FACT SHEET

L-776

INSTALLATION AND OPERATION OF MILKING EQUIPMENT

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The amount of milk a cow produces depends upon breeding, feeding and management. Harvesting this milk is the most important phase of dairy cow management. Both quantity and quality of milk are affected by the milking process. Health Department regulations require that milk be from healthy cows. Abnormal milk, including milk from cows with mastitis, may not be offered for sale. Tests based on the number of leucocytes in milk are being used to indicate milk from cows with mastitis.

What are leucocytes? They are commonly called white blood cells and are a normal constituent of both blood and milk. These white blood cells are one of the body's important defenses against infection. When an infection occurs in the body, such as mastitis, large numbers of these cells migrate to the area in an attempt to limit and combat infection. It is generally agreed that the concentration of leucocytes in normal milk is approximately 100,000 per milliliter (ml). Leucocyte counts in excess of 500,000 per ml are considered indicative of some abnormality. This may include, in addition to mastitis, colostrum milk, stripper milk or a diseased condition at some other location in the cow's body.

Most authorities feel that proper installation, maintenance and operation of milking equipment are major factors in preventing and controlling mastitis, rancidity, off-flavors and other quality problems. For this reason, the Texas Milk Quality Council has developed recommended minimum performance standards for the installation and operation of milking equipment. These standards follow:

Vacuum Pump

The vacuum pump should have the following minimum air flow capacities at 15 inches of mercury: (American Standard = approximately ½ these measurements.)

Number of units	Recommended air flow (CFM) for single and double milking machine installations			
	Single	Add for reserve	Double	Add for reserve
2	30	15	45	15
3	45	15	70	15
4	60	30	90	30
5	75	30	115	30
6	90	30	135	45
8	120	30	180	45

A vacuum tank of not less than 30 gallons capacity is recommended for any system.

Vacuum Regulators

The regulator should have an air-inlet capacity equal to any excess the pump is capable of producing and should maintain a relatively constant vacuum from no-load to full-load operation.

For more than four single units use a minimum of two regulators. For a double three system or less, one regulator may be sufficient. For double four and five systems, two regulators are required and for double six and above, a minimum of three regulators are required.

In pipeline installations, locate the regulator(s) on the vacuum pump side of the moisture trap near the receiver bowl. Do not place the vacuum regulator in the feed room or other dusty areas. Check periodically for cleanliness and proper function.

Air Flow Piping, Tubing and Fittings

Inside diameter of the pipe from a vacuum supplier (pump) to milk receiver should agree with recommended sizes for vacuum lines. There should be a moisture trap between the receiver and vacuum pump with an inlet and outlet diameter equal to the vacuum line diameter.

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In May, 1966, persons interested in the state's dairy industry assembled at Texas A&M University and took the first step toward forming a statewide organization now known as the Texas Milk Quality Council. Membership includes milk producer associations, Dairy Products Institute of Texas, Texas Animal Health Commission, Texas Department of Health, Texas Veterinary Medical Association, city health departments supervising milk sales and all Texas colleges of veterinary medicine and agriculture.

Purposes of the Council are: (1) collect, screen and dispense promptly to all members information regarding new public health rulings, scientific developments and guidelines for improving milk quality; (2) seek to coordinate efforts of all groups concerned with milk quality; (3) encourage and promote needed research; (4) develop evaluation methods for determining results of recommended procedures for improving milk quality; and (5) establish standards in various areas of milk quality control as needed.

One of the first Council actions, through its Committee on Milking Equipment, was to develop recommended guidelines (minimum performance standards) for the installation and operation of milking equipment.

Tees or elbows for risers in the vacuum line should be equipped with automatic drain valves at the low point. If a separate vacuum line is used for pulsators it should be a minimum diameter of 1¼ inches. Note: *Do not confuse this with the pulsator line from a master pulsator which may be ⅜ inch in diamster.*

Number of units	Recommended sizes for vacuum lines for single and double milking machine installation	
	Single	Double
	(inches)	
2	1½	1½
3	1½	2
4	2	2½
5	2	2½
6	2	3
8	3	3

All milk lines should be installed so the milk inlet is in the upper one-half of the milk line. All milk lines should have a continuous slope of at least 1½ inches per 10 feet.

