Tanker Cleaning Code of Practice

Dairy Operations

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(Version 3)

THIS GUIDANCE IS ADVISORY ONLY

The members of the CIP Working Party who prepared the initial version of the guide were:

Chairman

Mr Tim Hampton Milk Link

Members

Dr Ed Komorowski Dairy UK

Ms Nikki Olatunji Dairy UK

Ms Linda Clow Arla Foods

Mr Willie Callaghan Wiseman Dairies

Mr Richard Beattie First Milk

The Code of Practice was updated in May 2021 in consultation with Dairy UK's Scientific and Technical Committee and the DTAS Management Committee.

Further information can be found on the official DTAS website at http://www.dairytransport.co.uk/dtas/home.eb

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DAIRY UK TANKER CLEANING CODE OF PRACTICE

Introduction

This Code of Practice is intended to establish a framework of minimum requirements, which gives guidance in tanker cleaning. This Code recommends good practice, as it is impossible to include every cleaning and disinfection schedule. Each operator must determine the most suitable methods applicable to their needs and verify that they perform the function required. Hauliers are expected to be aware of and operate to this code of practice.

This document is designed to be used in conjunction with the *DTAS standards and **Dairy UK/ DTAS Codes of Practice on Milk Tanker Design.

This code is designed for automated clean–in-place (CIP) systems, i.e. tankers with integrated spray balls or spinners in place. If manual systems are used, the principles of this code still apply and need to demonstrate that tankers have been satisfactorily cleaned and disinfected.

Unless there are other contractual arrangements, this code will apply to the following:

- Dairy
- Haulier
- Commercial cleaning station

Unless there are other contractual arrangements:-

i) Consignees will be responsible for the proper cleaning of tankers after unloading at their premises.

ii) Hauliers will present properly certified cleaned tankers for loading at a despatching dairy.

iii) Hauliers will present properly cleaned tankers for farm collection routes.

In interpreting this Code, ‘milk’ should be deemed to include milk and milk products and a clean tanker is one which has been thoroughly cleaned by CIP within the previous **24** hours. (See 1.3)

***DTAS STANDARD – Dairy Transport Assurance Scheme Standards by Dairy UK**

****Dairy UK / DTAS Codes of Practice on Milk Tanker Design**

1.0 Cleaning and disinfection of tankers

1.1 All tankers used for the transport of milk must be cleaned once in a 24-hour period. The person responsible for cleaning will depend on the contractual arrangements but typically it will be the consignee where the milk is delivered/transhipped to their premises in such tankers. Where milk is transhipped prior to delivery to the dairy the haulier is responsible for ensuring the cleanliness, hygiene and security of the primary tankers.

1.2 In the case of ex-silo milk it is the haulier's responsibility to present a clean tanker for loading. Nevertheless, the consignor is responsible for ensuring that the tanker is clean before filling with evidence through submission of an electronic cleaning log / certificate. If this is not available, a log wash book must be used as the alternative. The consignee is responsible for cleaning and disinfecting the tanker after emptying.

1.3 Tankers will normally be cleaned once in a 24-hour period. If the tanker has been out of service for more than 24 hours from the last CIP then the tanker must be subject to a full CIP. By documented exception only, this could be extended to 48 hours, if the tanker has been sealed and the seals have not been broken. The requirement to clean tankers once in a 24-hour period does not apply if the tanker still contains milk at the end of the 24-hour period. In this case the tanker should be cleaned as soon as it is practicable after emptying.

1.4 Suitable facilities must be available where CIP is operated to enable cleaning and disinfection of tankers to be satisfactorily carried out.

1.5 Vacuum-filling tankers must be cleaned with the manway lids firmly shut and the vent pipe open. Other types must be cleaned with the manway lids open unless they are fitted with venting devices designed to give adequate venting under full CIP with the lid closed. When the lids are left open, due consideration must be given to local health and safety requirements.

2.0 Road tankers for the carriage of milk

2.1 Tankers for the carriage of milk must be suitable for this purpose and designed to be cleaned effectively by CIP using non-QAC-based chemicals. Other chemical use may be prohibited if contractual agreements dictate.

2.2 The operator must have clearly documented procedures for each design of tanker that defines how safe and effective cleaning must be carried out, e.g. whether or not it can be cleaned with the lids shut; if it has spray balls installed the delivery pressure and flow-rate required per section. The required CIP flow rate and pressure required to effectively clean a tank is determined by the spray balls or spinners fitted and must be suitable for the type, size and design of the vehicle being CIPd in line with the manufacturers recommendations.

2.3 All vessels shall be equipped with spray balls or rotary devices capable of withstanding water/chemical maximum temperatures of the chemical and water used and cleaning effectively all exposed surfaces inside the vessel with adequate fluid delivery to ensure effective cleaning of all exposed equipment inside the vessel. *(See section 3.2.1 for inspection requirements).*

2.4 Supply pipework shall be permanently fixed on the outside of the vessel but spray devices or rotary devices shall be removable for inspection and maintenance. Any vulnerable joints in exposed pipework shall be sealed to prevent unauthorised dismantling.

