MICRO BREWERIES

CLEANING- AND HYGIENE HANDBOOK

Complete instructions for
correct and effective cleaning
and control programmes

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NOVADAN®
Innovators in Cleaning

HYGIENE- AND CLEANING HANDBOOK

Novadan has developed this handbook which is designed for micro breweries.
The handbook is meant to be used as a reference manual.

For every application area you see thorough instructions for usage of the products and the cleaning process.
In addition, requirements regarding cleaning, Sinner's circle, chemicals and safety are described.

Novadan's products comply with applicable legislation on chemicals, safety and environment.

TYPES OF MICRO ORGANISMS:

Bacteria

- Gram positive - Often found in heat-treated or otherwise prepared food.
- Gram negative - Often found in raw food which is not heat-treated nor in any other way cooked.

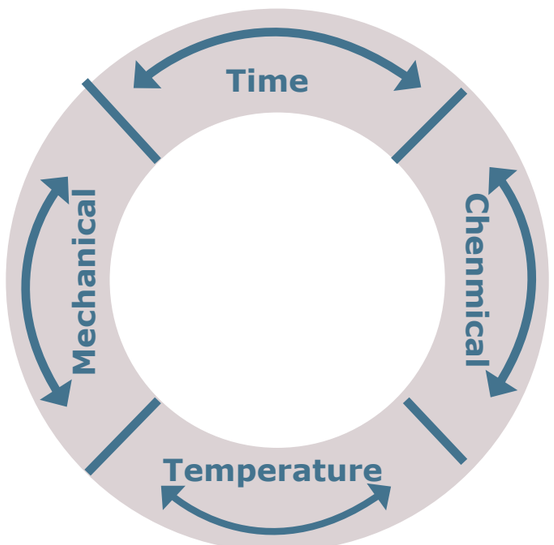
Bakterial spores
Yeast / Mold (Including wild yeast)
Virus

Typical gram +
- Lactobacillus
- Pediococcus

Typical gram -
- Hafnia protea
- Enterobakteria
- Pectinatus
- Megasphaera
- Zymomonas

GOOD HAND HYGIENE:

Good personal hygiene is important when you work in the food industry. Thereby you can avoid to transfer bacteria and virus. Begin by washing your hands thoroughly with soap and finish with disinfection.



SINNER'S CIRCLE

Factors which influence cleaning and cleaning efficiency are: Reaction time, chemical action, temperature, mechanical action.

These factors are interdependent. Whenever one of the factors is changed, it will have an effect on cleaning efficiency. If one factor is changed, one or more of the others must compensate for the change.

This is why Sinner's Circle is also used as a basis for optimising cleaning efficiency.

PRODUCTION HYGIENE

WHY BOTHER CLEANING? IT WILL GET DIRTY AGAIN!

- To assure the production of top-quality products
- To avoid micro biological contamination
  - Dirt and grime are growth media for micro organisms
- To maintain the production efficiency
  - Dirt and grime can reduce the effectivity for the production
- Legislation – the food act
  - Must basically protect consumers from health risks in connection with food
- Visually clean - odourless
  - Working environment and the image of the company

Cleaning must remove:
- Product residues
- Other types of organic material
- Dirt and grime
  - Nourishment for bacteria and other micro organisms
- Bacteria and other micro organisms
  - Risk of diminished product quality
  - Risk of biofilm formation and contamination.

Disinfection reduces the number of living micro organisms to a level which is acceptable for the given purpose.

Micro organisms are killed to such an extent that the disinfected area can be used without a risk of infection.

Sterilisation – complete absence of living micro organisms.

Cleaning – removal of dust and dirt.

MICRO BIOLOGY:

Bacterial reproduction

- Generation time can vary from a few minutes to several hours. The average generation time is appr. 30 minutes.

- Under favorable conditions, more than 7 mio bacteria can be formed during 7 hours if the generation time is 20 minutes.

- The generation time is dependent on dirt, room temperature, pH and humidity on the surface.

GROWTH CONDITIONS:

Micro organisms require water to grow.

- Micro organisms' growth opportunities on cleaned production equipment can therefore be limited by rapidly drying the facilities and equipment.
- Good ventilation and self-draining / wiped surfaces thus help prevent microbial growth.
- It is easier to kill micro organisms in a wet environment than in a dry.
- A higher concentration of disinfection and/or higher temperature may therefore be needed to kill micro organisms in dry production environments.

PRODUCT EXPLANATION

On Novadan's website: www.novadan.dk, it is easy to download detailed information about all Novadan's products in the "Download" banner.
In this brochure an overview of which products are recommended to use is shown.

- **Alkaline products**
- Products with a high pH value which dissolves organic material. Some also contain substances that dissolves inorganic materials.

- **Acidic products**
- Products which dissolves calcium and other inorganic materials.

