

Automatic Milking System Guidelines

INTRODUCTION

The first commercial automatic milking system (AMS or ‘robotic milking system’) in Canada was introduced in Ontario in March 1999. Existing regulations relating to milk quality and safety did not address some of the situations occurring with AMS installations and their management at that time, which led to quality issues, primarily with new startups. Regional guidelines have been developed and applied in different parts of Canada since 2001. This document is the result of a review and revision of these guidelines by a working group (WG) comprised of government and dairy industry representatives from across Canada and also includes consideration of international AMS standards.

Many changes have taken place in the dairy industry in Canada since 2001 including new manufacturers and the introduction of a ‘second generation’ of AMS designs. With this, new installations have steadily increased across Canada^{1,2}. For these reasons, the following revised guidelines are being proposed to provide consistent installation, operation and maintenance of systems for the safety and quality of milk produced and collected from farms with AMSs.

These guidelines are intended to be used as recommended ‘best practices’ and include proposed changes for consideration by the International Dairy Federation (Canada Chapter) Coordinating Committee on Dairy Regulatory Standards as they work to continuously improve the National Dairy Code (NDC). The NDC is used as a template (‘the standard’) for provinces as they look to develop regulations. Adoption and implementation of specific NDC requirements into regulations is conducted at the provincial level.

¹ 2002 Proceedings to the First North American Conference on Robotic Milking

² 2015 Automatic Milking System Working Group Provincial Survey

GLOSSARY OF TERMS

Automatic Milking System (AMS) – For the purposes of this document, an AMS is a milking system for unattended milking of identified animals and includes all milking units, milking apparatus, buffer tanks, bulk tanks, equipment cleaning apparatus, and all hardware and software components for operating and monitoring. AMSs include stationary and mobile models. Mobile models are also referred to as ‘tie stall AMSs’.

Boot Wash Station: An area where manure and other residues can be rinsed from boots or apparatus using potable water and where waste water drains away from the walkway.

Buffer Tank: A refrigerated or non-refrigerated temporary milk storage tank that is used while milk is being picked up from the bulk tank and while the bulk tank is being washed.

Bulk Tank: The tank that stores the milk that is being offered for sale and is capable of cooling or maintaining the pre-cooled milk between 0 and 4°C, agitating and measuring the milk.

Bulk Milk Grader (‘grader’): means a person authorized by the Regulatory Authority to perform the duties of a bulk milk grader including grading, sampling and measuring the milk in the bulk tank and transferring milk to the bulk milk truck (‘tank-truck’).

Clean Access: A walkway or path to a location on the farm premises that is free of manure and other organic materials.

Clean-in-place (CIP): An automated wash process that cleans milk contact surfaces without the need to disassemble equipment.

Failsafe alarm: an alarm that will operate despite a power failure or failure in the control mechanism or control system

Milk House: A building or structure where milk is cooled and/or stored and milking equipment is cleaned, sanitized, and stored.

Milk Room: A room separated from the milk house that contains the bulk tank port(s) and bulk tank controls.

Milking Apparatus: Equipment associated with the milking, milk transfer or milk cooling and storage functions.

Milking Equipment Area: is a clean, protected area housing the control side of the AMS milking unit, a sink, and where milking equipment (e.g., milking units) is stored and cleaned.

Milking Unit: The milking equipment that cleans and prepares teats for milking, attaches and removes the inflations, performs the milking and transfers the milk to the receiver group.

Milking Platform: floor space where cattle stand during milking

Milk Receiver: The container where milk from cattle being milked initially collects before it is transferred to a buffer tank or bulk tank.

Mobile AMS Station: A designated area, protected from contamination, where a mobile AMS is parked for cleaning and maintenance.

Operator: The person responsible for interacting with the AMS's computer at the farm. This person must be trained by the manufacturer or the manufacturer's agent for every operation needed by the operator such as entering information into the computer and making minor changes in settings for the AMS.