2.5 All tankers and trailers shall have provision for the carriage in an accessible and weatherproof location of a Cleaning Logbook or electronic cleaning log/certificate. (See Appendix 2)

2.6 Tanker outlets must be protected from road/farm contamination

3.0 Tanker cleaning facilities

3.1 Tanker cleaning bay

3.1.1 The tanker cleaning bay must provide adequate drainage of the tanker.

3.1.2 Ideally, the bay should be of sufficient size to allow for tankers being prepared for CIP while others are being cleaned.

3.1.3 An adequate supply of potable water of a suitable level of softness should be available for detergent make-up and tanker rinsing.

3.1.4 Facilities for hand cleaning parts (e.g. hose-ends and filters etc) must be provided. A supply of hot water must be available together with suitable fused head bristle brushes in good condition retained exclusively for use on milk contact surfaces together with a supply of detergent and appropriate disinfectant that has been designed for food and dairy use - refer to section 2.1. Chemical strengths and measuring equipment should be clearly marked to avoid any cross-contamination.

3.1.5 Provision should be made for storage of hoses off the ground, and such that they do not contain water, and must be capped when not in use.

3.2 Spray heads

3.2.1 According to the haulier's schedule for tanker service and maintenance, fixed spray devices, connecting pipes and fittings should be checked during service and maintenance and the inspection should be recorded (photographic evidence that this work has been carried out is satisfactory). It is recommended that this is carried out every 4-6 weeks to ensure that they are not blocked or damaged.

3.2.2 In the case of vacuum filling tanker which require that the spray device is manually fitted, this should be checked every 4 weeks to ensure that they are not blocked or damaged. Other frequencies may apply according to contractual agreements.

3.2.3 Vacuum tankers designed specifically for Farm Collection may utilise removable spray devices assemblies which shall be provided by the Customer and matched to the CIP delivery pump.

3.3 Cleaning plant

3.3.1 Each cleaning site must have facilities capable of effectively cleaning all sizes of tanker that will require cleaning at that site. Each CIP set should carry documentation stating its capabilities and records held showing its validation for each type and size of tanker design being cleaned at that specific site.

3.3.2 The CIP unit should incorporate a cleaning and disinfecting solution storage tank that is sufficient and adequate.

3.3.3 A pre rinse water recovery tank should be large enough to hold the total volume of water required. There should be sufficient residual space available in recovery tanks.

3.3.4 A feed pump should be of a proven suitable type and all wetted parts constructed of stainless steel, with the correct seal type for the chemical being used. A pressure gauge of suitable range should be fitted to the feed pump discharge as near to the inlet of the tanker as possible.

3.3.5 The return pump / scavenge pump should be effective, capable of self-priming, and pumping through air.

3.3.6 The provision of removable suitable filters in return lines is recommended and, if filters are in place, they should be inspected for debris/damage on a daily basis.

3.3.7 The cleaning solution should be heated by means suitable to the facilities of the site. The minimum temperature should be that specified by the detergent supplier.

3.3.8 It is recommended that a conductivity cell is included in the return line between the pump and detergent tank to enable a check to be maintained on the strength of the detergent solution.

3.3.9 It is strongly recommended that the CIP system records, where available, the temperature of circulating cleaning chemical, start time, finish time, tanker identification, and, ideally, chemical concentration and delivery pressure.

3.4 Transfer pumps and hoses

Transfer pumps and hoses are considered as part of tanker cleaning and are subject to this code of practice and must be fit for purpose.

4.0 Detergents, disinfectants and detergent/disinfectants

4.1 The basic steps in cleaning of milk tankers and ancillary equipment are:

(i) A preliminary pre-rinse or rinses to waste with cold or lukewarm water to remove gross soiling.

(ii) A cleaning treatment with detergent solution so that the soiled surfaces are cleaned. The amount of solution to be circulated should be adequate for the size of the tanker being washed at the predetermined temperature at such time as to adequately clean the tanker.

(iii) One or more rinses of the cleaned surfaces with potable water so that they are free from released contaminant and detergent solution.

(iv) Where appropriate, a disinfection treatment to reduce the number of micro-organisms present to a minimum.

(v) Where appropriate, further rinses with potable water to remove traces of chemical disinfectants where used. Treatments (ii) and (iv) may be combined in certain detergent/ disinfectants. The rinse water from (iii) and (v) may be recovered for subsequent pre-rinse purposes.

(vi) Where the tanker being cleaned is going straight back into service, the final rinse water should be used to cool the tanker sufficiently to allow it for this purpose. All final rinse water must be free drained from the vessel before leaving the depot.

(vii) Manual sample taps and in-line samplers should have appropriate cleaning procedures which are documented.

