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# UNIT 14 TYPES OF CAN WASHERS AND THEIR OPERATIONAL DETAILS

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## 14.0 OBJECTIVES

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After reading this unit, we should be able to:

- ☞ outline basic principles of washing and sterilization through can washers
- ☞ specify different types of can washers
- ☞ know design
- ☞ operate and maintain common can washers
- ☞ indicate precautions needed in operation of can washers.

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## 14.1 INTRODUCTION

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Raw milk from producers/suppliers is brought to the chilling center or dairy plant in milk cans. Initially, the cans were only made of aluminium or galvanized mild steel but presently stainless steel or plastic coated cans are also emerging. Cleaning of cans is an important feature of a dairy plant. Small numbers of cans are mostly cleaned manually, whereas it is not practicable in large dairy plant or chilling/collection centers. A large number of cans are used for collection of milk from primary collection centers. Manual cleaning takes lot of time and involves huge manpower.

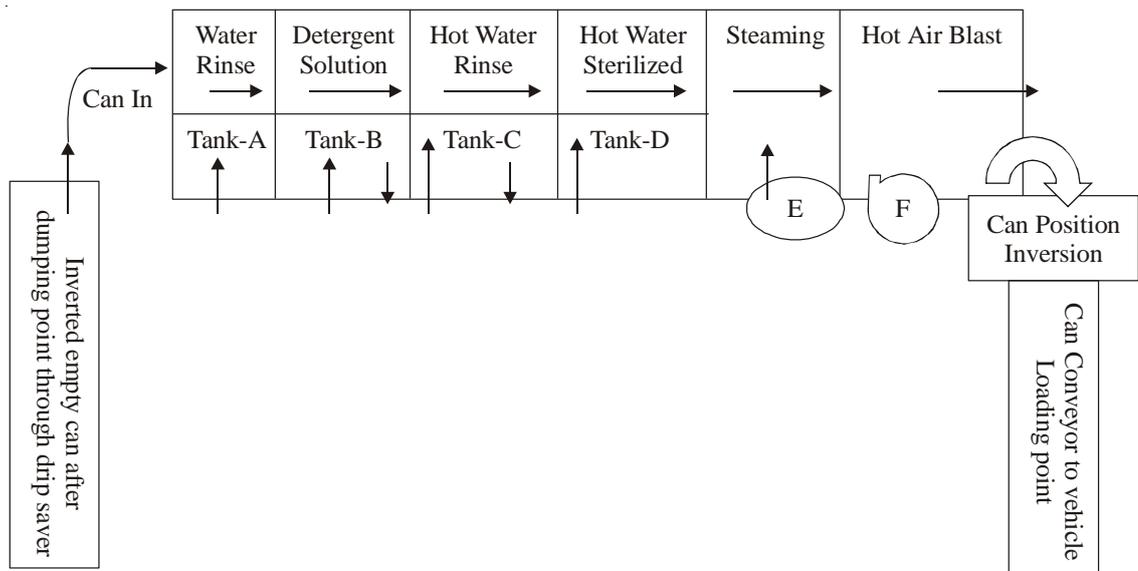
To cope with a heavy load, machine cleaning is preferred for effective washing and sanitization of cans. Better cleanliness through can washer not only helps in preventing quality deterioration of raw milk by good hygiene of cans, but at the same time, this promotes the mind set of dairy about maintenance of overall hygiene practices in the system. The effect slowly and steadily promotes clean milk production in the milk-shed area.

Economical designs of milk cans are available in the market and can be had depending on the scale of operation and financial capability of organization. Periodical review of cleaning and sanitization effectiveness keeps alarmed about the working of washers for taking preventive maintenance action.

## 14.2 WORKING OF CAN WASHERS

Though manufacturers may use special arrangement of treatment for getting effective can washing but certain operational activities as discussed below will result good cleaning:

- <sup>2/21</sup> Draining out milk or cream residue before feeding cans in the washing machine preferably over drip saver.
- <sup>2/21</sup> Rinse thoroughly with clean, cool water for removing the loosely adhered milk/ milk solids layer (Fig. 14.1, Tank-A).
- <sup>2/21</sup> Use warm and high velocity/turbulent detergent water/solution to loose and dislodge materials adhered to the can (Fig. 14.1, Tank-B). Drain the solution after an effective period.
- <sup>2/21</sup> Rinse with clean warm/cool water by circulation for desired period (Fig. 14.1, Tank-C), and/or
- <sup>2/21</sup> Follow by a clean, hot rinse by circulating hot water to remove all traces of washing solution (Fig. 14.1, Tank-D). Drain at the end.
- <sup>2/21</sup> Follow by steaming with dry saturated steam to sterilize the surface (Fig. 14.1, section-E).
- <sup>2/21</sup> Follow by treatment with a hot air blast to remove the remaining moisture (section-F of Fig. 14.1).