Regulatory Authority: The government authority or their representative responsible for the administration and enforcement of provincial regulations pertaining to raw milk quality, including the personnel appointed by the Regulatory Authority to carry out the responsibilities of the Regulatory Authority.

Time-Temperature Recorder (TTR): A device that provides constant electronic milk temperature monitoring and is usually connected to a milk storage tank (e.g., bulk tank, buffer tank) or pipeline. A TTR measures the milk or wash water temperature over a specified time period, records it and gives alarms when temperatures are out of acceptable range.

APPLICATION

This guideline applies to all automatic milking systems (AMSs) including stationary and mobile units ('tie stall AMS').

GUIDELINES

1.0 NOTIFICATION REQUIREMENTS

Prior to commencing construction, the license holder must notify the Regulatory Authority of their intent to install an AMS or additional automatic milking unit(s). Producers must have available a set of plans for the entire operation including the animal housing, automatic milking unit(s) location(s), milk house location and buffer and bulk tank locations. The proposed plans are expected to meet all provincial and municipal regulatory requirements upon completion.

2.0 APPROVALS

- 2.1 Any new facilities, or the installation of new milking systems must be approved, as required by the provincial Regulatory Authority, prior to milk being offered for sale.
- 2.2 Prior to harvesting and storing milk for marketing, the producer must ensure the automatic milking system and apparatus operate as intended by the manufacturer.

3.0 FACILITIES

- 3.1 The facilities must be constructed in such a manner that the main access to the cattle-housing area(s) must not be through the milk house or milk room but through a separate entrance from the exterior.
- 3.2 The facilities must be constructed to ensure clean access by people to the AMS milking equipment area.
- 3.3 The milking equipment area (i.e., stationary AMS) and the mobile AMS station must:
 - 1) be separated from the cattle housing and traffic areas and constructed to ensure equipment is protected from contamination and damage by cattle,
 - 2) be constructed of materials that are durable, will permit the effective cleaning of all interior surfaces, and are free of any toxic or noxious substances,
 - 3) be constructed and operated in a manner that prevents freezing,
 - 4) if necessary, be properly ventilated to minimize odours and flies,
 - 5) have proper lighting to perform equipment checks and maintenance, and that is protected from breakage or shatterproof,
 - 6) have adequate pest control, including means to prevent birds from perching,
 - 7) be supplied with pressurized hot and cold running potable water that is protected from any source of contamination,
 - 8) be equipped with a sink and the necessary materials for sanitary washing and drying of the hands, and for cleaning utensils,
 - 9) be equipped with a hose that permits cleaning of the area and equipment, and
 - 10) be cleaned regularly and kept clean.
- 3.4 The milking platform and mobile AMS station must:
 - 1) be designed and maintained in a manner that minimizes odours and accumulations of animal waste and debris,
 - 2) be equipped with a trapped drain to an approved wastewater containment system, and
 - 3) have a solid floor (i.e., not be installed directly over slatted floors).

- 3.5 There shall be boot wash stations provided at the exit points of the cattle housing area for use in cleaning boots prior to entering the milking equipment area and milk house and/or milk room. Boot wash stations should be installed and operated in a manner that prevents freezing.
- 3.6 In facilities with a milk room, the milk room must be equipped with a sink supplied with pressurized hot and cold potable water and the necessary materials for sanitary washing and drying of the hands, and for cleaning utensils.
- 3.7 The bulk milk grader must have clean access to the milk house and/or milk room either by direct exterior access or through a corridor that is not accessible to cattle or used as a cattle corridor.