(viii) In specifying the cleaning sequence consignees should bear in mind that cleaning of the air elimination vessel (AEV) is achieved by the intermittent diversion of CIP fluid from the inlet line. This may be achieved by means of a manual or pulsed valve which allows fluid into the AEV and the cleaning sequence, therefore, needs to be timed so as to ensure that there is a flow of CIP fluid during this period. The valve actuation timings must be set to achieve this.

NOTE: It is currently not possible to determine valve actuation times in the CIP programme of the tanker being cleaned – RECOMMENDATION all valves are opened prior to CIP to drain the tanker.

4.2 Detergents

A wide range of chemicals is available for use in manual and circulation cleaning. Detergents may be formulated from the basic chemicals at the dairy for use in cleaning systems, or suitable proprietary blended detergents are available.

4.2.1 Where branded dairy detergents are used the suppliers can be expected to provide the consignee with a statement indicating the detergent is suitable for the cleaning operation for which it is intended and giving guidance on its use.

4.2.2 Optimum conditions of use can only be determined from manufacturers' recommendations and the results of trial runs. The strength of detergent solutions used in manual and in CIP systems must be subject to continuous monitoring to ensure optimum conditions are maintained, with verification thereafter in line with the designated hygiene protocol.

4.2.3 Use of detergents must be carried out in line with health and safety protocols.

4.3 Disinfectants

4.3.1 Chemicals

In the dairy industry “chemicals” may be detergents or disinfectants alone or combined detergent/ disinfectants. Only non-QAC-based approved chemicals suitable for CIP use and food use must be used. Refer to section 2.1.

4.3.2 From time to time it may be necessary to use acid to remove milk stone or scale, particularly if unsoftened water is used. If this happens the detergent used should be modified to prevent this build up.

It is however recommended that the type of water used at the site is established and chemicals most suited should be used.

4.3.3 Use of disinfectants must be carried out in line with health and safety protocols.

Caution: Acid and hypochlorite must never be mixed as the mixture will produce chlorine gas which is highly poisonous.

5.0 Assessment of the effectiveness of cleaning systems

5.1 General

The interior of each tank compartment must have no surface film or deposits and must smell clean and fresh without any trace of stale or sour odours.

Sour smells may be due to

- Inadequate cleaning particularly in the pre rinse cycle;
- A small pocket of infection or area of deposit on the surface

Stale smells may be due to

- Inadequate cleaning, for example due to low detergent strength or temperature
- Poor-quality final rinse water

Visual inspection

Tankers should be inspected as far as practical access and health and safety allows after each CIP to ensure the CIP has been successfully completed. A UV light should be used if available to shine light on tanker surfaces. It is best practice to use UV light for picking up residual organic material at a level that may not be readily visible by the naked eye/white light. Stainless steel should be bright and shiny, with no signs of dulling or deposits. Surface of the metal should be cool to touch. When inspecting tankers, particular attention should be paid to the valves, blank ends and dead ends, vacuum release valves, manhole lids, hoses, bulk head ends, top ends, spray balls/spray arms, sample taps if fitted, presence of foreign bodies and seal integrity. The underside of the manway lid and seal must be clean and the interior surface of pipework and hose end fittings must be clean. Where low level manway lids are fitted, appropriate procedures should be followed.

If these criteria are not met the tanker cleaning is unsatisfactory and no further investigation need be carried out until after rectification of the problem.

5.2 Swab technique

A swab is a way of measuring cleanliness. If the conditions described in 5.1 are met, the effectiveness of the tanker cleaning may be further investigated using swab techniques, ATP and/or micro swabbing.

5.3 Recommended areas to be swabbed

Any accessible area of the tanker and pipework which comes into direct contact with the milk may be swabbed in line with health and safety protocols. It is recommended for normal checking procedures that swabs should be representative of the following areas, as a minimum:

i. If safely accessible, the top/side internal surface of the tanker.

ii. The internal surface of the manway lid, including low level manway internal surfaces.

iii. The AEV inlet and outlet.

iv. The internal surface of the tanker hose end or outlet pipe.

5.4 Standards

ATP testing should be used. The manufacturer of the ATP equipment used to perform the test will set recommendations on to what constitutes a satisfactory standard, a pass, a caution and a fail.

5.5 Frequency of swabbing

It is recommended that all tankers should be swabbed and examined every 4 – 6 weeks (other frequencies may apply according to contractual arrangements) and re-test results recorded. If unsatisfactory swab results are obtained, it may be necessary to re-clean the vehicle.

6. 0 CONTROL, INSPECTION AND RECORDS

6.1 Control

Responsibility for cleaning should be clearly defined. Staff at all levels who are responsible for cleaning should have an adequate degree of expertise and training in respect of the operation and checking records. Training records must be available.