- **Neutral products**
- Products with a new neutral pH value but good at removing organic materials.

- **Booster**
- Products which boost or regulate the process.

- **Disinfection**
- Products which kill bacteria after the cleaning process

1
2
3
4
5

ACIDIC
This category contains for example:
phosphoric acid, nitric acid, acetic acid, citric acid and sulphuric acid.
Characteristics: Acids have pH < 6, can be neutralised by bases, react dangerously with chlorine and are corrosive.
Properties: Dissolve mineral coatings (limestone, CaCO3) and corrode metal.

6
7
8

NEUTRAL
This category contains for example:
standard detergents, universal cleaning agents.
Characteristics: Neutral liquids have pH 6-8.
Properties: Remove dirt.

9
10
11
12
13
14

ALKALINE
This category contains for example:
sodium hydroxide (caustic soda), potassium hydroxide, metasilicate and complex binders.
Characteristics: Bases have pH > 8, can be neutralised by acids and are corrosive.
Properties: Dissolve grease and oil (soap production), destroy proteins, attack light metal and precipitate water-hardness salts.

MASH TUN

PROCESS
Only water, as CIP cleaning is used here. In breweries there are mash tuns and whirlpools. There is neither need for boiling at high temperatures nor fermentation.

INSTRUCTIONS
1. Soft water = CIP Alka 60
2. Hard water = CIP Alka 95/CIP Alka 96
3. Pre-rinse with water for at least 10 min.
4. CIP with 1-2% alkaline CIP product at 60-70^{0}C in minimum 30 minutes
5. Rinse to neutral ph-value
6. CIP with 0,5-2% acidic product: CIP Acid KA product in 29 min, 40-60^{0}C
7. Rinse to neutral pH

Choice of product and concentration depend on water quality and dirtiness.
All concentrations are based on weight percentage.

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96
CIP Acid KA

BREW KETTLE

PROCESS
The wort, which contains large amounts of sugar, starch and protein, is boiled in the brew kettle. Due to the high temperatures, materials can easily burn onto all surfaces.

INSTRUCTIONS
1. Rinse off any loose particles manually.
2. CIP with 3% CIP product at 60-70°C for at least 40 minutes. In case of burnt residues, add 0.5% Game Addi Oxi.
3. Rinse to neutral pH-value.
4. Cip with 0,5-2% acidic product: CIP Acid KA in 30 minutes., 40-60^{0}C
5. Rinse to neutral pH

In order to remove calcium deposits, cleaning with the acidic product Cip Acid KA in cold water is recommended as required.

PRODUCT NAME
Game Addi Oxi
CIP Alka 95
CIP Alka 96
CIP Acid KA

COOLER

PROCESS
After being boiled in the brew kettle, the wort is led through the whirlpool to the cooler/heat exchanger. Here, the temperature of the wort is reduced before it continues to the fermentation tanks. This is one of the critical HACCP areas. If not cleaned very carefully, deposits can accumulate with subsequent risk of bacterial growth.

INSTRUCTIONS
1. Rinse with water
2. CIP with 3% alkaline CIP product at 60-70^{0}C in minimum 40 minutes.
3. Rinse with water to neutral pH
4. CIP with 2,5% acidic product: CIP Acid KA at 60^{0}C in minimum 20 min.
5. Rinse with clean water to neutral pH
6. Disinfect with 0,5% Oxidan Extra in water in 10 minutes. Recirculate and leave it.
7. Leave the mixture in the heat exchanger until the next batch is to be cooled, at which time the exchanger should be flushed with water to neutral pH.

In case of difficult deposits, add 0,5% booster: Game Addi Oxi to alkaline CIP product. Remember to descale the heat exchanger on the water side.

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96
Game Addi Oxi
CIP Acid KA
Oxidan Extra

WHIRLPOOL

PROCESS
The hot wort is pumped into the whirlpool before continuing to the cooler. If a whirlpool is not included in the process, the wort is pumped back into the mash tun in case of a two-vat system.

INSTRUCTIONS
1. Pre-rinse with water in appr. 5 minutes
2. CIP with 1-2% alkaline CIP product at 60-70^{0}C in minimum 30 minutes.
3. Rinse to neutral pH value.
4. Disinfect with 0,5% Oxidan Extra in cold water.

Leave the above solution in the system until the next batch is produced, at which time the system should be initially flushed with cold water or cold wort.

Stubborn, coloured deposits, which cannot be removed with standard detergents, may form difficult coloured deposits in the whirlpool. If this is the case, add 0.5% Game Addi Oxi.

PRODUCT NAME
Game Addi Oxi
Oxidan Extra
CIP Alka 95
CIP Alka 96

FERMENTATION/STORAGE

PROCESS
In fermentation/storage tanks, fermentation causes a rim of yeast, which can be very difficult to remove. Beer stone is also formed, which consists of limestone and small amounts of organic material.

