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Guidelines for Using Computerized Concentrate Feeders for Dairy Herds

This NebGuide describes how computerized feeders work, the advantages of using them, and provides general guidelines on their installation, maintenance, and economical operation.

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A computerized grain feeding system consists of an identification tag -- carried around the neck of the cow -- a computer, power source, feeding station(s), and grain bin(s). Although each manufacturer uses slightly different hardware, all systems function similarly.

As a cow with a tag approaches the feeder, a signal is picked up and sent to the computer. The computer verifies whether this cow is assigned to this feeding station, and if so, the amount of feed allowance remaining, if any. The accessibility to feed is generally divided into one- to six-hour intervals for a 24-hour total. If she has feed remaining during the particular time period, a signal activates a feeding station motor which dispenses feed into the feeding chamber.

The rate of feed-down is about one-half pound per minute, making it possible for the cow to consume the feed as it is dispensed. Thus, cows entering the feeding station afterwards are not able to obtain feed intended for the previous animal. The feed per time interval feature prevents excess feed intake for better digestive system consistency, but does require each cow to return to the feeding station multiple times each day in order to get her full feed allowance. Despite the benefits of interval feeding, the feature limits the number of cows that can be assigned to an individual feeding station.

Benefits of Computer Feeders

Computer feeding systems provide a number of features important to feeding management including:

1. Grain is dispensed to individual cows only in the amounts they need. This helps prevent feed waste,

yet provides the amounts needed for cows at different production levels. Grain allowance for late-lactation cows can be restricted when their nutrient requirements are lower. This helps to avoid "fat cow syndrome" problems.

2. Each cow's grain allocation can be changed simply by entering the new amount into the computer. This avoids the stress involved in moving cows from one group to another, and the necessity of handling animals as required with certain electronic feeding systems.

3. Several different rations can be fed to cows within the same lot. Thus, segregating cows into nutritional groups is less important, a desirable feature for herds with fewer than 100 cows.

4. A daily grain allowance can be portioned to each cow in four to 24 daily feedings, although four to six feedings are typically programmed. This reduces the disruption of normal rumen function, especially fiber digestion, which can result when cows consume large amounts of grain at a single feeding. Improved ruminal fiber digestion with more frequent grain feeding will increase fat test an average of 0.1 percentage unit. Increases of 0.2 to 0.3 percent have been reported.

5. The computer identifies cows consuming less than their assigned quantity of grain or that are off-feed. The amount of feed consumed per cow and the amount of feed dispensed from each feeder station can be tabulated and printed out. The print-out is usually done automatically every 24 hours or whenever the operator activates the computer.

Economics of Computerized Feeders

Although basic features are similar, system costs vary considerably. Therefore, dairy producers should investigate available options thoroughly before purchasing one. Savings can be realized by investing only in features that are needed and will be used. Consider the availability of qualified service personnel before purchasing a system.

Dairy operators who are failing to get peak milk yield, or who are wasting grain, are most likely to benefit from installing a computer feeder. If cows are achieving optimal peak milk yields and average grain feeding level is normal for the quality of forage fed, economic benefits from installation of a computer feeder are unlikely.

The following example partial budget calculates the change in net farm income from installing a computer feeder for a 100-cow dairy. Insert information specific to your operation to obtain a net return value for your dairy.

Items that Increase Net Return	Items that Reduce Net Return
Increased milk yield 2 pounds more milk per cow per day x 305 days of lactation x 100 cows x 0.1250 milk price per pound = $7,625	Increased labor 0.5 hour per day x 365 days x $7.00 per hour = $1,278
Increased butterfat yield 0.10 percentage unit x 17,000 pounds of milk x 100 cows x $1.36 per pound of butterfat = $2,312	Additional milk hauling expense 2 pounds per cow per day x 305 days of lactation x 100 cows x $0.40 per cwt = $244
Reduced concentrate consumed 10% reduction per cow x $312 per cow x 100 cows = $3,120	Ownership costs ($25,000 purchase price) Maintenance (3%) = $750 Insurance (0.3%) = $75 Depreciation (10%) = $2,500 Interest (9%) = $2,250 Total = $5,575
Total increased returns and reduced costs = $13,057 (A)	Total increased costs and reduced returns = $7,097 (B)
Change in net return (A - B) = $5,960	

With the assumptions used in these calculations, the purchase price would be recovered by increased net returns in about four years, if herd management was equal and consistent.

Procedures for Using Computer Feeders

To achieve maximum benefits, computer feeders must be used in a manner that capitalizes on and takes advantage of their capabilities.

1. ***Keep equipment operating properly***. Check at least once daily to ensure each feeder station is operating. Not only must the motor run, but the feed must flow without interruption when the feeder is activated. Check that each cow has a functioning transponder. Transponders do fail and get lost. (Routine checking of "off-feed" cows should identify these problems.) Calibrate the feeding rate to deliver about one-half pound per minute. This should be checked at least once every two weeks and when each batch of feed is received. Seemingly identical grain mixes may flow differently through the metering mechanism.

