



A Comparison of Surfactants Used in U.S. Cattle Feedlots

Introduction:

A large commercial cattle feedlot invited AgriChem, Inc. to bring its pilot scale Grain Prep Auto Delivery System[®] on-site to evaluate the efficacy of several surfactant (grain conditioner) products. Following is a data summary, a description of the equipment, the test protocol, and all of the experimental data.

Summary of Data:

Product	Grain Moisture Content		Specific Absorption	Solution pH
	Incoming	Treated		
Grain Prep [®]	12.1	19.1	1.47	6.8
Science & Service	12.0	18.9	1.40	6.2
SarTemp	12.1	17.7	1.25	6.8
Mycoflake	12.4	17.3	1.15	5.9
Nutrichem	12.1	17.4	1.0	6.2
Water	13.0	18.1	1.0	6.8
EZ Flake	12.4	16.3	0.77	< 5.0

Equipment Used:

The pilot scale Grain Prep Auto Delivery System[®] was designed specifically to do this type of field evaluation. It is mounted on a 10 ft trailer and has:

1. A grain bin capable of holding approximately 300 pounds of grain.
2. Variable speed drives on the bin auger and treating auger. This provides a constant and reproducible grain flow control.
3. An on-line moisture sensor to continuously monitor moisture content of untreated grain flowing from the bin into the treating auger.
4. A precise surfactant solution metering system with an electronic flow meter.
5. A rack holding carboys of the test solutions with quick-connect type tubing connectors between the carboy and small centrifugal solution pump.

Procedure:

1. Samples of the surfactants to be tested were obtained from the inventory of feedlots using the tested products. This assured the product tested was a production sample and not specifically formulated for a test.
2. Approximately 40 pounds of surfactant solution was prepared for each product according to the manufacturers' suggested use rates. The products and use rates are shown in Table 1.

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3. 350 pounds of sacked corn was obtained from the local co-op and was mixed thoroughly in the grain bin. This assured all products would be tested on identical corn.
4. Grain flow was set initially and the controller was not changed for the duration of the test. A run time of four minutes for each product allowed:
 - A. all products to be tested with the single batch in the bin, but also a large enough sample of grain to be processed to approximate production conditions.
 - B. a "steady state" to be achieved in the tempering process.
5. Run order was randomized.
6. Treated grain was discharged from the treating auger into a woven plastic feed bag and allowed to "soak" for 30 minutes before a sample was withdrawn for laboratory moisture assay.
7. The moisture assay sample was withdrawn from near the center of the bag, blotted with paper toweling to remove surface moisture, placed in a labeled ZipLoc bag, and sent to the laboratory for a standard 72 hour oven-dry assay.

Data Gathered:

From the pilot trailer:

1. Average moisture content of incoming grain (*im*)
2. Final weight of treated (conditioned or tempered) grain
3. Volume of surfactant solution applied
4. pH of surfactant solution

From the laboratory:

Treated grain moisture content

Calculations:

1. Weight of applied surfactant solution
Volume (gallons) X 8.33 = pounds of applied solution (#S)
2. Initial weight of untreated grain (IW)
3. Final weight of treated grain X (1 - lab assay) = #s of dry matter (DM)

$$\frac{DM}{1 - im} = IW$$

4. Pounds of absorbed moisture
Final weight - initial weight = pounds of absorbed moisture (# AM)
5. %Absorption

$$\frac{\# AM}{\# S} X 100 = \% A$$

6. Specific Absorption = Ratio of treated to untreated water absorption rates
All of the data generated are presented in Table 2.

Table 1: Grain Conditioner Physical Data & Use Rates

Product	Suggested Use Rate	Density (lb/gal)	Solution* (ml/lb)
EZ Flake	6 oz/ton of grain	8.6	0.82
MycoFlake	4 oz/ton of grain	8.7	0.55
Nutrichem	16 oz/ton of grain	10	2.2
SarTemp	3 oz/ton of grain	10	0.41
Science & Service	5 oz/ton of grain	9	0.82
Grain Prep	0.09 oz/gallon of water	10.3	0.14

*Data used to calculate surfactant solution concentrations:

1. Target moisture addition rate
2. Amount of grain to be treated
3. Solution weight in carboy

Table 2: Experimental Data (Products listed in run order)

Product	Incoming % Moisture	lb Added Moisture	Final Weight	Treated % Moisture	Initial Weight	Absorbed Moisture (lb)	% Moisture Absorbed	Solution pH
EZ Flake	12.4	3.3	36.5	16.3	35.0	1.5	46	< 5.0
Mycoflake	12.4	2.9	37.0	17.3	35.0	2.0	69	5.9
Grain Prep	12.1	3.4	35.5	19.1	32.5	3.0	88	6.8
Nutrichem	12.1	3.3	34.5	17.4	32.5	2.0	60	6.2
SarTemp	12.1	3.3	36.0	17.7	33.5	2.5	75	6.8
Science & Service	12.0	3.6	37.0	18.9	34.0	3.0	84	6.2
Water	13.0	3.3	37.5	18.1	35.5	2.0	60	6.8

Notes:

The pH of the surfactant solution was determined with laboratory pH paper having a range between 5 and 8. The EZ Flake solution was below that range.

The corn used was not good quality, clean corn. There were many broken kernels and much dirt. Therefore the water absorption rate is higher than is usually obtained with clean whole corn.