6.2 Inspection

Adequate facilities for inspection of CIP cleaning must be made available. These may include:

- Access to the interior of pipes and vessels;
- Access to inspect CIP return filters
- Thermometers;
- Pressure gauges;
- Concentration indicators (e.g. conductivity meters).
- Flow rates indicators;
- Visual indication of CIP timings;
- Built in warnings or alarms or stop functions to prevent incorrect CIP routines from going forward.
- Identification of qualified and trained operators

The following is a guide to daily and weekly checks which can be carried out to reflect the effectiveness of the CIP programme in place. The results of all checks should be recorded with every wash of the vehicle.

Daily-

- Chemical strength,
- Temperature,
- Leaks in the circuit,
- In-line filters

- Flow data,
- Time of each CIP circuit operation,
- Confirm that all necessary CIP circuits have operated,
- Confirm that all records generated have been produced and are in order

Weekly/monthly- (depending on the severity of the soiling, the appropriate action will be taken)

- Effectiveness of cleaning, e.g. swabs, hygiene monitor etc.
- Challenge fail safe devices,
- Inspect detergent and rinse water tank contents. Clean tanks and dispose of and change detergent as necessary.

Quarterly

Check the microbial quality of the rinse water from holding tank quarterly unless otherwise defined by enforcement authority or contractual arrangements.

Annually

- Annual Instrument calibration is required (thermometers, conductivity probes, flow meters, level probes and volume measuring devices).
- CIP Plant maintenance service plan in place to be carried out by competent engineers.

Every three years

CIP validation is recommended to ensure correct ongoing effectiveness.

6.3 Records

Adequate records (paper and/or electronic) are essential in order to demonstrate "due diligence".

Consideration should be given to means of recording the parameters given in section 6.2

7.0 Tanker cleaning record

7.1 For traceability purposes at the cleaning site, a full record should be made immediately after cleaning takes place and, when appropriate, results from your particular swabbing regime. This record should be kept at the site responsible for cleaning and made available to other parties.

7.2 In addition all tankers should be provided with tanker cleaning log sheets ("Wash Book"). These sheets should indicate brief details of the cleaning process when completed. Copies should be kept by the haulier for a period of time in line with DTAS standard.

ANNEX

INTRODUCTION

This annex gives a general overview of CIP and an understanding of its principles, concepts and application.

The highest standards of milk tanker hygiene are an essential pre requisite for the production of high-quality dairy product. The cleaning and subsequent sterilisation or disinfection of milk tankers must be carried out with great care and attention.

CIP can be defined as the cleaning of the internal surfaces of raw milk tanks and associated components without dismantling or opening of the equipment and with little or no manual involvement on the part of the operator. The process involves jetting or spraying of surfaces or circulation of cleaning solutions through the milk tanker under conditions of increased turbulence and flow velocity.

1.0 PRINCIPLES OF CLEANING-IN-PLACE

1.1 Why clean? Introduction to cleaning-in-place

Milk tankers and associated equipment must be cleaned to maintain product quality in terms of both microbiological and product cross contamination.

1.2 Stages of the cleaning process

CIP involves a number of steps, typically a pre-rinse, followed by chemical circulation and a final rinse. Additional steps are required if there is more than one type of chemical used or if there is a sanitization step. Drain down time of the equipment must be taken into consideration. A precise programme cannot be stated here because of the different requirements for cleaning equipment of different specification or with different CIP control.

The basic actions of each step are discussed below:

Pre-rinse- Removes gross, loose soil from equipment. The greater the amount of soil removed at this stage, the less work there is for the detergent to do. For open systems (such as tankers) it is important that the vessel is drained of any pre-rinse water before the detergent cycle commences to reduce loading on the chemical and possible contamination of the chemical storage tank if the detergent is recovered. If used to recover product this step is cold potable water, although warm rinses may be used to remove fat from cold surfaces. However, when the pre-rinse is not required to recover the product, it is common practice to use recovered final rinse water. For vessels which are fitted with spray devices a "burst" rinse (on/off effect built into the flow) can result in both reductions in water usage and improved removal of soil.

Detergent- The detergent wash should remove all soil bound to the tanker internal surfaces. A detergent is chosen that the soil is most soluble in. Acid or alkali solutions are typically used; the chemical best suited to different types of soil has been discussed later. The effectiveness of this step is dependent on concentration, temperature, flow rate and time. During detergent circulation the soil must remain in solution to prevent it re-depositing on the surface. Acid is often required to remove build-up of milk stone.

Final rinse- Ensures that there is no detergent left in the system prior to commencing loading. All soil should be detached from the equipment surface prior to the final rinse. Potable water must be used. Where the tanker being cleaned is going straight back into service, the final rinse water should be used to cool the tanker sufficiently to allow it for this purpose.

Sterilisation- The final rinse can be dosed with a suitable disinfectant, e.g. peracetic acid to give 'terminal' disinfection.