**Figure 14.1 : Progressive Cleaning & Sanitization Operations in Can Washer Straight Through Can washer**

The above procedure is usually followed in straight-through can washer and similar process is used in rotary type can washers. However, some changes in the above cycle could be made to suit the specific requirement depending upon the design of container, availability of steam or design features of can washer.

In the simple can washing machine popularly known as can scrubbers, the emptied milk can after draining of milk, is scrubbed with the brushes submerged in detergent solution maintained at 45 to 50°C temperature. Later on the can is rinsed with clean water followed by sterilization in the steaming block.

### Check Your Progress 1

1. Describe the procedure of washing cans effectively?

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### 14.3 TYPES OF CAN WASHERS

Many types of can washers have been developed and are commercially available for washing milk cans of different shapes and sizes. Popularly, following types could be observed in the dairy industry:

- i. Can scrubber
- ii. Can Steaming Block
- iii. Rotary can washer
- iv. Straight-through can washer

#### i. Can Scrubber

**Design and Operator:** These are very simple type of can washing machines. As shown in the Fig. 14.2, one nylon fibre hard brush “A” of cylindrical shape revolves about its axis which is driven by small rating (usually 0.5 to 0.75 HP) electrical motor. Another brush “B” is driven with the connected gear. One stationary brush “C” to suit the shape of can is fitted at one sidewall of the scrubbing machine. The arrangement of these brushes are shown in the following schematic diagram (Fig. 14.2).

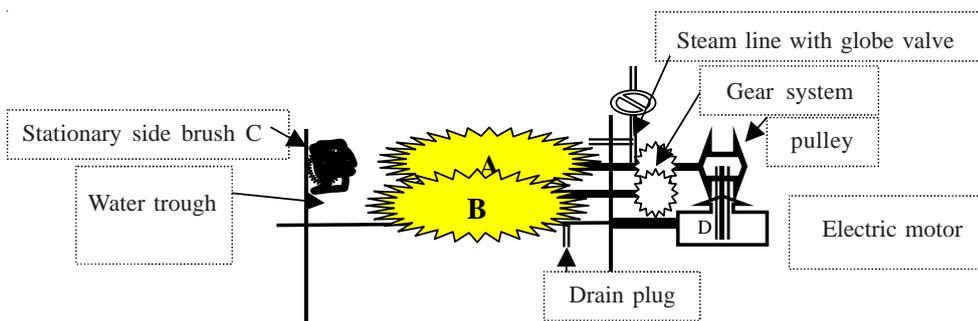


Fig 14.2 Schematic Diagram of Can Scrubber

Following procedure is usually employed for washing cans in the scrubber:

- 2|21 Fill the washer and put the required quantity of detergent.
- 2|21 Heat the solution up to 45 to 50°C.
- 2|21 Now start the motor of can scrubber to rotate the brushes.
- 2|21 Collect can from drip saver and insert it into the scrubber brush “A” from the free end side.
- 2|21 Hold the can for enough time to loose the deposited materials.
- 2|21 The brush “A” will scrub the inside surface of can, and rotating brush “B” and; stationary side brush of special shape will scrub the external surface of can.
- 2|21 Take out the cans and rinse with cold water.
- 2|21 Check the cleaning status with clean fingers.

**Precautions:** Major precautions required for effective operation of a can scrubber are:

- 2|21 Proper temperature, concentration of solution and enough holding/scrubbing time are important factors for effective washing. Being manually operated, low-

temperature, concentration and holding time are kept at low levels to prevent irritation to the operator. For safety reasons operators should be provided with protective hand gloves.