Number of units	Recommended sizes for milking lines for single and double milking machine installation	
	Single	Double*
	(inches)	
2	1½	1½
3	1½	1½
4	2	2
5	2	2½
6	2½	3
8	3	3

*Lines for this system should be double-sloped, emptying into a double inlet receiver jar.

Vacuum Stability

Vacuum should be stabilized within 2 inches of mercury at the teat end in all milkers during full milk flow. Alternating pulsators are recommended if vacuum varies over 2 inches inside the inflation during full milk flow. Vacuum level at the teat end should be 11–13 inches of mercury.

At least one vacuum gauge should be installed at the most distant point from the vacuum pump.

Pulsation Ratio and Rates

Pulsation should be constant and should not cause unstable vacuum in the teat cup assembly. The pulsator should permit vacuum relief on the teat end for a *minimum* of 20 percent of the total pulsation cycle.

Teat Cup Liner or Inflation

Teat cup inflations should not crowd against the base of the udder except when milking cows with small teats. The inflation bore should not exceed 13/16 inches in diameter at the widest point, due either to design or use. Design of the inflation should permit complete closure or vacuum relief on the teat end at normal milking vacuum. The milk tube outlet should be of sufficient diameter to permit rapid outflow of milk, or an air vent should be provided in the proximal end of the milk tube to push milk out and prevent flooding in the inflation bore.

Milking

Positive visual means should be provided to determine when the cow is milked out. This can be done either by use of a visual claw assembly, clear plastic milk hose or clear milk tubes or inflations.

Teat Cup Shell

The shell should be of adequate size and construction to provide for complete collapse of teat cup inflation during operation. The shell should not unduly restrict the flow of milk through the milk tube.

Teat Cup Claw or Receiver Unit

The milk receiving portion of the milking unit should have enough capacity to prevent flooding of the inflation with milk originating from milk hose or unit due to the action of the pulsating inflation and to prevent excessive vacuum fluctuation at the teat end. The milk cup of the claw should be drained from the bottom when in operation. The claw should be provided with an air vent to allow ½ cubic foot to enter per minute, or the milk tubes should be provided with air vents equal to ½ cubic foot for four inflations. Claw ferrules should not unduly restrict flow of air or milk due to design or abuse.

Milking machine installations should meet the aforementioned minimum specifications. A check sheet designed for this purpose appears on the back page of this publication.

Name_____ Address_____

Location of Dairy:_____

Type of Installation:_____ No. Units:_____ No. Operators:_____

1.

VACUUM PUMP: (Make) (Model Number)

Pump Capacity	Effective Pump Capacity*	Reserve	Size of Reserve Tank	Size of Drain	Exhaust Size
(a) CFM	(b) CFM	(c) CFM	(d) GAL	(e)	(f)

2.

VACUUM LINES: (Size)

Main Line (Diam.) Length of line	Tank to Pump (Diam.)	Pump to Receiver (Diam.)	Slope (in. to 10')	Automatic Drains: At Low Points	Restrictions: (Reducers, Unnecessary bends, etc.)
(a) in. ft.	(b) in.	(c) in.	(d) in.	(e)	(f)

3.

VACUUM REGULATOR:

LOCATION	CONDITION		Is air continuously admitted during milking?
On pump side of moisture trap near releaser	Clean	Working properly	
(a)	(b)	(c)	(d)

4.

VACUUM GAUGE:

LOCATION		ACCURACY	CONDITION		MILKING VACUUM	
Between Reserve Tank & Receiver	Between Reserve Tank & First Stall Cock	Test with Gauge of Known Accuracy	Clean	Good Repair	Inches	Recommended
(a)	(b)	(c)	(d)	(e)	(f)	(g)

5.

PULSATORS:

Number	Clean	Good Repair	Pulsations Per Minute	Single Action or Alternating	Pulsation Ratio
(a)	(b)	(c)	(d)	(e)	(f)

6.

CLAW ASSEMBLY: No Flooding: (a) Adequate Vent: (b)

7.

VACUUM STABILITY: (Measured at teat end during full milk flow)

RECOMMENDATIONS:_____

*Measured at end of vacuum line farthest from the pump (with all stall cocks closed).

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