1.3 Factors controlling cleaning

The type of soil present determines the detergent/chemical type required to clean the deposit, the ease of solubility of the soil in different chemicals must be considered. The solubility of different soils is discussed below. Provided the right chemical formulation is chosen then the effectiveness and efficiency of cleaning is dependent on the following:

- Temperature;
- Flow rate;
- Chemical concentration;
- Time.

Soil type: The cleaning process is dependent on the amount and nature of soil present; therefore, the chemical used is specified by the expected soil.

Temperature: Increasing the solution temperature increases the rate of reaction between the chemical and the soil and also the rate that the chemical penetrates the soil. There are two considerations for choosing the detergent circulation temperature: (a) Detergent chemicals, especially alkalis, are likely to require heating in order to work effectively: typical temperatures recommended are 60°C to 80°C. Acid cleaning chemicals are usually recommended for use between 50°C and 60°C because of a tendency to become more corrosive and/or less effective at higher temperatures. (b) This heating process also gives an element of disinfection to the items being cleaned. **This is likely to be especially important where materials handled are not subsequently re-processed, e.g. short shelf-life products such as pasteurised milk**. For all products being moved, advice on the correct temperature, and the appropriate chemical to be used, should be sought from the product manufacturer.

Flow rate: Specification for CIP minimum flow rates may be given by the equipment manufacturer due to design considerations. Where spray balls or other flow distribution devices are used the pressure is also important to get the correct coverage and should be specified by the manufacturer.

Chemical concentration: Recommendations for the desired chemical concentration to be used should be sought from the chemical supplier and the equipment to be cleaned must be taken into account. Typically, for alkaline detergents 0.5 to 2.5% causticity is the conventional range Where acidic cleaners are used, refer to suppliers' recommendations. **Increasing the chemical concentration or temperature will not always lead to a more efficient/effective clean.**

2.0 BEST PRACTICE FOR CIP DESIGN

NOTE ON SAFETY:

Since the construction and operation of CIP involves machinery, chemicals and potentially awkward access issues, a health and safety expert should be consulted before construction of plant involved in CIP.

HACCP

Hazards present when plant is cleaned by CIP fall into two natural groups:

- Those relating to the product itself: example potential microbiological contamination created by soil left on the equipment after use
- Those created by cleaning activities: example potential chemical contamination to product from cleaning chemicals.

All potential hazards should be listed and the HACCP process carried out. This process cannot be completed until all parameters of the system have been verified. It should then be reviewed when the system has been in operation for 4-6 weeks.

Critical Limits:

So far as the critical limits to be applied to control of the hazards created by product soil on the equipment are concerned, early decisions must be made about the level of cleanliness required. This depends on the nature of the food materials handled by the plant, and the amount and type of contamination to product, if any, which is acceptable. The following list gives guidance on considerations that should be taken into account when considering how the effectiveness of cleaning is to be measured and what standards are to be set. Detail must be fixed for each individual case.

Typical indications to be used for cleanliness and for which targets and critical limits should be set are:

- Values for key cleaning parameters such as flow rate, temperature, detergent concentration, valve movement sequences etc should be set and verification facilities built in;
- Product surfaces should be visually clean;
- Surface hygiene tests whether carried out by microbial or surface residue methods should indicate that insignificant levels of food, bacterial or other undesirable residue remain on product contact surfaces;
- Cleaning or any other chemicals except those designated as terminal sanitizers must be removed from internal plant surfaces by the end of a clean down to an insignificant concentration;
- For ingredients and raw milk, there should be confirmation by appropriate tests that there is no significant increase in total bacterial loading.

The key features of the CIP system to be provided to achieve the standards specified can then be documented as the detailed control procedures. Thus, systematic resource can be provided to achieve the cleanliness criteria.

The requirements of some products may need to be considered in conjunction with suppliers of equipment or other expert opinion.

Separation of Product and Cleaning Fluids:

CIP is likely to involve use of product routes for cleaning fluids. This introduces potential movement conflicts which need to be resolved to ensure efficiency and product safety. This could be by use of separate hoses and not locating CIP hoses while product present.

Parallel Flows Safeguards:

Coincidental parallel routing in CIP circuits is fundamentally bad practice because of the risks of tracking (failure of flow in one or more arms of parallel flows). Some CIP sets have the ability to select an acid or alkali wash. In this case, particular safeguards should be built in to prevent cross-contamination of the two wash solutions to eliminate possible development of toxic chlorine gas.

If it is adopted, for economy or whatever, then safeguards should be built in which will, as a **minimum** safeguard, warn the operator if such a contamination occurs. A proactive maintenance regime should be employed to eliminate any potential risks.

Internal CIP Cross Contamination:

Consideration needs to be given to provision of breaks. This could either be by use of double seat valves or duplicated valves with a drain down device between them to segregate one circuit from another on both the feed and return side, and also to protect clean water supplies.

The Facility for Quality Control: As a general rule a high priority should be given to quality control and assurance requirements, (e.g. sample points, visual parameter indicators, production of records) because cleanliness **should be easily verifiable.**

Requirements for Maintenance: All maintenance requirements should be considered at all levels, in particular in respect of accessibility. Guidance on necessary maintenance is given later.

