. . . a progress report

The MILKING EQUIPMENT TESTING PROGRAM *In California*

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The rapid improvement of milking machine systems on California dairies is indicated in this study showing that 61 per cent of the participating dairies reported no obvious mechanical defects in the first half of 1961, as compared with only 6 per cent in the first half of 1959 when the testing program began. The eight most important items for improvement during the program included: vacuum pump, vacuum controller, vacuum supply pipe, milk pipe, air bleeder holes, pulsators, liners and vacuum level.

THE FIRST PHASE of dairy barn mechanization in the United States produced a pipeline milking machine that was unquestionably more enjoyable than milking by hand, was acceptable to most sanitarians, and was economically sound. But until 1958, scientific logic and principles of physics had not in most cases been adequately applied to the milking machine systems in use. Animal physiology is now influencing milking machine design in this second phase of mechanization, as indicated in the results of the California testing program.

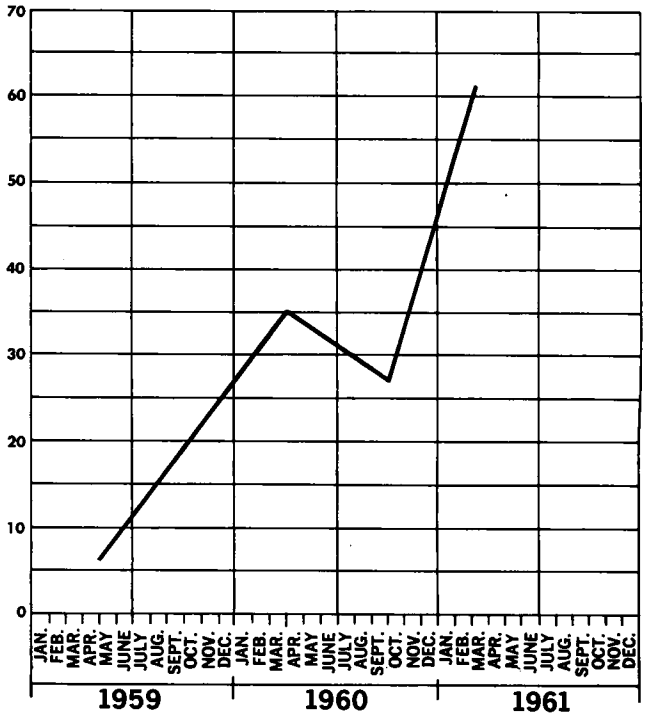
Farm advisors in 39 counties assisted in recording data from the 262 dairies cooperating in the testing program. Every significant dairy region of the state has been sampled, but no attempt can be made to attach statistical importance to the mass data reported, because of the many uncontrolled factors. These include extreme variations in (1) herd size (24 to 1800 cows); (2) milking barn size (2-cow to 270-cow); (3) pipeline milking units in simultaneous operation (1–24); and (4) distance to a milking equipment service-dealer, milking machine factory, or research laboratory (2–100 miles). Also, dairies participated in the study because they felt the need for an equipment analysis to improve their herds. Such dairies are probably not a representative sample of all California dairies.

The relationship of the milking machine system to gross udder health is not entirely predictable using present information and resources. A controlled experiment would require two or more complete milking machine systems for simultaneous and continuous comparison and a sizable herd to provide an adequate number of cows under uniform management. Such a study should extend over two or more years to establish degree of repeatability as well as to determine the cumulative effect of machine-caused mastitis from one lactation to the next.

The milking equipment check sheet used statewide for recording the physical situation in milking barns and parlors listed information on (1) size of operation, herd and barn; (2) equipment, its installation and operation under other than milking conditions (usually); and (3) certain observations, comments, or both from qualified extension personnel, veterinarians and local health departments.

The table included summarizes the most significant observations from each of the 306 records, beginning with their inception in March 1959. The check sheet includes 34 "suggested items for improvement," but only the eight considered most important are reported here: vacuum pump, vacuum controller, vacuum supply pipe, milk pipe, air bleeder holes, pulsators, liners and vacuum level.

PERCENTAGE OF MILKING MACHINE INSTALLATIONS WITH NO OBVIOUS DISCREPANCIES REPORTED



This graph indicates the rapid improvement of milking machine systems on California dairies. The one break in the curve is during 1960 when the discomforting effects of minor vacuum fluctuations on the teats were realized. However, these fluctuations usually could not be demonstrated as causing physical stress to udder tissues. This curve does not indicate that 61 percent of California's dairies have perfect milking machine installations. On those dairies where this "fill in" was favorably reported, there were frequently mechanical factors adversely marked but which could not be demonstrated as being significant detriments.

