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Milking and cooling machine installations — Monitoring device for bulk milk cooling tanks — Requirements

Installations de machines de traite et de refroidissement — Dispositif de surveillance des réservoirs de refroidissement — Exigences

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

As milk is a sensitive product, the cooling and storage conditions are of special importance. Monitoring devices for cooling tanks support the control of the cooling and storage conditions and indicate if actual conditions do not comply with the specified conditions.

As the monitoring device is part of the milking and cooling installation, it is essential that its design and installation are compatible with the complete installation and comply with the installation manufacturer's specifications.

This document compliments the other standards for milking and cooling equipment provided by TC 23.

Milking and cooling machine installations — Monitoring device for bulk milk cooling tanks — Requirements

1 Scope

This document specifies minimum performance and information requirements for monitoring devices of bulk milk cooling tanks as part of milking and milk cooling machinery installations in agricultural operations. It also specifies the minimum requirements for materials, design and installation.

The purpose of this document is to contribute to a high-quality milk production by monitoring, collecting data and providing alarms with respect to defined parameters of the milk cooling, storage and cleaning processes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3918, *Milking machine installations — Vocabulary*

ISO 5708, *Refrigerated bulk milk tanks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3918 and ISO 5708 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
monitoring device
means allowing to measure, to record and to evaluate specified technical or operational parameters of the bulk milk tank

3.2
first batch of milk
quantity of milk that is filled to the tank between T0 and T1

Note 1 to entry: See Table 2 and Figure 1.

3.3
blended batch
comprises the quantity of milk stored between T1 and T2

Note 1 to entry: See Table 2 and Figure 1.

3.4
milk
refers to the entire quantity of milk added between T0 and T2

Note 1 to entry: See Table 2 and Figure 1.

4 Requirements

4.1 General

4.1.1 Functionality and suitability

4.1.1.1 Monitoring devices provided by the milking and cooling equipment manufacturer, and being part of the installation, shall be included in the manufacturer's conformity procedure for the milking and cooling installation to ensure compliance with possible legal requirements, such as those related to safety and hygiene.

4.1.1.2 Manufacturers/installers of monitoring devices as independent products, for example for retrofitting of an installation, shall take into consideration any relevant legal requirements. In addition, the manufacturers/installers shall ensure compatibility with the installation to avoid negative effects, such as disturbances of functions or malfunctions, on the whole milking and cooling installation.

4.1.2 Design

4.1.2.1 Materials used for monitoring devices shall comply with ISO 5708.

4.1.2.2 The monitoring device shall inform about the operational status of the bulk milk tank.

4.1.2.3 The monitoring device shall be able to transfer data to external devices such as farm's cowshed PC, USB storage device or other electronic equipment.

4.1.2.4 The monitoring device shall be protected against unauthorized modifications (manipulations).

4.1.2.5 The sensor for monitoring the milk and cleaning temperature shall

— be independent of the sensor(s) for controlling the milk cooling and cleaning processes; or

— in case of tank controller with integrated monitoring unit, dual temperature sensors shall be used.

4.2 Technical requirements of the monitoring device

4.2.1 Functional requirements

The accuracy of measurements shall be:

— ± 0,5 °C for temperatures between 0 °C and 20 °C;

— ± 1,0 °C for temperatures between > 20 °C and < 100 °C.

4.2.1.1 The monitoring device shall monitor the milk cooling and storage conditions from at least 6,7 % of the rated tank volume.

4.2.1.2 The monitoring device and its components shall not affect milking, cooling or cleaning.

4.2.1.3 The monitoring device shall allow the reading and the adjustment of temperature and time limits for critical and informative alarms by the authorized service personnel (see Tables 2, 3 and 4).

4.2.1.4 The monitoring device shall show whether the milk cooling and storage conditions are as intended, or an alarm has been activated.

Alarms shall be clearly indicated in form of a visual signal (for example green, orange, red). Additional information can be shown on a display. In case of abbreviations or codes, the meaning shall be explained by information located next to the monitoring device. In case of textual information, this information shall be provided in the language used most commonly in the country/region. The alarm information shall be available even in case of power supply failure (see 4.2.1.6).

The alarm can also be sent to a remote system (e.g. the central control unit of the milking and cooling installation, farm's PC, and/or the mobile communication device of the person responsible for the operation of the installation).

4.2.1.5 Data (see Table 1) and alarms (see 4.3 and 4.4) to be recorded shall be provided with a date and time and stored for at least 60 days. It shall not be possible to change recorded data manually. A backup system shall be provided to ensure that data are not lost as a result of a breakdown or power failure.

Data export shall be provided [for example Comma-Separated-Values (CSV), Java Script Object Notation (JSON) or others].

4.2.1.6 The monitoring device shall be provided with sufficient backup power so that, in the event of power failure, the system is able to generate and send the appropriate alarm message(s).