Health and Safety: Health and Safety must be considered, including compliance with COSHH.

Waste Disposal: Disposal of waste from the cleaning process must be documented, i.e. Water Authority consent to discharge to foul drainage or registration with a licensed waste haulier to remove waste from the site.

Consideration of "Off the Shelf" Packages: It is often desirable to bring together many CIP functions, such as control, pumps, supply fluid tanks together as a package CIP "unit" or "set". Some manufacturers supply this equipment as a package, possibly in standard modules.

Re-use and Recovery: For economic and environmental reasons it is beneficial to recover both water and chemicals where possible. For example, it is common practice to have a water recovery tank that can retain the final rinse water from a clean to be used as the pre-rinse for the next clean. Also, a diluted caustic/acid tank allows the chemical to be recovered and reused. Frequent visual checks, e.g. monthly, should be made of the recovery tanks to make sure the liquid is clear. If the liquid is not clear, this may be a sign of contamination in which case the recovery tank liquid should be dumped and replaced with fresh stock.

3.0 CONSTRUCTION REQUIREMENTS

All CIP systems must be constructed of a material that does not deform or corrode in the conditions that they are used. Construction materials should be of such a nature that they could stand up to any heating or pressurisation likely to be applied during cleaning or disinfection.

Requirements for hygienic design, discussed above, must be taken into consideration in the construction.

Sufficient labels or other markings should be applied to equipment, to enable straightforward identification of functions for staff involved in management operation and auditing of cleaning.

This is likely to include at least the purpose and flow direction for pipework, and purpose and target tolerance of contents parameters for tanks.

3.1 Water supply

Water Specification:

Water quality needs careful consideration. Potable water standards or better are required for final rinse water.

All cleaning is more effective with soft water but, in the cleaning of plate heat exchangers in particular, softness of water supply is preferable. Use of soft water enables the necessity for cleaning with acid detergent to be reduced or eliminated.

When water is softened, the regulations specify that hardness should not be reduced to below 60 ppm as calcium carbonate, but in practice partial softening is difficult to manage, and provided that water drainage after cleaning can be demonstrated, regulatory authorities will normally waive this requirement.

Water Distribution:

The following is a basic summary of requirements of the water distribution system which leads water to a CIP duty. The aim is to maintain the water at the supply specification, see above.

a) Absence of "deadlegs" or other stagnant areas.

b) Minimisation of the volume of intermediate storage.

c) Use of appropriate construction materials (non-contaminating).

d) Provision of a water treatment to maintain water in a satisfactory microbial condition.

e) An appropriate test programme to demonstrate water quality maintained.

f) Visual inspections of the system.

g) Maintenance of accurate plans of the system.

h) The keeping of appropriate records, including those relating to construction, changes, tests carried out and authorisations.

Avoidance of contamination:

There are a number of possibilities for contamination, (principally from microorganisms), to affect the water used for CIP. The highest impact of contamination from microorganisms is greatest when they occur in the final rinse i.e. that left in contact with the equipment being cleaned.

It is most important that these hazards are considered as part of the site HACCP. When they occur, they should be considered as defects in the control system, arising as they do from control failures.

Examples of possible sources of such contamination:

a) Failure to meet good practice in the supply of water to the CIP duty;

b) Cross contamination in the CIP unit or circuits due to incomplete segregation of final rinse water from other fluids.

3.2 Pumps

Should be selected to give correct flows in the CIP circuit at the rated range of speed and pressure.

Special consideration may be required for scavenge pumps, used in vessel cleaning circuits for return of fluid from a vessel. A degree of self-priming may be required.

3.3 Spray devices

In open circuits, the nature of any vessels needs to be considered individually to give complete coverage. Spray devices are frequently used to disperse cleaning fluids in tank or vessel cleans.

Care must be taken to match the device and volume to the tank and consideration given to pressures, flow rates and vessel dimensions and capacity. **The spray pattern must reach all parts of the tank, and be able to provide a sufficient volume of fluid**. Spray devices must be accessible for removal for cleaning or maintenance. If a spray device is fitted, it is strongly recommended that an appropriate strainer must be provided. The pore size of such a strainer must be less than that of any pores in the spray device. Blockage or loss of spray heads can be indicated by provision of a pressure gauge in the pipeline feeding CIP fluids to them.

As and when replacement tankers are introduced into the fleet, the requirement for a strainer must become a pre-requisite.

3.4 Pipework

- Poor regions of poor flow should be avoided; if these areas do exist, they should be no greater than 1.5 times the pipe diameter and face toward the CIP flow.
- Should have as few joints as possible.
- Avoid changes in pipe diameter and should avoid excessive numbers of bends.
- Slope down toward any drainage points built into the system.

3.5 Vessels to be cleaned

Appropriate devices are needed to spread cleaning fluid, e.g. spray balls.

