
Quality assurance for milking machines and recording devices

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Without doubt, the milking machine is one of the most intensively used machines on a dairy farm. A well functioning milking machine is a prerequisite for good udder health and excellent milk quality. Many milking installations are equipped with milk recording devices. Milk recording is a basic prerequisite for management purposes and moreover milk recording is also the basic element of herd improvement and breeding programs. ISO recommendations and ICAR Guide Lines were developed for both milking installations as milk recording organizations to ensure proper construction and functioning. In the Netherlands these standards were implemented in an integrated quality assurance system comprising milking machines, bulk cooling tanks and recording devices. The system has been setup by the national farmers union, the manufacturers of milking machines, the national milk recording organization and moreover has been incorporated in the dairy quality assurance systems of the different dairy industries.

The basic idea is that all checks are conducted by certified technicians of the milking machine dealers. An independent organization KOM, established as result of an agreement between the National Farmers Union, Milking machine manufacturers union and the National Breeding and milk recording organization, is responsible for the quality control. The system guarantees the farmer that the maintenance of his milking machine and the necessary accuracy checks of milk meters and jars are performed well against minimal costs.

Key words: *Quality system, Maintenance, Milking machines, Milk meters, Recorder devices, Accuracy, Calibration.*

In the seventies and early eighties manufacturers and experts from various countries, prepared the first international standards for milking machines which were more or less based on the Dutch system. The most recent ISO standards are from 2007. ISO 3918 describes the vocabulary, ISO 5707 describes the standards for construction

Summary

Introduction

and performance of milking machines and ISO 6690 deals with the testing methods. The standards apply to both new installations, and machines in use, to check the performance of operation periodically. In the same time ICAR developed guide lines for the approval and the use of milk meters and jars for milk recording purposes (ICAR, 1995 -2006). ICAR Guide Lines for milk recording devices are under revision at the moment and an update is expected in mid 2008.

Quality system

In the mid nineties the Dutch national extension service together with the Dutch farmers union and the Dutch organization of milking machine manufacturers, developed plans to start a quality system for milking machine maintenance (KOM). This seemed to be a logical step in the further development of the preventive maintenance system of milking installations developed earlier following the principles of ISO 9000 and HACCP. The quality system was expanded with certification of the technicians, calibration of test equipment and by special courses for machine on time testing. The ultimate goal of course was to guarantee the farmer that the milking machine is working properly, without having a negative effect on milk quality or udder health. Another prerequisite was that the KOM system should fit in to the total quality management system for dairy farms as developed by the Dutch dairy industry and the national farmers union. The KKM system is permissive to the national and EU legislation aspects, and obligatory for all Dutch dairy farmers since 2000. Since 2006 the system is linked to each individual dairy industry. Farmers who want to deliver milk to one of the dairies, have to meet the requirements of the several quality modules. These modules are Medicines, Animal health and welfare, Foodstuff and water, Milking and milk storage, Cleaning and disinfection and Environment and waste products. The module Milking specifies that the milking machine should be tested yearly by a KOM-certified technician.

Institution KOM

The foundation KOM is an independent institution, because quality systems and quality control should be independent from the parties involved. After the start of the KOM organization, also the Dutch breeding and milk recording organizations decided to incorporate the routine accuracy check of electronic milk meters and recorder jars into the KOM responsibilities. This check is necessary for meters used for the official milk recording system as stated by the ICAR rules. The technicians from the manufacturers combine the yearly service on the milking machine and the routine tests on the functioning and accuracy of electronic milk meters and jars. The reason to do so was to reduce the costs for the farmer by combining control systems and maintenance.

The KOM quality assurance system

KOM has developed several activities to control the quality assurance system:

- Registration and evaluation of all test reports made by the technicians including reports on the accuracy of milk meters and jars.
- Annual control and calibration of the test equipment used by technicians.
- Performing random checks on the 'quality of work' of the technician including milk meters and jars.
- Certification of (new) technicians.
- Development of standard test reports (MAR) and tests (based on ISO and/or ICAR).
- Studies on the relation between milking machines and milk quality.
- Development of guide lines for new areas, like automatic milking systems.

During the yearly check on the milking machine, as done by the milking machine technicians, all components are checked and tested. If necessary, repairs are made or devices like pulsators are adjusted to the right value. Vacuum level, reserve capacity, air inlet, air consumption, air leakage and pulsation curves, are measured by using test equipment like airflow meters, vacuum testers and pulsation testers. The test results are recorded in a standard test report, which is equal for all manufacturers. The technician can also write down his comments. A copy of the report is handed over to the farmer, another copy is sent to KOM. The reports are registered per technician and evaluated at random using an evaluation protocol. The evaluation report is discussed with each technician once a year.