4.2.1.7 The monitoring device shall provide critical and informative alarms (see 4.3 and 4.4).

4.2.1.8 The temperature recording shall start as soon as milk is detected entering the tank. The recording interval shall not be more than 15 min during milk cooling and storage and not more than 1 min during cleaning.

4.2.1.9 The monitoring device shall record at least the events shown in Table 1.

Table 1 — Events to be recorded

Event with date and time in h:min:sec	**Explanation**
First milk in the tank	Recording of arrival of the first milk into the tank after the tank has been emptied and cleaned
Agitation started	Recording of start of agitation
Agitation stopped	Recording of stop or breakdown of the system
Cleaning started	Recording of start of cleaning unit /CIP system
Cleaning completion	Recording of completion of cleaning process
Monitoring device operational	Recording of working of monitoring device
Monitoring device not operational	Recording of interruption of monitoring device or power supply failure
Application of cleaning agents	The application of the cleaning agent shall be monitored at appropriate times.[a]
[a] Measuring the detergent volume is not required.	

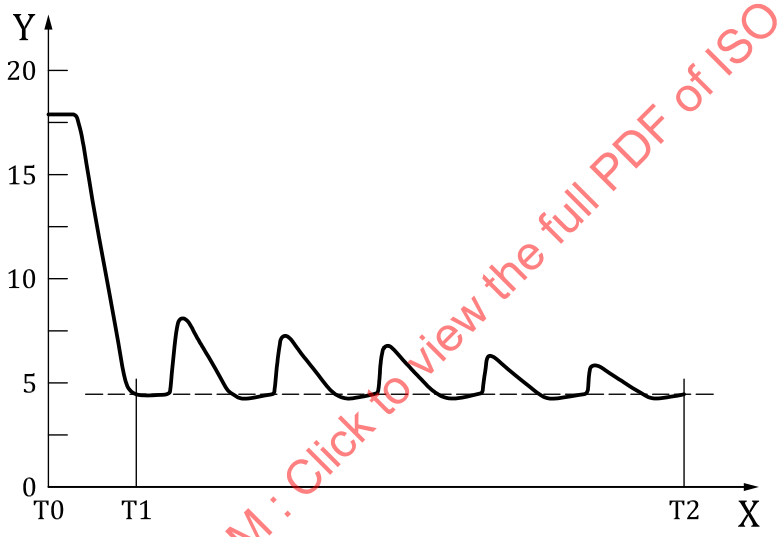
4.3 Alarms for monitoring milk cooling, storage and agitation

4.3.1 Monitoring milk cooling and storage temperature

Means to specify at least 6 temperature alarms shall be provided. Table 2 shows 3 examples. Figure 1 shows the time definitions.

Table 2 — Examples for cooling and storage alarms

Temperature		Duration		Critical or informative	1st batch or blended batch or all
Operator (> or <)	Limit value °C	Operator (> or <)	Limit value min		
<	1,0	>	0	Informative	All
<	0,5	>	0	Critical	All
>	10,0	>	60	Critical	Blended



Key

T0 time when milk begins to enter the milk tank
T1 time when the first batch of milk has been cooled to the target storage temperature
T2 time when the milk is collected, after which the milk tank is cleaned before the addition of a new batch of milk
X time
Y temperature

Figure 1 — Example for temperature graph for milk cooling and storage

4.3.2 Monitoring agitation

Means to specify at least 3 agitation alarms when milk is in the tank shall be provided. Table 3 shows 2 examples.

Table 3 — Examples for agitation alarms

Agitation		Duration		Critical or informative
Operator (> or <)	Agitation duration min	Operator (> or <)	Period min	
<	2,0	>	30	critical
>	240			informative

4.4 Monitoring cleaning of bulk milk tank

Means to specify at least 5 cleaning alarms shall be provided. Table 4 shows 2 examples.

Table 4 — Examples for cleaning alarms

Operating conditions	Operator	Temperature C°	Minimum duration min	Period h	Informative or critical	Remark
Minimum temperature during main cleaning	<	45	2	72	informative	Becomes critical when time frame is exceeded
Maximum temperature during cleaning	>	90	1	—	critical	

Informative or critical alarms shall also be provided if specific events (for example application of cleaning agents, tank not empty after cleaning) do or do not occur.

4.5 Record information

The records shall include the following information

— reference to the monitoring profile or specification used;

— farm identification;

— tank identification;

— monitoring device identification;

— monitoring device manufacturer name;

— date, time.

5 Retrofitting of monitoring devices

5.1 Monitoring devices for retrofitting shall comply with the all requirements given in this document.

5.2 On completion of retrofitting, the new/additional equipment and all associated sensors shall be inspected and tested to ensure:

— compliance with the instructions of the manufacturers of both cooling and milking equipment;