- 2/21 Condition of brush requires regular monitoring so that worn out set of brushes are replaced in time. The brushes after some period of operation either gets worn out or becomes of reduced diameter/thickness due to de-shaping/compression of fibers. With such worn out condition, brushes are not able to touch and scrub the surfaces leading to ineffective cleaning of cans.
- 2/21 Care should be taken in adopting right procedure of charging the can scrubber. The clean/soft water is filled up to required level and then measured quantity of detergent is added followed by opening of the steam valve slowly to warm up the detergent solution.
- 2/21 Concentration of the detergent solution is checked at desired interval of operation. If required, additional quantity of detergent is charged.
- 2/21 The solution is drained after every 150 can washing and then recharged freshly. However, the interval could be changed after observing the practical requirements.

**Maintenance:** Apart from above routine precautionary measures following maintenance aspects need serious considerations:

- 2/21 Draining of dirty detergent solution and washing properly to keep the trough clean.
- 2/21 Checking all the brushes for proper alignment, tightening and condition of fibers. If found not proper set right properly. Change worn out brushes.
- 2/21 Checking motor and motion/power transmission system including chain/belt and sprocket/pulley for wear - tear and alignment.
- 2/21 Providing grease/oiling over the chain/gears
- 2/21 Checking glands to prevent loss of detergent solution.
- 2/21 Checking the drain plug to prevent leakage through it.

**ii. Can Steaming Block**

After manual cleaning of cans, the sterilization is done either by spraying cold sanitizer solution or steam sanitization through steaming blocks (Fig 14.3).

**Design and Operation:** This equipment is specially designed for holding can in the inverted position. Paddle operated steam and water jets are used to rinse the washed can with cold water and sterilize by injecting live steam till the can becomes hot.

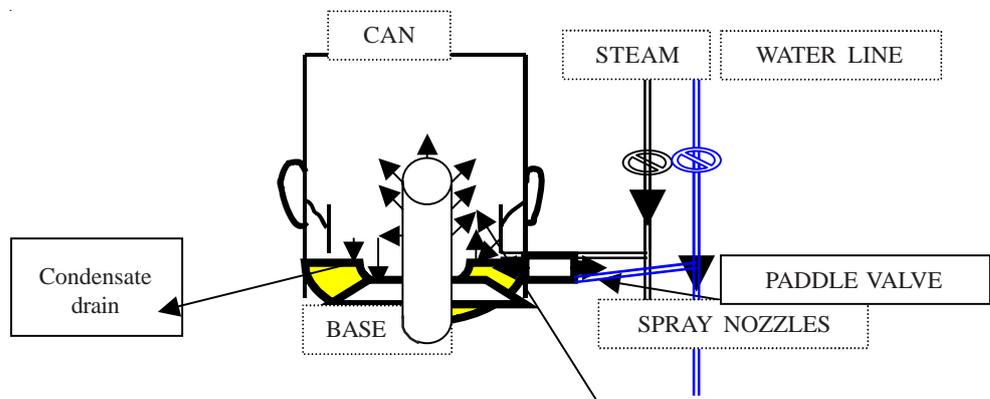


Figure 14.3: Schematic Diagram of Steaming Block

**Precautions:** Main precautions required in operating steaming block are to ensure steam opening and working of rinse/steam injection valve. The safety of operator who is holding the hot can need to be ensured to avoid burn. Some times, operator

holds cans for less time which may result in an ineffective operation. In order to avoid accident from hot water spray, the can should be positioned and then rinse or steam valve is opened. Steam pressure of 2 to 3 kg/sq. cm is enough to get the effect.

### Maintenance

- 221 Check and clean holes of jet regularly.
- 221 Check and adjust spring tension of paddle-operated valve.
- 221 Clear the drain water holes and maintain cleanliness.

### iii. Rotary Can Washer

These are semi-automatic or automatic can washing machines, in which cans are rinsed, cleaned and sterilized very effectively. The details of the machine are described below.

**Design:** The cans are carried on a large rotating table or carrier (see Fig: 14.4); this type of washer is very simple in construction. Dished cans are also cleaned without any problem of falling. These are built in various sizes for handling low to medium number of cans and are very compact machines.

