Silostop seal =	$7,070
Silage saved with "typical" seal =	$6,400

THANKS!!

www.oznet.ksu.edu/pr_silage

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