The Dutch quality system for milking machine maintenance in 2003 and 2004

K. de Koning[1] & P. Huijsmans[2]

[1]*Animal Sciences Group, Wageningen University and Research Centre, P.O.Box 65, NL-8200 AB Lelystad, The Netherlands*
E-mail: kees.dekoning@wur.nl

[2]*Stichting Kwaliteitszorg Onderhoud Melkinstallaties, NL-8200 AB Lelystad, The Netherlands*

Abstract

In the eighties and nineties ISO and ICAR standards were developed for milking machines and milk recording devices. In the Netherlands these standards were implemented in a Quality System for the maintenance of milking machines and the accuracy check on milk recording equipment managed by an independent organisation KOM. This organisation is controlled by national farmers union, the milking machine manufacturers union and the national breeding and milk recording organisation. KOM has set up several actions and procedures to supervise and to control the quality system, like 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 and education and certification of (new) technicians. Moreover studies on the relation between milking machine settings and milk quality are carried out and guidelines for new areas like automatic milking systems are developed. 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. The system has been incorporated in the total quality management system for dairy producers (KKM) of the Dutch dairy industry.

Key words: *Quality system, maintenance, milking machines, milk meters, recorder jars, accuracy, calibration*

Introduction

With the introduction of milking parlours in the early seventies, it became clear that milking machines need regular testing and maintenance for good milking. Testing was done by advisors from the dairy industry, animal health services or governmental extension services on request of the farmer or when problems with milk quality or udder health occurred

on the farm. In the case of malfunctioning, a technician of the milking machine dealer was asked to perform the necessary repairs, and the dairy advisor or extension officer checked the milking machine again.
In the early eighties the Dutch farmers union, governmental extension service and the milking machine manufacturers developed a national maintenance system. The basic idea behind this system was that all regular testing and maintenance should be integrated and performed by the technicians employed by dealers of the manufacturers to reduce the costs for the farmer and to improve the quality of maintenance. The national extension service became responsible for the training and evaluation of the technicians to guarantee their quality of work. The testing method was described in a national guideline for technicians. From that time on, all manufacturers used the same testing method, a uniform test report (Maintenance and Advice Report - MAR) and farmers paid a fixed price for the yearly test. At the end of the eighties over 80% of the Dutch farmers participated in this voluntarily maintenance system.

International Standards

In the seventies and early eighties manufacturers and experts from various countries, prepared the first international standards for milking machines. ISO 3918 describes the vocabulary, ISO 5707 describes the standards for construction and performance of milking machines and ISO 6690 deals with the testing methods. These standards are under revision at the moment. The standards apply to both new installations, and machines in use, to check the performance of operation periodically. In the same time ICAR developed guidelines for the approval and the use of milk meters and jars for milk recording purposes (ICAR, 1995).

Quality control system

In the mid nineties plans were developed with the Dutch farmers union, the national milk recording organisation and the Dutch organisation of milking machine manufacturers, to establish a quality control system for milking machine maintenance including milk recording devices (KOM). The quality system was expanded with certification programs for the technicians, calibration of test equipment and training and education courses. 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 such a system should fit in the Total Quality Management system for dairy farms (KKM, 2002) 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 joining such a system is obligatory for all Dutch dairy farmers since 2000. In 2005 this national program will be transferred to individual dairy industry quality programs, however the main objective will remain the same. Farmers, who want to deliver milk to one of the dairies, have to meet the requirements of the Quality Control Programs. Current modules of the Quality Programs are Medicines, Animal health

and welfare, Foodstuff and water, Milking and milk storage and Cleaning and disinfection. The module Milking specifies that the milking machine should be tested yearly by a KOM-certified technician.

Institution KOM

The institution KOM was founded in 1998. The KOM organisation is responsible for the entire quality system focussing on milking machines and milk recording devices. The supervision on the annual routine accuracy check of electronic milk meters and recorder jars is part of the KOM responsibilities. The 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 annual service on the milking machine with 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 the annual accuracy checks and the maintenance.