2. ***Program the computer for grain feeding levels***. During the first four to six weeks following freshening, adjustments in the feeding level should be made at least twice weekly, then weekly up to 12 weeks. Thereafter, adjustments on a monthly basis, or after DHI test, should be sufficient.

At the beginning of lactation, feed grain at a rate equal to one percent of bodyweight. Increase allocated feed by three to five pounds per week until production or intake peaks. A feeding rate up to 21/4 percent of bodyweight is usually a safe maximum grain level. As production begins to decline, decrease the level of grain by an amount related to forage quality, grain and milk prices, and the cow's requirement (milk yield, fat percent, and body condition score). During the last month of lactation, the amount of grain for cows fed more than 15 pounds daily can be reduced gradually as an aid to drying off. The recommended pounds of grain to feed daily in relation to milk yield, body condition score, and quality of forage are listed in *Table I.*

Table I. Grain feeding schedule for use with computerized concentrate feeder.

	_____Milk (pounds/day)_____														
Schedule[a]	*25*	*30*	*35*	*40*	*45*	*50*	*55*	*60*	*65*	*70*	*75*	*80*	*85*	*90*	*95*
NE_L (Mcal/cwt)	_____(Grain to feed daily, pounds)[b,c] _____														
72	6	6	6	6	8	10	13	16	18	21	23	26	28	31	33
70	6	6	6	8	10	12	15	18	20	23	25	28	30	32	**
67	6	6	8	10	12	14	17	20	22	25	27	30	32	**	**
65	7	8	10	12	14	17	19	22	24	27	29	31	33	**	**
63	8	10	11	13	15	18	20	23	25	28	30	32	34	**	**
61	9	11	12	14	16	19	21	24	26	29	31	33	**	**	**
57	10	12	13	15	17	20	22	25	27	30	32	**	**	**	**
55	11	13	14	16	18	21	23	26	28	31	33	**	**	**	**
54	12	14	15	17	19	22	24	27	29	32	**	**	**	**	**
50	14	15	16	18	20	23	26	28	30	33	**	**	**	**	**
46	15	17	18	20	22	25	27	30	32	**	**	**	**	**	**

[a]Use the schedule which represents the energy level of the forage being fed, or the weighted average value, if more than one is fed. Energy is expressed as NE_L in Mcal per 100 pound, dry basis. The grain levels presented are based on feeding of forage to the limit of appetite.

[b]Add 2-4 pounds daily to rations of first or second calf heifers and to older cows in the last half of lactation which need to improve body condition.

[c]Add about 1 pound of grain for each 0.3% unit over 3.6% fat test.

**Above these levels of grain, care must be exercised to assure that the cow stays on- feed and consumes adequate roughage. At high levels the grain mixture should be fed in three or more portions daily and, if possible, should contain high fiber, high energy ingredients such as oats, wheat bran, corn gluten feed, corn and cob meal, soyhulls or beet pulp. Excessive grain feeding, especially when fed separate from forage, increases the risk of acidosis and laminitis.

Grain allowances should be divided into at least four daily portions. This helps maintain a stable rumen condition, maintain higher milk fat test, prevent off-feed problems and reduce risk of acidosis/laminitis. More feeding intervals reduce disruptive behavior among cows when consuming grain at the feeder. However, this requires that cows be provided ample opportunity to visit the feeder repeatedly during each 24-hour period and reduces the number of cows each station can accommodate (*Table II*).

Dry cows can also benefit from using a computer controlled feeder. Lead-feeding of cows during the

last ten days before freshening can help them adjust to the higher grain levels they will receive following calving. Increasing grain in three or four increments to a maximum of one percent of bodyweight is recommended. Dry cows should receive a separate low calcium, low protein grain mixture rather than the lactation ration.

3. ***Ration assignments***. In herds of 50 or more cows, three or more feeding stations and storage bins will likely be required to provide different rations for cows of high, medium, and low production levels. Both the number of feed mixes and the number of cows assigned to a feeding station need to be considered in planning an installation.

   Cows in early lactation need a relatively high ration content of energy, protein, calcium, and phosphorus. These high nutrient levels are necessary because of the very high output of nutrients in milk and lower intake during early lactation. Forage quality is especially important during this period. The grain ration should contain 20 to 40 percent feeds high in fiber and energy such as oats, beet pulp, soyhulls, corn gluten feed, or other ingredients with similar qualities.

   Special attention must be given to including ample minerals and vitamins when formulating these rations. Supplementing with buffers and other additives may also be advisable. In mid and late lactation, considerable feed cost savings can be realized by lowering ration protein and energy content. Seasonal changes in nutrient density should be made to ensure adequate trace element intake associated with variations in overall feed intake.

4. ***Cow assignment to feeder stations***. Cows must be assigned to the feeder with the appropriate grain ration for their production level and stage of lactation. (Dual feeders are available, but they are not considered in this publication as they are more complex to use and have advantages only in special circumstances.) The number of cows that one station can accommodate depends on the amount of grain programmed for each cow and the number of daily feeding intervals.