Registration of all test reports

At Waiboerhoeve experimental station, the research facility of the Animal Sciences Group of Wageningen UR, a training and test centre was established. This centre has a special test installation suited to test and calibrate vacuum gauges, air flow meters and pulsator test devices (De Koning and Huijsmans, 2001). The centre has also equipment to test other devices used during annual testing and moreover is equipped with almost every approved electronic milk meters available. They are used for training courses, to explain and practice the routine test for milk meters.

Control and calibration of the test equipment in use

KOM performs random checks on farms to evaluate the quality of work by the technicians, both for milking machine maintenance and for the routine test of milk meters. Each technician will get at least one random check per year by one of the KOM-officers. This re-test is carried out as soon as possible after the technician has done the yearly test of the milking installation. It consists of a check on vacuum level, reserve capacity, regulator leakage, the pulsation system partially, cleaning temperature and the presence of the test report. If necessary the whole test will be performed. If the technician is not doing a good job, KOM may decide to withdraw his certificate, so that he is not allowed to do any testing anymore.

Random checks

According to the requirements of KOM and the quality assurance systems of the dairy industry, all technicians should be well qualified and certified. Because there is no general education for this type of work, KOM has set up a special education program for milking machine technicians. The course consists of several modules varying from udder physiology, milking routines, milk quality, Mastitis, machine milking and testing, milk meter routine testing to dialogue techniques with the farmer. For the already more skilled technicians a modified course was developed. Over 350 technicians joined these courses and approximately 85% succeeded and obtained a certificate, so they are allowed to test milking machines within the KOM system. Special courses were designed for those technicians who do regular maintenance of automatic milking systems, which are now in use on over 6% of the Dutch farms.

Certification of the technicians

Results of random checks on milking installations and recording devices

The number and type of milking machine installations and the number of received test reports has changed in the past 25 years as presented in table 1. In the past 4 years the percentage of both rotary parlours as automatic milking systems in The Netherlands was doubled as can be concluded from table 1.

Table 2 presents the results for the random checks performed by KOM in 2007. The objective is to check 2% of all MAR test reports and 5% of the milk meter routine tests. Around 7% of the random checks on milking parlours in 2007 resulted in a remark concerning one or more aspects. Most remarks concerned completeness of data entry, assessments, and test procedures. In a few cases the technician was ordered to repair some things, like pulsation system or air leakages. About 8% of the farms with milk meters had a deviation on the accuracy of one or more milk meters, while 13% of the farms with recorder jars received a comment.

Table 1. Number of farms and type of milking installation in The Netherlands.

Milking system	1983	1993	2003	2007
Bucket milking machines (%)	26.3	5.3	0.8	0.2
Pipe line milking machines (%)	27.3	21.1	14.4	12.6
Herringbone parlours (%)	40.4	62.7	68.6	65.8
Side by side / tandem parlours (%)	5.6	10.1	12.5	13.6
Rotary parlours (%)	0.4	0.6	1.3	2.5
Automatic Milking Systems (%)	0.0	0.04	2.4	5.3
Total number of farms	49 500	35 540	23 595	20 790
Number of MAR test reports	21 000	32 000	25 000	23 000

Table 2. The number of random checks (farms and meters) in 2007 (Huijsmans, 2008).

	Milking parlours	Milk meters		Recorder Jars	
		Farms	Meters	Farms	Meters
Total number	234	118	1 308	106	1 026
Number with comments ¹	16	9	21	14	31
Percent deviation with comments	6.8	7.6	1.6	13.2	3.0

¹There has been a comment due to deviation in the test results, or over the procedure used, the result or on the report itself.

Results of calibrations tests on recording devices

The test results for the calibration (installation) tests are shown in table 3. It is remarkable to see that relatively more meters had to be adjusted during the calibration tests in most recent years.

A correct installation of the recording devices and installation procedure seems to be crucial for correct results of the recording devices in use.

Table 3 Results installation tests on recording devices by KOM technicians (Huijsmans, 2008).

Year	No. meters	Adjustments		Deviating samplers	
		(number and percent)	(number and percent)	(number and percent)	(number and percent)
2005	6 298	663	10.5	175	2.8
2006	5 691	873	15.3	290	5.1
2007	5 201	1 086	20.8	310	6.0

The fast development and introduction of portable PC's, e-mail services and Internet offer interesting perspectives to improve the quality system. Improving the speed, for example by using digital MAR reports which are send electronically to KOM using Internet, can make a further step. Another interesting aspect is the expected integration of test equipment; so one device is able to measure the different functions of the milking machine and to fill the data into a digital MAR report. New data could be checked for mistakes but could also be compared automatically with the historical data. Moreover working procedures and regulations will be standardized between the neighbouring countries Belgium and Germany.

Annual tests for milk recording devices are quite time consuming due to the fact that most milk meters have to tested in routine test procedures using water. When milk meters are connected to a PC system, statistical data analysis will offer time and money saving alternatives to the current procedures with water tests. For farmers using electronic milk meters connected to a PC system, such an alternative might save costs and will improve the quality of measured data. This is an advantage both for the milk recording organisation as for the farmers.

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Future developments

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