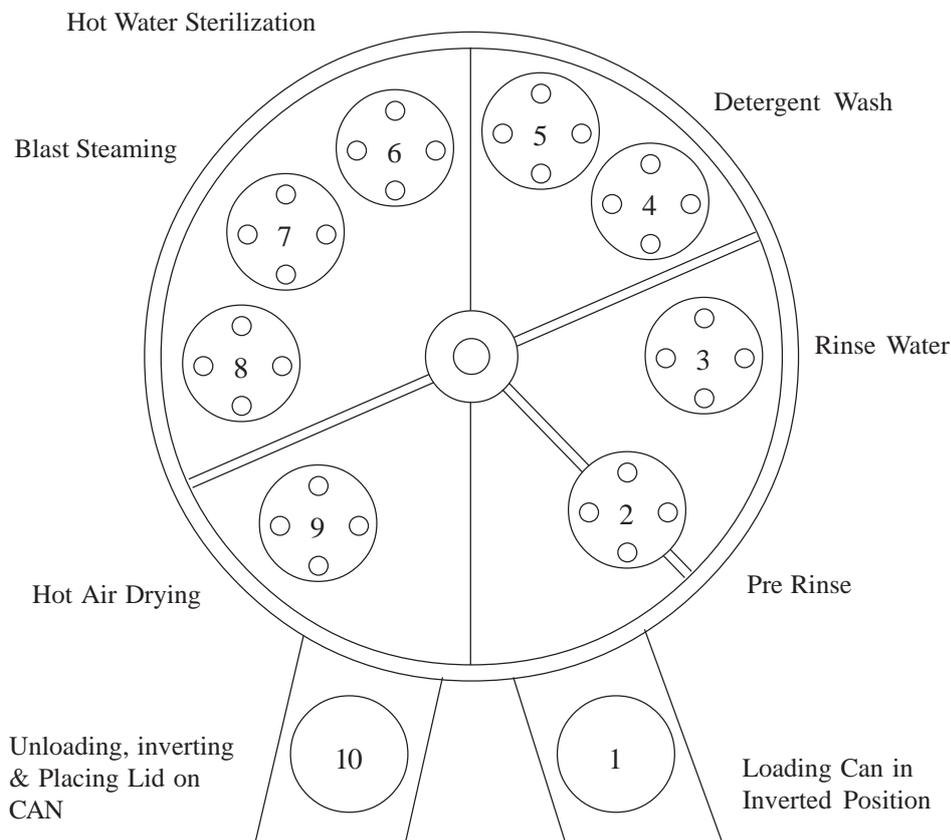


Fig. 14.4: Rotary Can Washer

### Operation

- 221 The detergent tank is charged.
- 221 Temperatures of rinse water, detergent solution, heating air is set in the automatic type washer. In the semi automatic machine valves are opened to heat the liquid and temperature is monitored.
- 221 Start the machine to revolve the table, to operate pumps and to heat with the steam.

- <sup>2/21</sup> Empty cans after draining milk at the drip saver are placed one by one manually or automatically on the revolving carrier/table of washer from the entry door
- <sup>2/21</sup> Cleaned and sterilized cans will come out from the unloading door.

**Precautions:** Check the effectiveness of cleaning. In case of dented cans or heavy soiled can, scrub the can in the can scrubber before loading in the rotary can washer.

**Maintenance:**

- <sup>2/21</sup> Like other can washer, pumps and nozzles are to be checked timely.
- <sup>2/21</sup> Lubricate the moving parts daily or as per the manufacture's instructions.
- <sup>2/21</sup> Check and attend the gland/oil seal/water seal
- <sup>2/21</sup> Keep all the doors closed except entry and exit.

**iv. Straight-through Can Washer**

**Design and operation :** The washer has rinsing, detergent spraying, hot water rinsing, steaming and air-drying sections (Fig.14.1). The cans are moving from entry door over the steel or plastic chains of special design to hold the can and carry towards the exit door. In other type of moving arrangements cans are carried forward through a ratchet from one position to the next. Can moves forward from entry door in inverted position to rinsing section, where warm water is injected from bottom and other sides removing loosen soils and some part of dirt. Then these cans move to detergent section, in which hot detergent solution of 0.5 to 1% concentration is sprayed inside and out side surface of cans to remove the soil completely. These cans move to hot water rinsing section where the traces of detergent and soils are removed. Now, the cans are effectively clean and move to steaming section for sterilization. Finally the hot cans are dried into the air-drying section. Before reaching to exit door, by suitable attachment, inverted cans are brought to the normal position with mouth upside.

Two types of steam injection are presolent i.e. intermittent and continuous. The intermittent type jets give economy of saving steam.

The cleaning operation can be accomplished in semi-automatically or automatically in the machine depending upon the technique employed.