4.0 MILK PICKUP

- 4.1 Instructions for milk pickup must be posted in a visible location in the milk house and/or milk room for use by the bulk milk grader. They must be current, legible and include sufficient detail to direct an unfamiliar grader as to how to collect the milk.
- 4.2 Milk pickup instructions must include:
 - 1) diversion of milk flow from the bulk tank to the buffer tank or drain, prior to initiating the milk pickup procedure (i.e., measuring, agitating, grading and sampling milk in the bulk tank). Note, absolutely no milk from any AMS may enter the bulk tank once the milk pickup procedure has been initiated.
 - 2) a properly labelled, emergency shut off procedure for stopping milk transfer from the bulk tank during pickup, and
 - 3) contact information for the producer and manufacturer or manufacturer's agent in case of an emergency or problems.
- 4.3 The grader may connect the wash system and should start the bulk tank wash. The producer must have current, legible wash procedures posted in the milk house and/or milk room and the system must be safe to operate. The grader is not expected to handle cleaning chemicals.
- 4.4 Visual check(s) of the bulk tank should be performed after the completion of the bulk tank wash to detect incomplete wash water drainage and ensure proper cooling of milk.

5.0 MILK COOLING AND STORAGE

- 5.1 Bulk tanks must be equipped with a filtered vent that is located in the milk house or milk room.
- 5.2 Continuous cooling of the milk must be initiated within the first hour of milk harvest (i.e., from the moment milk is diverted to the buffer or storage tank).
- 5.3 Milk must be cooled, without freezing, to 4°C or less within 3 hours of the start of milk harvest.
- 5.4 After milk has initially cooled to below 4°C, it must be maintained at a temperature of greater than 0°C and less than or equal to 4°C until collection. The blend temperature of milk in the bulk tank connected to an AMS must not rise above 4°C for more than 15 consecutive minutes.
- 5.5 The bulk tank must be equipped with agitation and an interval agitation timing device that provides sufficient agitation to properly cool the milk and prevent freezing, without excessive agitation that could cause other quality defects (such as foaming). Between 5 and 10 minutes of agitation per hour is generally acceptable.
- 5.6 A control that redirects milk from the bulk tank to the buffer tank, must be installed at a convenient location near the bulk tank outlet valve to start the milk pickup procedure.
- 5.7 The bulk tank must be of sufficient capacity to store the milk produced in the normal pickup interval plus 12 hours.
- 5.8 Bulk tanks must be equipped with a Time Temperature Recorder (TTR) that has been approved by the Regulatory Authority. The TTR must indicate when milk and/or wash temperatures and times are out of range. Sensors and agitators must be installed such that milk is uniformly mixed and milk temperature can be accurately recorded within 3 hours of the beginning of milk harvest.
- 5.9 Where milk is stored in the buffer tank for more than 3 hours, the buffer tank must be equipped with:
 - 1) cooling,
 - 2) a TTR that has been approved by the Regulatory Authority, and
 - 3) agitation to ensure that an accurate temperature reading can be obtained.
- 5.10 Milk handling systems must be designed and operated such that milk quality is not jeopardized by excessive turbulence due to such features as the use of high-speed pumps, poor (rough) welds, or excessive number of system joints or milk line elbows.

5.11 Milk must be filtered between the milk receiver and the bulk tank. For installations with a pre-cooler, filtration must occur before the pre-cooler.

6.0 MILKING EQUIPMENT

6.1 All milk handling equipment and transfer lines must be safe for use with food products. 3A Sanitary Standards (North American), European Hygienic Engineering & Design Group or 'EHEDG' (Europe), and ISO 5707 (International) standards are considered acceptable.

6.2 All valves used in the system must revert to a safe or closed position if there is a failure in the control mechanism or control system such that the milk in the bulk tank is protected from contamination. Systems must be equipped with a functioning failsafe alarm.

6.3 Visual indicators of valve position are required on proximity sensors for bulk tank outlet valves and must be connected to an alarm within the AMS system.

6.4 A safety switch and control, that prevents milk from entering the bulk tank unless it has been completely drained of liquids following the cleaning cycle, must be installed on the bulk tank.

6.5 All milk handling lines, transfer lines, and valves are to be clean-in-place (CIP).

6.6 Any Clean-Out-of-Place (COP) milking apparatus must be clearly marked as such. Current, legible instructions for COP cleaning shall be posted in a visible location, and personnel shall be trained on cleaning requirements.

