Milking Center Advisor:
Software To Estimate Milking Center Costs And Performance

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INTRODUCTION

A primary reason for investing in a milking parlor is to increase the number of cows milked per person per hour. Other motivating factors include; improved working conditions, increased uniformity and quality of milking, and attracting and keeping hired or family labor. These benefits must be weighed against the capital cost of the parlor.

A combination of these and other factors unique to each dairy will influence the choice of parlor type and size. The parlor makes up only a small portion of the milking center. The milking center should include a holding area, return lanes, animal retention area, milk and utility rooms, and an office. The design of the milking center must be such that its components work well together. The milking center must also be integrated into all other facilities on the dairy. This will help realize the full benefit of the investment in each component.

This software is to be used as a decision aid to choose the size of a new parlor and the type of equipment to be installed. It can also be used to evaluate equipment modifications in existing parlors and improve parlor throughput. The capital cost of a milking center and freestall barn and number of cows milked per hour are calculated based on user inputs. Annualized capital costs are combined with annual labor costs to yield total annual milking cost. The annual costs of various options can then be compared. Only double-sided herringbone or parallel parlors are considered as these make up the largest share of parlors being installed.

Milking center cost and performance depend on many variables such as management system, management intensity, location, climate, and others. The results obtained from this software should therefore be taken as an approximation. The software should be used to compare options, not to develop exact cost and performance figures. For most inputs the user supplies either the actual numerical value or a 'high', 'medium', or 'low' indicator. The indicators are converted to numerical values representing a reasonable range for the corresponding variable.

BUILDING AND EQUIPMENT COSTS

The building and equipment costs are separated into four parts: free stall barn, milking center building, milk house equipment, and milking equipment as

defined below. For this analysis, the milking center includes the milking parlor, a holding area, animal retention pens, milk house, office, and utility room. Building sizes were determined from stock plans used by various milking equipment companies. Building costs on a per-square- foot basis are representative of actual 1997 figures. Equipment costs are estimates from various milking equipment companies. The software provides estimates of building and equipment costs. A better estimate of construction and equipment costs can be obtained from a milking equipment dealer and farm builder. Actual cost figures from these sources may be entered directly as inputs. Capital costs are annualized for depreciation, interest, repairs, taxes, and insurance.

PARLOR THROUGHPUT

Milking task times are separated into four functional groups: cow movement, prepping cows and attaching units, machine on time, and post milking unit removal and/or teat dip. The time to work both sides of the parlor is calculated by adding the user-selected task times assuming an efficient milking routine. The resulting time to perform one "turn" is then used to calculate the maximum theoretical parlor throughput. This milking rate is reduced by 10 to 20 percent based on the ability of the milker and management level of the dairy. This method produces throughput (cows milked per hour) which correspond well to actual field performance data with reasonable assumptions for milking task timing. Parlor throughput measured in cows milked per hour is the figure most often quoted in milking parlor literature. The operator(s) often perform other tasks such as equipment set up, moving groups of cows from the housing pens to the holding pen and washing of the parlor and equipment. These additional tasks times may be added to the actual milking time to determine the total time to perform one milking.

User Inputs

The user inputs and their definitions are presented below, in the order they appear on the spreadsheet.

Free Stall Barn Cost includes the cost of the barn (shell and concrete for floor), stalls, gates, electrical service, and waterers. The low range is typical of a wood frame, un-insulated, naturally ventilated barn with curtain sidewalls and scraped concrete alleys. The high range is representative of a barn with insulated walls and roof, sliding or tilting doors for ventilation and a slatted floor over gravity manure gutters with central collection pit.

Milking Center Building Cost includes an adequately sized holding area, catch pens, parlor area, utility and milk rooms and office. The size of the milking

center building is scaled to the parlor size. The low range is typical of a building with un-insulated holding area with curtain sidewalls, and wood frame construction for the parlor, milk, and utility rooms. The high range is representative of a building with insulated holding area and concrete block wall structure in the parlor/utility area.

Milk House Equipment Cost includes equipment such as the bulk tank, refrigeration unit(s), water heater, ventilation system, vacuum pumps, and washing sink for the low range. The high range includes equipment such as an automatic washer, heat recovery equipment and well water pre-cooler.

Milking Equipment Cost includes all of the equipment in the parlor and holding area such as milking units, stalls, gates, and parlor automation. The low range is typical of a parlor and pipeline milking system with no automation i.e. manual unit removal, manual entrance and exit gates and no crowd gates. The middle range would include automation such as automatic unit removers, and powered entrance, exit, and crowd gates. The high range is representative of the medium range of automation plus computerized cow identification and milk metering and, automatic backflush.

MILKING TASK TIMING

The milking tasks time inputs are shown below. The task time ranges are based on studies of actual milking parlors and recommended milking practices. A table of the suggested range of times is presented in the spreadsheet along with the time inputs. This table is shown in screen 2 in Appendix A.

Release/Reload is the time required releasing a group of cows from one side of the parlor and reloading that side with the next group. Time is calculated as number of seconds per milking stall. The time required to move cows depends on the type of stalls used (single file or rapid exit), the degree of gate automation, and the cow flow pattern. The slow range corresponds to a parlor with manual entrance and exit gates, single file exit and no crowd gate in the holding area. The medium range represents a single file exit parlor with powered entrance, exit and crowd gates, and good cow flow. The high range represents a rapid exit parlor with powered gates and excellent cow flow.