The KOM Quality System

KOM has developed several activities within the KOM quality system. These activities and the procedures are recorded in the KOM guidelines (KOM, 1999):

- Registration and evaluation of all test reports made by the technicians including reports on the accuracy of milk meters and jars,
- Yearly 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 reports (MAR) and tests (based on ISO),
- Studies on the relation between milking machines and milk quality,
- Development of guidelines for new areas, like automatic milking systems.

Registration of all test reports

During the yearly check on the milking machine, 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.

Control and calibration of the test equipment in use

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 &Huijsmans, 2001).

Random checks

The KOM institution 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 performed the annual test. The random check test consists of a check on vacuum level, reserve capacity, regulator leakage, and the pulsation system partially, cleaning temperature and the presence of the test report. If necessary a complete test procedure will be carried out. If the technician is not doing a good job, KOM may decide to withdraw his certificate, so that he is not longer allowed to test milking machines.

Certification of the technicians

According to the requirements of KOM, technicians should be well qualified. Because there is no general education for this type of work, KOM together with the Animal Sciences Group of Wageningen UR, 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 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. Joining an annual retraining course including the accuracy check of the test equipment, is a prerequisite for keeping the certificate. Moreover special courses were developed for technicians of automatic milking systems and technicians dealing with the maintenance of milk cooling tanks.

Results of evaluation and test equipment calibration

One of the first activities of the KOM –project was to evaluate the technicians by reviewing an at random selection of ten Maintenance and Advice Reports (MAR) for each technician. The reports were evaluated on several aspects, like completeness of the report, measurements, interpretations and remarks and advise. The results were discussed with the technicians. The number and type of milking machine installations and the number of received test reports has changed in the past 20 years as presented in table 1.

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

Milking System	1983	1993	2003
Bucket milking machines	26.3%	5.3%	0.8%
Pipe line milking machines	27.3%	21.1%	14.4%
Herringbone parlours	40.4%	62.7%	68.6%
Side by Side / tandem parlours	5.6%	10.1%	12.5%
Rotary parlours	0.4%	0.6%	1.3%
Automatic Milking Systems	0.0%	0.04%	2.4%
Total number of farms	49500	35540	23595
Number of MAR test reports	21000	32000	25000

Accuracy requirements

Technicians use different types of test instruments. These devices have to comply with the relevant ISO and. ICAR Standards. The equipment used by technicians vary from Bourdon gauges and digital vacuum meters, air flow meters (metering tube and a floating device, orifice air flow meters and electronic air flow devices), pulsation testers, balances and angle measurement instruments to check the position of recorder jars.

Results

The test results are shown in figure 1. In the year 2003 85% of the vacuum meters, air flow meters and pulsation testers was approved immediately, compared to 83% according to De Koning (1994). About 14% was approved after adjustment and 1% was rejected.

For the other test devices like balances and temperature meters, the results were well within the acceptable limits, although over 22% of all angle measuring instruments had to be readjusted. The results clearly show that calibration is necessary to guarantee accurate testing in practice to prevent wrong interpretations on the functioning of milking machines and or milk meter devices. Therefore it was decided to calibrate the test equipment of the technicians at least once a year (KOM, 1999). Each approved device will get an approval sticker of KOM, so farmers can check whether the technician is using calibrated equipment.

Random checks

Table 2 presents the results for the random checks performed by KOM in 2002 and 2003. The objective is to check 2% of all MAR test reports and 5% of the milk meter routine tests. The figures show an improvement from 2002 to 2003. Around 11% of the random checks in 2003 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 13% of the farms with milk meters had a deviation on the accuracy of one or more milk meters.