   The maximum daily dispensing capacity of each feeder is about 500 pounds. However, a practical limit of 300 pounds is recommended. No more than 20 to 25 cows should ever be assigned to one feeding station. Consider feed dispensing rate, expected cow intake, and cow access time when determining the number of stations needed to meet the needs of the cows. Time in the holding area or being milked, time eating hay, forage or on pasture, time for alley scraping, time out on dirt lots for heat detection, and similar events all decrease the amount of time actually available during which cows can use the feeders. Cow use should also be expected to decrease overnight.

   Good lighting will lead to some increase in nighttime use but likely will not increase usage to daytime levels. *Table II* gives the maximum number of cows per feeding station as a function of expected feed intake per cow and number of feeding intervals daily.

Table II. Maximum number of cows per feeding station.[a]

Feeding Intervals Per Day	*Average expected feed intake per cow in group, pounds per day*					
	5	***10***	***15***	***20***	***25***	***30***
2	55	32	22	17	NR	NR
4	39	27	19	16	13	11
6	NR/P	21	18	14	11	10
8	NR/P	NR/P	16	13	10	9
12	NR/P	NR/P	NR/P	10	9	9
24	NR/P	NR/P	NR/P	NR/P	6	6

NR/P = Not considered realistic or practical use of system.
NR = Not recommended.

[a]Assumptions incorporated into the table include:

- feed dispensing/cow consumption rate of 1/2 pound per minute
- cows on dry lot two hours per day for heat detection
- cows in holding or milking area three hours per day
- cows eating hay, silage or other roughage six hours per day

No allowance is made for time feeders are inaccessible to cows due to cleaning of stalls, maintenance, manure removal, etc. Table assumes two minutes required per cycle for one cow to exit and another cow to enter stall. All times rounded up to nearest minute. Cow numbers rounded down to nearest whole number.

Combination System of Computer Feeder and Total Mixed Ration

An efficient method of using the computer feeder is in combination with a bunk-fed total mixed ration, or bunk mix. This method involves the formulation of a bunk mix for all cows balanced for low production; for example, 50 to 60 pounds of milk. Cows producing more milk are given computer neck tags so they can obtain additional grain. The rations formulated for use in the computer feeder station are designed for higher milk production by balancing them with the nutrients supplied to the cow in the bunk mix. This method of feeding encourages cows to consume their roughage requirement.

Roughage intake is frequently less than optimal for cows allowed high levels of grain. The bunk mix also helps maintain production of cows during the period when they are learning to eat from the computer stations. Using this method will reduce the number of computer feeder stations required to feed a herd of a given size, thus lowering investment and maintenance costs. Having fresh bunk mix available as the cows exit the parlor aids cow movement through the parlor, reduces competition at the feeding stations, and may aid in mastitis control by encouraging cows to eat rather than lie down during the period immediately following milking when the udder is highly subject to invasion by pathogenic organisms.

Installation and Maintenance Guidelines

1. Provide enough feeding stations to handle the number of cows. Be realistic in the number of cows each station can handle. No feeding system will be in use every minute of every day. An extra station is a relatively inexpensive investment and can serve as a replacement while another is inoperative.
2. Provide good electrical service to all components. Proper materials and good grounding are essential

for personnel and animal safety. Small voltage fluctuations can cause computer program problems. Select a unit with built-in protection against lightning, voltage fluctuations, and power outages. An equipotential plane should be considered around the feeder. All wiring should meet or exceed minimum standards of the *National Electrical Code*. Be sure the electrical distribution panel providing power to the computer and feeding stations is properly grounded and equipped with a lightning surge arrestor. Power for the entire feeding system (computer, stations, bins, etc.) must come from the same distribution panel for safety reasons.

3. Provide overcurrent protection (properly sized fuse or circuit breaker) and safety shutoffs for the total system (feeding stations) in the immediate vicinity of the feeders. These are required for safety and maintenance.
4. Locate feeding stations where they are convenient for cows to enter and leave, and where you can observe them and keep them clean. A sheltered feeding station is desirable for consistent feed intake. If stalls are used, make them at least eight feet long to reduce butting from the sides and around the udder by other cows. If possible, avoid locating feed stations in a corner. A position at least 20 feet from the end of an alley facilitates cleaning and maintenance.
5. Arrange for servicing and maintenance. Few dairy producers possess the skills or equipment to monitor and repair electronic equipment. Does the dealer or company have trained service personnel available? What do they charge for service work? What is their turnaround time on service calls? Do they stock repair parts, including basic circuit cards?
6. Learn to operate the system as efficiently as possible. Calibration and routine maintenance should be producer-oriented. If special tools and basic spare parts are required, obtain them before you need them.
7. What experiences have other producers had with this type equipment? Take time to visit them in person or by phone. Their experience might help you avoid similar problems.

Conclusions

Computerized concentrate feeders offer the potential for improving milk yield and reducing waste in the use of concentrate rations. Economic benefits are possible with herds as small as 50 cows. Benefits tend to increase with herd size. Quality of herd management is the primary factor which will determine the benefits of using computer feeders. Economic benefits are not likely in herds in which concentrates are closely regulated according to requirements. For herds of 100 to 150 cows or more, a total mixed ration (TMR) or a combination of a TMR and computer feeder may be an efficient feeding system.

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