Prep and attach unit is the time, in seconds, required to perform all tasks performed before and including attachment of milking units. These may include, udder washing, teat pre-dipping, teat and udder drying, udder stimulation and milking unit attachment. The time may be adjusted according to which of these tasks are performed. The cleanliness of cows entering the parlor and care given to cleaning and drying udders has a great deal of influence on this time. Prep and

attach time is a major factor in both parlor throughput and udder health. Reducing prep and attach time is the surest way to increase parlor throughput but may also lead to increased udder health problems.

Average milk-out time is the time, in minutes, required for complete milk-out or 'unit on time'. It is assumed that milking units are removed upon the completion of milking by automatic detachers or manually by the operator. Note that there is not a strong correlation between production level and milk-out time. Milk out time will generally be lowered by 1/2 to 1 minute when going from two to three time a day milking.

Detach/ Post dip is the time, in seconds per cow, to perform any tasks after milking is completed such as post dipping, checking udders, and manual unit removal if automatic detachers are not used. Adjust time according to which tasks are manually performed by the operator(s).

Milker efficiency is the percentage of the maximum theoretical milking rate that the operator(s) achieves. Consider the physical condition and motivation level of the operators when choosing this number.

Equipment setup and wash is the time, in minutes, required to set up equipment before milking and wash it at the end of milking.

Move group from barn is the time, in minutes, required to move one milking group from their housing area into the holding area. Enter zero if the people doing the milking do not perform this task. The number of groups is automatically calculated from the size of the milking herd, estimated parlor throughput, and 1-hour maximum time in the holding area.

LABOR AND FINANCIAL INPUTS

Milkings Per Day is the number of times the cows are milked (2 or 3) per day. Reduce average milk-out time by 1/2 to 1 minute for the herd if 3x milking is chosen.

Maximum Units per Side per operator indicates the maximum number of milking units per parlor side that one operator will be expected to use. A value of 8 entered here means that double 8 parlors and smaller will be run by one operator. A double 9 and above would employ 2 operators. The PARLOR RATE graph may be consulted to help determine this value after the desired milking task timing inputs have been entered. The level of automation, design, and management of the milking center have a significant impact on the number of units one operator can practically handle.

Labor Cost is the wage paid to the operator(s) including fringe benefits in dollars per hour. Use a reasonable figure for competent help in your area if hired labor is anticipated. Consider the value of the owner/operator's time compared to time spent on other management tasks if this person is also expecting to work in the parlor.

Barn Stocking Density is the ratio of stalls in the freestall barn to the number of cows housed there. A 300-stall barn housing 330 cows would have a stocking density of 110 percent.

Capital Annualization factors are the five parameters used to determine the annual cost of the capital investment. These factors are entered separately for buildings and equipment. The annualization factors and their default values are:

	Buildings	Equipment
Interest	12.0%	12.0%
Depreciation	5.0%	10.0%
Repairs	5.0%	5.0%
Taxes	1.5%	0.0%
Insurance	0.5%	0.5%

INDIVIDUAL CASE ANALYSIS

Labor and capital cost and milking time analysis using the above inputs is performed for both for a range of parlor and herd sizes and for a user selected individual case. Output for individual case examples is presented in table form. The following two inputs determine the herd and parlor size used for the individual case analysis.

INPUTS

Number of Cows to milk is the size of the milking herd. This value will be used to size the freestall barn and determine total time for one milking for the individual case analysis.

Number of Parlor Stalls Per Side is the size of the parlor to be used for detailed individual case output. For a double-8 parlor, enter 8.

OUTPUTS

Parlor Throughput is the number of cows milked per hour in the parlor size selected for individual case output. Time for each milking is the length of each milking shift, in hours, for the herd selected for individual case output. This

includes time for equipment setup and wash and moving cow groups to the holding area. Number of operators is the number of operators in the parlor during each milking.

Milking Center Cost is the cost of all buildings and equipment associated with the milking center and is expressed as total capital cost, capital cost per cow, total annual cost and annual cost per cow.

Freestall Barn Cost is the cost of animal housing facilities and is expressed as total capital cost, capital cost per cow, total annual cost and annual cost per cow.

Milking Center Cost + Barn Cost is the combined cost of the milking center and freestall barn expressed as total capital cost, capital cost per cow, total annual cost and annual cost per cow

Milking Labor Cost is the cost of labor expressed as total annual labor cost to milk the selected herd size and the annual labor cost per cow.

Milking Center + Milking Labor Cost combines the annualized costs of the milking facility and milking labor expressed as total annual cost and annual cost per cow.

Milking Center + Barn + Milking Labor Cost combines the annualized cost of animal housing, milking facilities and milking labor and is expressed as a total annual cost and annual cost per cow. Note that these costs do not include labor and facilities for manure handling, feeding, freestall maintenance, or any other tasks and facilities not associated with milking.

Find your Parlor Planner spreadsheet on the disk located on the back inside cover of this manual