MILKING EQUIPMENT TESTING PROGRAM SUMMARY FROM 306 DAIRY RECORD SHEETS INCLUDING EIGHT MOST IMPORTANT SUGGESTED ITEMS FOR IMPROVEMENT

	1959				1960				1961	
	Mar.–June		July–Dec.		Jan.–June		July–Dec.		Jan.–April	
	No.[1]	%[2]	No.	%	No.	%	No.	%	No.	%
Vacuum Pump	6	19	13	10	12	13	7	23	3	9
Vacuum Controller	3	9	38	30	28	30	10	33	4	12
Vacuum Supply Pipe	6	19	67	53	40	43	9	30	5	15
Milk Pipe	2	6	34	27	32	35	15	50	8	24
Air Bleed Hole	5	16	12	10	9	10	3	10	1	3
Pulsators	7	22	29	23	22	24	4	13	6	18
Liners	13	40	32	25	26	28	9	30	5	15
Vacuum Level	8	25	19	15	14	15	12	40	8	24
No Significant Recommendations	2	6	24	19	32	35	8	27	20	61
(Total check sheets)	(32)		(126)		(92)		(30)		(33)	

[1] Number of barn checks where item was not up to specifications.

[2] Percentage of barn checks where item was not up to specifications.

Expected trends

All eight items follow expected trends. Those factors which were well understood and explained by the School of Veterinary Medicine prior to this data showed immediate improvement. Less improvement was shown in the factors which were not so well defined at the start, but which were studied as the program progressed. The first six-month period was one of development and cautious experimentation. The middle twelve months was a period of expanding field demonstrations. The most recent six-month period showed evidence of real progress. The pulsator was the only mechanical factor that did not show a decreasing need for improvement during the most recent period.

Vacuum pump

Improvement during the first six-month interval occurred as expected. Many old vacuum pumps on California dairies were replaced with more adequate equipment during 1959. This was largely a first result of the program on mastitis control which had reached the public a few months earlier through field activities of the School of Veterinary Medicine and through the popular press. The apparent need for greater pump capacity increased again from late 1959 to late 1960 as concurrent field studies indicated significant benefits to be gained by even greater capacities. During 1960, several new high capacity rotary pumps were introduced. equipment dealers and fieldmen started using air flow meters to measure pump performance and system losses, and the remaining group of grade-A producers upgraded their milking systems.

Vacuum controller

The two most common faults of vacuum controllers observed were inadequate size for the vacuum pump and milking system and improper location. It was common to find the single controller in the far end of the vacuum (pulsator) line, where it was perhaps most effective for a bucket installation. When the conversion was made to a pipeline system, however, the controller should have been relocated close to the milk receiver to provide fast response. Proper installations are now usually made.

Vacuum supply pipe

A bucket milking system usually did not require a sizable vacuum pipe, since each properly maintained bucket provided vacuum reserve at the most efficacious point. Too often pipeline systems were purchased on competitive bid, and it was a natural sales advantage to imply that the existing vacuum pipe was adequate. (There was no authoritative information to the contrary.) Rapid and unquestionable progress has occurred in the past year and a half.

Milk pipe

Most of the pipeline installations prior to 1960 had faults which were contrary to the physical principles of mechanical milking. Field demonstrations produced evidence that height above floor, slope, absence of risers, number of fittings and milk inlet valve placement were all important factors. This evidence continued to raise our minimum standards, accounting for increasing criticism of installations until the fall of 1960. Most faulty milk pipes have been corrected in recent months, and new installations are usually properly made.

Air bleeder holes

When the School of Veterinary Medicine began its active investigation of the milking machine as a primary cause of mastitis, there was a preponderance of obsolete, faulty equipment. Often there was no controlled means for admitting adequate air at the claw or suspension cup to move the milk into the conveyance system and maintain vacuum stability. This improvement was obvious, easy to demonstrate at no cost and therefore quickly adopted. Most equipment manufactured in recent years has adequate air bleeder holes.

Pulsators

Uniform pulsation was recognized and accepted early in the program as mandatory for fast, clean, comfortable milking. Most dairymen now have these devices checked frequently with instruments and reconditioned or replaced as indicated. In recent months, field studies (at the county level) have suggested pulsator speed and ratio should be more absolutely uniform than was previously considered necessary.

Liners

In the early phases of this program most California dairymen were using molded teat cup liners of a synthetic material and with a wide bore (greater than ¾ in.). The publication of laboratory studies attributing unnecessary teat and udder injury or stress to certain types of liners speeded the adoption of narrow bore ring type stretch liners. After this initial period of changeover to narrow bore liners, the rate of change decreased for one year and then increased again as the remaining group of dairymen had the opportunity, financial means, or experimental desire to try a change.

Vacuum level

At the beginning of this study, many milking machines were being operated at higher vacuum levels although the program encouraged vacuum levels not exceeding 15 inches of mercury. Observations and study of new, modern installations during 1960 indicated that with a good pipeline system the vacuum could be reduced still further, thus reducing the possibility for tissue damage or discomfort. This additional information resulted in modification of minimum specifications and increasing criticism of existing vacuum levels. This accounted for a peak in the fall of 1960 indicating 40 per cent of the cooperators had vacuum level problems. By spring 1961, only 24 per cent of the installations reported this problem.

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