**Precautions**

- <sup>2/21</sup> Steam jets should be cleaned regularly for proper injection of steam.
- <sup>2/21</sup> Damaged cans should not be used, as they often fall inside the washer and interrupt the washing operation.
- <sup>2/21</sup> Use steam and air at enough pressure & temperature.
- <sup>2/21</sup> Ensure that proper quantity of water is available to can washer.
- <sup>2/21</sup> Keep door closed while washing is in progress.

**Maintenance:** The following maintenance is required in straight through can washer to carryout the washing operation smoothly:

- <sup>2/21</sup> Inspect the oil seal/water gland of pumps.
- <sup>2/21</sup> Check the steam nozzle before and after the washing operation. Clean the blocked nozzle.
- <sup>2/21</sup> Can conveying chain should be checked, loose link should be repaired/ replaced.
- <sup>2/21</sup> Clean all the tanks (water/detergent/hot water).
- <sup>2/21</sup> Check the door gaskets and replaced if found damaged.
- <sup>2/21</sup> Check ratchets movement and do needful adjustment, if required.

## Check Your Progress 2

1. What are various types of can washers used in dairy industry?  
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2. What are the main precautions to be taken while sterilizing cans in the steam\ block?  
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3. Write various steps involved in operation of a straight-through can washer?  
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## 14.4 LET US SUM UP

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The process of clean milk production begins with ensuring effective cleaning and sanitization of cans. This works two folds: 1) clean and sanitized cans used for containing/carrying milk help in preventing contamination of raw milk, check further multiplication of bacteria and thus improves the initial quality of milk; 2) The cleaned cans when reach villages, they help in improving the perception of milk producers toward hygiene and sanitation drive of dairy plant and in turn, help in the continual improvement of cleanliness at the producers' level.

In this way the cleaning process and machines acquire very important place. Depending upon the volume of milk or number of cans, dairy plants should acquire suitable type of can washing arrangement.

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## 14.5 KEY WORDS

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<b>Can</b>	:	Container used for storing milk.
<b>Can Washer</b>	:	Specially designed machine for washing cans.
<b>Container</b>	:	A thing for containing something, box, can , jar, vessel, etc.
<b>Dairy</b>	:	A commercial establishment that processes and distributes milk and milk products
<b>Design</b>	:	To make preliminary sketches of; plan or to plan and workout something creativity, device.
<b>Equipment</b>	:	Machinery used for processing operations. Whatever one is equipped with, supplies, furnishes, apparatus, etc.
<b>Machinery</b>	:	Any means by which some thing is kept in action or a desired result is obtained.
<b>Plant</b>	:	The equipment, machinery, building etc. of a factory or the apparatus for performing certain operation.
<b>Sterilization</b>	:	A process of completely destroying microbes.

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## 14.6 SOME USEFULL BOOKS

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Farrall, Arthur W, (1967) Engineering for Dairy and Food Products, Wiley Eastern Private Limited New Delhi.

IS 15000:(1998), Food Hygiene – General principles - Code of practice (second Revision), BIS, New Delhi 110 002.

IS 2491:(1998), Food Hygiene–Hazard Analysis and Critical Control pont (HACCP) - system and guidelines for its application BIS, New Delhi 110 002.

De, Sukumar (1980), Outlines of dairy technology. Oxford University Press, Delhi.

Hall, H.S. and Helge, B. (1963). In milk plant Layout, FAO, Rome

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## 14.7 ANSWERS TO CHECK YOUR PROGRESS

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Your answer should include the following points:

### Check Your Progress 1

- 1)
  - i. Remove remains of milk by draining & rinsing.
  - ii. Loosening and detaching soil through penetration effect of hot detergent solution.
  - iii. Rinse to wash away soils and traces of detergent by cool/warm water.
  - iv. Sterilize by steam/hot water and/or sanitizer solution to inactivate microbes.

### Check Your Progress 2

- 1)
  - i. Can scrubber
  - ii. Rotary can washer
  - iii. Straight through can washer
- 2)
  - i. Nozzle holes should be open/clear
  - ii. Can is put before opening steam valve and/or operating paddle valve.
  - iii. Hand gloves should be used by operator to protect from burning.
- 3)
  - i. Pre-rinsing with normal water.
  - ii. Spray of hot detergent solution of proper concentration.
  - iii. Rinsing with clean/cool/hot water.
  - iv. Hot water spray or steam sterilization
  - v. Hot air drying