PROCESSING PARAMETERS DETERMINE THE EFFICIENCY OF STARCH (GRAIN) UTILIZATION BY CATTLE ON A FINISHING RATION.

Gain and feed efficiency are parameters of feeding cattle that are controllable. Ration energy levels are often not realized at close out because of processing practices. The bottom line to improved close outs can be found in fecal starch levels. Close outs are obtained at the end of a feeding period. This is after the fact data that doesn't help in predicting the outcome of the finishing efficiency of a pen of cattle. Commonly followed grain processing parameters such as moisture, flake density, and starch availability, are not well correlated to gain and efficiency of feedlot cattle. On the other hand, fecal starch studies are highly correlated with feed efficiency and gain (Zinn *et al*.). The percentage of grain passing through the cattle (not being utilized) increases the feed cost in a one to one ratio. A fecal starch result of one percent means that one percent of the grain fed is lost and the resulting feed cost is increased by one percent of the cost of the grain fed. Optimally, fecal starch should be 3% or less for rations containing flaked corn as the grain source. Any fecal starch value higher than 3% indicates a need to change the processing practices.

PROCEDURES FOR FECAL STARCH DETERMINATION

Benchmark to determine a base line fecal starch value for the feedlot.

I. SELECTION OF A PEN OF CATTLE

The cattle should be of uniform weight (around 800-900 pounds). The cattle should have been on the finish ration for a minimum of 6 weeks. This pen of cattle should be available for a minimum period of 8-10 weeks in order to complete the study. No ration changes should be made until after the benchmark study has been concluded.

II. STEAM VALVE SETTINGS

Note steam valve settings and record them.

III. RESIDENCE TIME & DYE TEST

Determine the residence time of the grain in the steam chest for **each flaker** using the *Dye Test:*

- Inject food coloring into the top of the steam chest, noting the time.
- Determine the time elapsed until the colored grain appears at the peg feeder.
- Record residence time and peg feeder settings for each flaker.

IV. FLAKE BUSHEL WEIGHT

Test flake bushel weight four times for **each flaker and record**:

1. Date
2. Flaker number
3. Sample number
4. Bushel weight
5. Time of day sample was obtained

BENCH MARK SETTINGS

Maintain the peg feeder, steam valve settings, residence times and bushel weights recorded above for the remainder of the fecal collection periods.

RATION CHANGES DURING BENCHMARK STUDY

No ration changes (flake density, residence time, ingredients or ingredient levels) should be made during the remainder of the benchmark study. Any changes made will render the study unreliable.

FECAL MATERIAL COLLECTION

1. Take 2 tablespoons of fecal material per stool.
2. Sample 10 fresh stools per pen (early morning best)
3. Avoid dirt.
4. Place the composite of the 20 tablespoons in one container.
5. Label the sample with
    - Date
    - Feedlot
    - Pen Number
    - Collection Period
    - SarTemp or SarStart DSC level.
6. Place sample on ice and freeze as soon as possible (a second option is to dry the sample in a microwave for 8-9 minutes on the defrost setting).
7. Repeat for five days.
8. Ship the 5 frozen samples to the SDK Lab for % total starch analysis.

SDK Laboratories, Inc.
P.O. Box 886
Hutchinson, KS 67504-0886

9. Frozen samples should be packed with a frozen gel pack and shipped by next day service early in the week.
10. Repeat the above process for a second 5-day period. Compare the variation of the two periods. If the two sets of results are consistent, proceed with the processing improvements study. If the results of the two fecal starch studies are not consistent; some variable has likely changed during the study and another five-day collection should be made.

PROCESSING IMPROVEMENT STUDY

If the fecal starches are not in the three percent range a processing improvement study should be conducted. The technique for conducting such a study follows.

Procedure for reducing fecal starch and controlling the resulting digestive upset associated with improved flake quality.

FLAKE DENSITY

The first step is to obtain a three percent (or less) fecal starch level by optimizing the flake density. The target for optimum flake density should be 24-25 lb./bu. If the bushel weight has been very high (29-30 lb/bu), the first step in lowering the flake density should be small. The first incremental step should lower the bushel weight to the 26-27-lb./bu range. Digestive upset will most likely occur as the flake density is decreased. Management of the bunk (see ration additions) will be better accommodated if the increment of change is small. Adjust flake density to either 25-27 lb. per bushel or 24-25 lb. per bushel and record bushel weights for each flaker. A new fecal starch study should be done upon each incremental change. Once a three percent fecal starch level is obtained other considerations such as steam flow can addressed.