INSTRUCTIONS
Two-step cleaning is often used here.

1. Pre-rinse with water, until residues of beer and foam have been flushed out.
2. CIP with 2-3% alkaline CIP product at 40-60^{0}C in minimum 30 minutes
3. Rinse to neutral pH-value
4. Acidic wash with CIP Acid KC or CIP Acid KA 0,5-2%
5. Rinse to neutral pH.
6. Disinfection with 0,3-0,5% Oxidan Extra in minimum 10 minutes (can be done before start-up if the tank is not used immediately after cleaning.
7. Final rinse with clean water to neutral pH

Difficult deposits can be removed by adding 0,5% booster:
Game Addi Oxi to an alkaline CIP product.

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96
CIP Acid KA
CIP Acid KC
Oxidan Extra

SEALS/HOSES/FITTINGS/HATCHES

PROCESS
Fittings, hatches, seals and hoses must be kept clean to avoid cross-contamination.

INSTRUCTIONS
1. Clean fittings and seals manually with 1% Foam 42 (neutral product).
2. Rinse with water.
3. Disinfection with 0,5% Oxidan Extra (soaking).
4. Rinse with water.
5. Before refitting, disinfect with IPA Sprit 70%.
6. Store hoses in 0,5% desinfektion Oxidan Extra when not in use
7. Rinse with water.

PRODUCT NAME
Oxidan Extra
Foam 42
IPA Sprit 70%
Desinfect TA

RINSING MACHINE

PROCESS
Reusable bottles are washed and their labels removed in the rinsing machine.

INSTRUCTIONS
1. Add Natronlud until a NaOH concentration of 1.8-2% is obtained.
2. Add 0.2% Game Addi 1 to the Natronlud solution. (NOTE: Calculate 0.2% on basis of the total volume of water in the vat.)
3. Add 2-4 ppm active chlorine or 0.2% Oxidan Extra to the second last rinse.
4. Final rinse with clean water.

If foam occurs in the Natronlud vat, add Game Antifoam 51 or Game Antifoam 52.

PRODUCT NAME
Oxidan Extra
Hypochlor Des
Natronlud
Game Additive 1
Game Antifoam 51
Game Antifoam 52

BOTTLE WASHER

PROCESS
Rinse new bottles to remove dust and foreign bodies.

INSTRUCTIONS
1. Add 2-4 ppm active chlorine or 0.2% Oxidan Extra to the rinsing water.
2. Rinse with clean water.

PRODUCT NAME
Oxidan Extra
Hypochlor Des

BOTTLING MACHINE

PROCESS
The bottling machine is an important HACCP area. When bottling is complete, clean all pipes- from the pressure/storage tanks to the bottling machine.

INSTRUCTIONS
1. Rinse with water.
2. CIP with 2-3% alkaline CIP product at 70-80^{0}C hot water in minimum 30-40 minutes
3. Rinse to neutral pH
4. CIP with 2,5% acidic product: CIP Acid KC or Cip Acid KA product in 30 minutes in max 40-60^{0}C.
5. Rinse to neutral pH
6. Disinfect with 0,2% Oxidan Extra in cold water in 5-10 minutes
7. Final rinse with clean water.

If the bottling machine is not used again immediately after disinfection, it must be flushed with water containing 0,2% Oxidan Extra and then rinsed before reuse.

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96
Oxidan Extra
CIP Acid KC
CIP Acid KA

TUNNEL PASTEURISER

PROCESS
To extend shelf life, the beer is pasteurised in either a tunnel pasteuriser or flash pasteruriser (heat exhanger).

INSTRUCTIONS
TUNNEL PASTEURISER
1. Clean the tunnel pasteuriser periodically with 2% alkaline CIP product at 70-80°C for one hour.
2. Rinse
3. Disinfect with 0,5% Oxidan Extra in 5-15 minutes
4. Empty the system

Daily operation: To prevent slime formation in the temperature zones, add Oxivit Aktiv Plus 1% morning and evening during production.

PLATE HEAT EXCHANGER
5. Prerinse with clean water
6. CIP with 3% alkaline CIP product at 70-80^{0}C in minimum 40 minutes.
7. Intermediate rinse with clean water to neutral pH
8. CIP with 2% acidic product: CIP Acid KA at 40-60^{0}C in 30 minutes.
9. Rinse with clean water to neutral pH
10. Desinfect with 0,5% Oxidan Extra in cold water in 5-15 minutes.
11. Final rinse with clean water

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96
CIP Acid KA
Oxidan Extra
Oxivit Aktiv Plus

LUBRICATION

PROCESS
The purpose of the conveyor belt lubrication is to reduce friction between the bottles/cans and the conveyor and to keep the belt clean.