Should be able to scavenge adequately, e.g. self-draining or scavenge pumps. The relative positions of the scavenge pumps should be carefully considered- slope from the tank outlet to the pump may be important.

Internal inspection of the vessels should be possible through manways.

Venting should be provided to eliminate damage from rapid internal pressure changes. External vessels, e.g. silos, should also be screened to prevent risk of foreign body access.

3.6 Valves and routings

Valves should be used which can be cleaned internally.

Non-return valves alone should not be relied on to form barriers between product and CIP circuits, or to separate CIP circuits from each other, because of the risk of invisible internal leak.

An alternative to the use of some valves is the use of 'swing bend' connections. Careful consideration of these is required to ensure that all such are included in a clean.

Positioning of valves should be considered in relation to accessibility for inspection and maintenance.

3.7 Heating of CIP fluids

A means of heating CIP fluid is required which enables the specified temperature to be quickly reached and maintained.

Timing devices should be provided to allow time for heating up the circuit and for the hot circulation time period specified.

3.8 Control of chemicals

Guidance on the choice of detergent should be obtained from the chemical supplier for the tanker/vessels being cleaned. Some sites will need to use an alkali or acid detergent and disinfectant. In the case of hard water supply or heavy soiling acid based detergent circulation would be required.

Working concentrations and tolerances affect the nature of equipment used for creating the working solutions. Automated dosing systems are desirable. However, safeguards must be built in to such systems to prevent accidental dosing taking place.

If chemicals are to be introduced into CIP systems, then subsequently mixed whilst in circulation, consideration may have to be made of inclusion of in-line mixing devices. The specific strength should be reached throughout the circulating liquid within a period of time specified, if necessary, by analyses and before the end of the time programmed for this stage of the clean.

Up-to-date relevant Control of Substances Hazardous to Health (COSHH) and Health and Safety (H&S) data sheets must be held and available for reference for all chemicals used at the premises.

Vessels for storages of working solutions of cleaning chemicals and rinse waters:

Many chemicals used are aggressive and corrosive and special arrangements have to be made for storage of both concentrates and working solutions, in construction materials and protection of staff. Health and Safety (COSHH) rules for chemical storage should be adhered to. Advice should be sought from the chemical suppliers if in any doubt of requirements.

Access must be provided at the top of such a tank for visual inspection of contents, internal condition and for manual internal cleaning if necessary, and of all parts of the exterior for periodic visual inspection.

Two discharge points should be provided - one at the very bottom of the tank for removal of any deposited material from the base, and one above about 5 to 10% of the tanks contents for routine provision of cleaning fluid to CIP circuits. Consideration should be given to provision of cleaning facilities by CIP to such tanks themselves.

3.9 Provision for air or water purges

Air and water used, and the means for introducing it, must be of a suitable hygienic standard. Valves used for such materials need to include provision for a physical break when closed.

3.10 Automation

Should include the following features:

- The ability to be programmed to deliver reliable consistent cleaning.
- Security preventing changes being made except by designated personnel.
- Displays which indicate status of operation at any given time.
- Feedback from the functions controlled to indicate that the instructions given have been carried out.
- Ability to produce records of key activities carried out.
- The desirable extent of automation, which has the following advantages and disadvantages:

  Possible Advantages:

  (a) More complex systems can be easily controlled.

  (b) More comprehensive and better presented records.

  (c) Cheaper running costs.

  Possible Disadvantages:

  (a) Higher capital cost.

  (b) Depends on more exacting design.

  (c) Reliability

Note: Do not assume that automation means that checking procedures can be abandoned.

4.0 INSTALLATION, COMMISSIONING OF NEW CIP & ASSOCIATED DOCUMENTATION

Commissioning can be defined as the setting up and proving of the effective operation of CIP after installation or modification of equipment. It should be carried out by persons with appropriate knowledge and competency of both the equipment's capabilities and cleaning requirements.

4.1 Procedure

1. Before or during the installation draw up a checklist of operating functions.
2. During and after installation, check that all these functions operate correctly. Modify or correct and recheck as appropriate.
3. After modification, as necessary, record that checks have been carried out successfully to validate the cleaning system.

4.2 CIP Documentation

CIP procedures should be documented on each site and readily available detailing the following:

- Commissioning check record;
- Cleaning sequences;
- Cleaning circuits;
- Operating procedures;
- Engineering drawings;
- Maintenance schedules;
- Quality check schedules.

It is important to ensure that the procedures are revised/updated whenever changes are made to the system such that they represent the current situation. A record of any changes must be documented.

4.3 Training

Appropriate training in operation, maintenance and quality control should be provided. Responsibility for such training should be clearly defined, and it should be included as part of a supply contract.

Instruction documentation should be supplied.

Records should be kept indicating the extent of training received by the relevant personnel and the party that carried out the training.

Both instruction documentation and training records should be subject to periodic review and amended when necessary.