6.7 Milk transfer lines must have continual slope and be self-draining, without sagging.

6.8 The producer must ensure that during operation the system will:
a) clean, sanitize and dry the teats and discard the first milk streams,
b) detect and discard milk that is abnormal in colour, and
c) discard milk from treated animals.

6.9 Jetter cups and inflations must be protected during teat prepping and milking to prevent contaminants from getting into the milk and must be drained of liquids after cleaning cycles.

6.10 Post milking teat dip and teat spray applicators must be protected from contamination.

6.11 In-line filters must be stored in suitable containers or cabinets to protect against contamination.

- 6.12 Milk contact surfaces must be accessible for inspection.
- 6.13 Where compressed air is directed towards milk contact surfaces, the oil used in air compressors must be food-grade and must be changed as recommended by the manufacturer.
- 6.14 Compressed air and air used for air injector systems and air blows must be free of foreign material (e.g., rust, oil, heavy metals), water (i.e., condensation) and micro-organisms.

7.0 CLEANING OPERATIONS

- 7.1 Cleaning chemicals used for cleaning milk contact surfaces (includes bulk tank, buffer tank, milking apparatus) must be properly labelled, approved for use in Canada, and used according to their intended use.
- 7.2 All milk contact surfaces associated with the AMS must be cleaned according to the chemical and/or equipment manufacturer's wash instructions, three times a day at approximately eight-hour intervals.
- 7.3 New milk filters must be installed at least 3 times within every 24-hour period at approximately eight-hour intervals.
- 7.4 Equipment surfaces in contact with milk from treated cattle or bloody milk must be thoroughly rinsed and drained immediately following milking to ensure no residues remain on milk contact surfaces.
- 7.5 The buffer tank must be rinsed and cleaned as soon as possible after emptying.
- 7.6 For AMSs that only clean the buffer tank following milk pickup, the buffer tank must be cleaned or sanitized again within a few hours prior to the next milk pickup.
- 7.7 If a milking unit is unused for more than 45 minutes, the milk contact surfaces of the milking unit and associated lines and hoses must be rinsed with potable water and drained, to minimize milk residues in equipment.
- 7.8 Milk contact surfaces of milking apparatus (other than a buffer tank) unused for more than two hours must be purged of milk, and rinsed immediately before use, and drained.
- 7.9 Exterior of AMS milking units, milking apparatus, and AMS milking platform must be cleaned regularly and kept clean.

- 7.10 The area surrounding cattle access to the AMS milking platform must be maintained clean.
- 7.11 Producers must maintain clean access to the milking equipment area and milk house and/or milk room.

8.0 MAINTENANCE

- 8.1 Preventive maintenance, whether conducted by the manufacturer's agent or the producer, must meet the intent of the manufacturer's scheduled maintenance at all times.
- 8.2 All maintenance must be documented and accessible for review.

9.0 TRAINING

- 9.1 It is the responsibility of the producer to ensure that an operator is trained to perform daily tasks related to the AMS including interacting with the AMS's computer.
- 9.2 The operator must obtain training on the AMS and have an operator's manual (hardcopy or electronic) written in at least either official language prior to the system's first use.
- 9.3 The operator must be capable of interpreting data output from the AMS.
- 9.4 The operator should be aware of and understand what corrective action to take if there are quality issues related to freezing points, bacterial counts, veterinary drug residues (inhibitors), and somatic cell counts.
- 9.5 The operator's manual and a report of system data output must be available to the regulatory authority for inspection purposes.

10.0 TESTING

- 10.1 The water that will be used for teat cleaning and milking system cleaning, rinsing and sanitizing must be potable ('drinking quality') as determined by the provincial authority.

11.0 COW CLEANLINESS AND MILKING ROUTINE

- 11.1 Cattle must be clean.
- 11.2 Udder hair must be maintained short.

- 11.3 Teats must be cleaned before milking.
- 11.4 A teat sanitizing product, approved for use in Canada, must be used in the teat preparation process.
- 11.5 A post dip, approved for use in Canada, must be applied to teats immediately following milking.
- 11.6 Record the medical treatments of cattle in the computer system before administering medication.