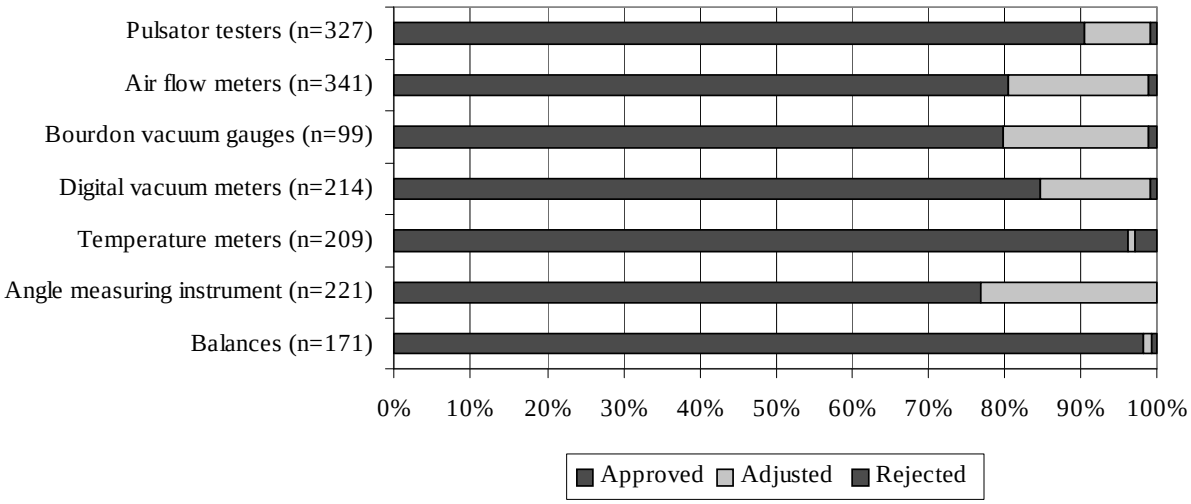

Figure 1. Results of the calibration tests in 2003 for different devices.

Table 2. The number of random checks (farms and meters) in 2002 and 2003.

	Milking parlours	Milk meters		Recorder Jars	
2002		Farms	Meters	Farms	Meters
Random checks	364	79	788	122	1082
Number with comments [1)]	41	14	29	39	94
% Deviation with comments	11,3%	17,7%	3,7%	32,0%	8,7%
2003					
Random checks	443	128	1222	135	1273
Number with comments [1)]	48	17	37	9	23
% Deviation with comments	10,8%	13,4%	3,0%	6,7%	1,8%

[1)] Type of comment not specified (there has been a comment due to deviation in the test results, or over the procedure used, or on the report itself).

Studies on the relationship between milking machines and milk quality

A study was performed on the relationship between technical parameters and milk quality parameters. MAR reports received in March 2002 were used for this study. Technical parameters like reserve capacity, vacuum level and pulsation characteristics were analysed for the relation with somatic cell counts and total plate count. In 9% of the reports from milking parlours with a known installation date, reserve capacity was below the ISO standards. For installations installed after 1996 this was 3%, for installations installed before 1996 11% did not meet the standards. Somatic cell counts and TPC (total plate counts) on farms with insufficient reserve capacity were slightly higher, however the differences were very small and not significant.

Future developments

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 neighbour countries.

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 might offer time and money saving alternatives to the current procedures. 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.

References

Huijsmans P., 2003: Jaarverslag 2001-2002, Stichting Kwaliteitszorg Onderhoud Melkinstallaties (in Dutch).

Huijsmans P., 2004: Jaarverslag 2003, Stichting Kwaliteitszorg Onderhoud Melkinstallaties (in Dutch).

ICAR, 1995-2004: The approval and checking of milk recording equipment, ICAR, Sub Committee Meters and Jars, Rome.

KKM, 2002: Erkenningsreglement KKM, protocol 2002. – in Dutch).

KOM, 1999: Kwaliteitscontrole melkinstallaties (Reglement voor kwaliteitsbewaking op onderhoud en controle van melkinstallaties en melkmeetapparatuur – in Dutch).

Koning C. de, Huijsmans, P., 1995: Jaarverslag 1994 – project Kwaliteitszorg Onderhoud Melkinstallaties, IKC Landbouw, Lelystad (in Dutch).

Koning C. de, Huijsmans, P., 2001: The Dutch Quality System for Milking Machine Maintenance, ICAR Technical Series, nr7.