RATION ADDITIONS

Introduce a level of SarTemp or SarStart DSC or SarTemp/SarStart DSC into the ration. These products will be helpful in bunk management. Often feed intake will vary widely when lowering flake density, thus resulting in digestive upset. The introduction of SarTemp and SarStart DSC into the ration will minimize moisture variation and the resulting feed intake variation associated with ration changes.

STEAM CONSIDERATIONS

Steam considerations should only be addressed after a fecal starch level of three percent has been obtained through optimization of the flake bushel weight. Minimize steam flow to the top of the steam chest and increase it through the ports in the lower portion of the chest. A new fecal starch study should be done upon each change; keeping in mind that the target fecal starch level is three percent or less. No ration changes (flake density, residence time, ingredients or ingredient levels) should be made during the fecal starch sample collection periods of the study. Any changes made during the collection periods will make the study unreliable

As grain drops onto the rolls, the temperature of the grain should be as hot as possible. Any temperature reduction at this point will be detrimental to the final flake quality. Cooking the grain on the bottom of the flaker will reduce the energy required to raise the temperature of the grain to 210 °F. This reduction in energy will reduce the gas cost to the feed yard. Energy cost is an on going cost to the feed yard. This cost is usually not passed on to the feeder and thus the feed yard has no way to control the fixed cost. The energy usage is a day in and day out cost to the feed yard. A reduction of energy used to steam flake grain will show positively on the bottom line of the feedyard's cash flow. Fecal starch is not directly related to residence time in the steam chest. The temperature of the corn should be 210 °F. It is not as important how long the grain is at 210 °F as it is that it be at that temperature when it hits the rolls. Flaking the grain when heating it at the bottom of the chest is more difficult than heating it to 210 °F all the way through the chest with a long residence time. The output of the flaker will be greater as the residence time is reduced and it requires more attention on the part of the operator. If it is decided not to cook the grain at the bottom of the flaker it is still possible to reduce fecal starch. Record the steam valve settings.

RESIDENCE TIME & DYE TEST

Set residence time of grain in steam chest for **each flaker** to 30 minutes using Dye Test. Inject food coloring into the top of the steam chest, noting the time. Determine the time for the colored grain to appear at the peg feeder. Adjust peg feeder to attain a 30-minute residence time. Record the residence time for each flaker. *Note: The residence time of grain can change drastically when the incoming % moisture varies. This effect is greatly reduced using SarTemp and SarTec's automated conditioning system.*

SAMPLE COLLECTION

Two five-day fecal sample collection periods should be conducted after the flake density is lowered, steam valves reset and new residence times attained. A minimum of 5 days should elapse post ration changes prior to fecal sample collection.

1. Take 2 tablespoons of fecal material per stool.
2. Sample 10 fresh stools per pen (early morning best)
3. Avoid dirt.
4. Place the composite of the 20 tablespoons in one container.
5. Label the sample with
    a. Date
    b. Feedlot
    c. Pen Number
    d. Collection Period
    e. SarTemp or SarStart DSC level.

6. Place sample on ice and freeze as soon as possible.
7. Repeat for five days.
8. Ship the 5 frozen samples to the SDK Lab for % total starch analysis
9. Frozen samples should be packed with a frozen gel pack and shipped by next day service early in the week.

10. Repeat the above process for a second 5-day period.
11. Compare the variation of the two periods.
12. If the two sets of results are consistent, and above the desired 2-3 percent level consider proceeding with the following steps:

Summary

- Obtain a benchmark study to determine the fecal starch (FS) level.
- If the FS level is above 3 percent, then the flake bushel weight needs to be optimized.
- During flake bushel weight optimization digestive upset (DU) may occur. Employ SarTemp and SarStart DSC to combat DU.
- After a FS level of 3 percent or less has been achieved, steam considerations and other energy saving issues may be addressed.