5.0 ROUTINE MAINTENANCE

A maintenance plan should be written and records kept demonstrating that specified work has been done. These records might include:-

- Replace valve and pump seals and gaskets - as determined by supplier recommendation and inspection.
- Replace H.E. gaskets/plates: as determined by inspection.
- Verify programme sequences.
- Check operation of spray devices.
- Inspect heat exchanger plates.
- Clean conductivity meter probes.
- Additionally, records should be kept of breakdown repairs. Auditing is simplified if these records are kept near the machinery.

6.0 STANDARD PROCEDURES

During the course of CIP, all tanker washing protocols must include, as a minimum, a pre-rinse, a detergent wash and a final rinse.

Appendix 1

INTERPRETING RESULTS AND TAKING ACTION

RESULT	ACTION TO TAKE
Tanker still warm to touch after cleaning	Insufficient final rinse may be the cause. Check tanker is empty of cleaning fluids.
Hard deposits, thin and difficult to remove: Milk scale deposited in the tanker	The strength, the pressure and the suitability of the detergent should be checked.
Soft and bulky deposits with offensive smell: deposits are usually localised and consists of milk fat, soured milk solids and some detergent residues.	This mostly occurs where the CIP solutions do not reach because: 1. The spray ball is partly blocked 2. The wrong type of spray ball for that CIP system has been fitted 3. The spray ball may be blocked with debris 4. A rotary spray head has become seized or is not spinning 5. The spray ball has been damaged 6. There is a varying delivery pressure caused by a blocked filter on the CIP delivery line, or poor recovery from the CIP circuit so the feed pump is starved.
Scum or froth particularly in a bathtub ring towards the top of the road tanker	1. Flooding of the tanker during cleaning due to inadequate scavenging 2. Inadequate pre rinse 3. Faulty joint allowing air to be sucked in;

Water remaining in the tanker	1. Inadequate scavenging; 2. Inadequate venting; 3. Air lock in the CIP circuit; 4. Insufficient slope on the tanker bay roadway 5. Deformed bottom to the tanker 6. Insufficient air supply for valve activation on the tanker being cleaned.
Flowing pressure decreases and flow rate increases	Spray head should be checked for blockage to include any inline filters on the vehicle or CIP set.
Unsatisfactory swab results	Unsatisfactory results obtained from ATP testing indicate that CIP is not sufficiently effective and further investigation should take place to identify the problem. If necessary, further swabs should be carried out. If a further swab test fails, then a further re-clean should be carried out and re-tested. If swabs continue to fail then spray devices can be checked to ensure that they are in place and are working correctly. Further checks of detergent strength, temperature and pressure can also be made.

Appendix 2

Guidance Note: Tanker Cleaning Record

TANKER CLEANING

The person responsible for the tanker must carry out completion of this log.

This form must be completed EACH TIME the tanker is cleaned. It MUST be kept with the tanker at all times and be available for inspection on request by a customer or a representative. Electronic records are also acceptable, e.g. BCT55, sub-contractors cleaning certificate/documentation.

Records must be retained for at least 12 months.

If the tanker is not in service or is loaded awaiting next morning delivery this MUST also be noted in the Comments box.

The final end time of the wash must be used when completing Date & Time of last CIP of Trailer on the Consignment Note for Transhipped Milk.

Tankers will normally be cleaned once in a 24-hour period. If the tanker has been out of service for more than 24 hours from the last CIP then the tanker can must be given a full CIP. Subject to contractual arrangements, this could be extended to 48 hours if the tanker has been sealed and the seals have not been broken. The requirement to clean tankers once in a 24-hour period does not apply if the tanker still contains milk at the end of the 24-hour period. In this case the tanker should be cleaned as soon as it is practicable after emptying.

When cleaning is complete check that: -

1) The tank is fully drained and final rinse residues are clear.
2) If internal inspection of tank is practical check that:
    a. The underside of the man-way lid and sealing ring are clean.
    b. The air in the tank smells clean and there are no deposits, or milk foam on the interior of the vessel
3) Valves and pipe work are clean, if necessary dismantle them to check.
4) Ensure cleaning record is fully completed and times are accurately recorded in 24-hour clock format.

The driver must sign the record every time the milk tanker is cleaned to confirm cleaning checks have been carried out.

Example of Tanker Cleaning Record **Week Commencing.....**

Tanker Reg. No. -OR- Trailer Number	**Depot**

Date	**Time**	**Cleaning premises**	**Time CIP First rinse started**	**Time CIP Final Cold water rinse completed**	**Drivers Signature (that cleaning checks - have been undertaken)**	**Buyers Signature (if Applicable)**	**Sampler tube changed (Y/N for ex-farm tankers or N\A for reload tankers)**	**Comments**

The weekly cleaning log should be delivered to a competent person who is responsible for reviewing and signing-off to ensure that all records are satisfactorily completed.

Supervisors Signature:	**Date:**