INSTRUCTIONS
1. For wet lubrication: Apply a 1:600 solution of Con Lube 600 in water. (Lubrication and cleaning in the same process.)
2. For dry lubricaton: Spray Danalub S4 using special dosing equipment. More frequent cleaning is necessary here.
3. Daily cleaning of conveyor belts is recommended with Foam 42 or Foam 32T, used in a 3-5% solution at 40-60^{0}C.

PRODUCT NAME
Con Lube 600
Danalub S4
Foam 42
Foam 32T

KEGS

PROCESS
KEGS are reusable containers and require thorough cleaning before being refilled in order to assure duration and flavour of the beer.

INSTRUCTIONS
1. KEGS are cleaned according to the machine's instruction.
2. CIP with 2% alkaline CIP product in 50-70^{0}C warm water according to the machine's CIP-program.
3. CIP with 1% acidic CIP-product at 50-60^{0}C warm water according to the machine's CIP program.
   Disinfect the broach with 1% disinfection: Oxidan, before putting on the cap.

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96
CIP Acid CC
CIP Acid KA
Oxidan

SURFACE CLEANING

PROCESS
It is important to maintain good standards of hygiene throughout the brewery, particularly in sensitive areas such as the bottling area and the fermentation/ storage area.

INSTRUCTIONS
1. The bottling hall should be cleaned and disinfected after each batch.
2. The same applies to tank areas where pipes and hoses are connected.
3. Bottle conveyor belts should be cleaned daily.

SUGGESTED CHEMICAL PLAN FOR SURFACE CLEANING AND DISINFECTION

Day	Rinse	Soap/surface cleaning	Rinse	Disinfection	Final rinse
Monday	X	Foam 32 T	X	Des Foam PAA	X
Tuesday	X	Foam 32 T	X	Des Foam PAA	X
Wednesday	X	Foam 19 T	X	Des Foam PAA	X
Thursday	X	Foam 32 T	X	Des Foam PAA	X
Friday	X	Foam 32 T	X	Des Foam PAA	X

Recommended dosage:
2-3% foam cleaning
1-2% Des Foam PAA

Foam 42 is used for light metals, e.g. the label machine.

PRODUCT NAME
Foam 32T
Foam 19T
Foam 42
Des Foam PAA

DRAUGHT BEER EQUIPMENT

PROCESS
To ensure premium beer quality, draught beer equipment must be kept clean. We recommend that products with colour change are used.

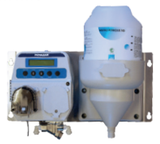
INSTRUCTIONS
1. Mix the product with lukewarm water. Switch off the chiller.
2. The solution must be appr. 3% (1,5 dl. to 5 ltr. water) – In case of very dirty plant, prepare a 5% solution.
3. Attach the cleaning container with the solution.
4. Draw beer through the tap.
5. Once the cleaning solution appears (green colour), close the tap.
6. Draw cleaning solution through the system at five-minute intervals.
7. Once the cleaning solution has changed colour to constant purple (after approx. 20 minutes), the system is clean.
8. Control of cleaning: Fill a clean glass with cleaning solution. No blur ring or particles should be visible when the glass is held up to the light.
   If blur ring/particles are visible, repeat the cleaning process until the solution remains clear.
9. Now attach a clean water supply to the system and rinse until all traces of colour have disappeared and the water is completely clear.
10. Restart the chiller and the system is ready for use.

PRODUCT NAME
Beer Line Cleaner Color

GLASS WASHING

PROCESS
In order to make customers satisfied, it is important that their glasses are clean.

INSTRUCTIONS
Novadan has developed special products for washing beer glasses.



PRODUCT NAME
Bistro 741
Bistro Powder 743

PRODUCTS/APPLICATIONS

Process/ Product	Mash tun	Brew kettle	Cooler Whirlpool	Fermentation/ storage	Rinsing machine	Bottling machine	Tunnel- pasteruriser	Lubrication	KEGS	Surface cleaning
CIP Alka 60	x		x	x		x	x		x	
CIP Alka 95 (EDTA)	x	x	x	x		x	x		x	
CIP Alka 96	x	x	x	x		x	x		x	
CIP Acid CC				x		x			x	
CIP Acid KC										
CIP Acid KA		x	x	x		x	x		x	
Natronlud					x					
Hypochlorit				x						
Game Addi- tive 1					x					
Game Addi- tive Oxi		x	x							
Game Anti- foam 51					x					
Game Anti- foam 52					x					
Foam 32T										x
Foam 19T										x
Foam 42										x
Des Foam PAA										x
Oxidan									x	
Oxidan Extra			x	x	x	x	x			
Oxivit Aktiv Plus							x			
Con Lube 600								x		
Danalub 14								x		

LABELS

Novadan's labels are colour coded which reflects the pH-level of the products.

If the label is read, the product is acidic whereas a blue label indicates an alkaline product. A green label indicates a pH-neutral product.

A yellow label is a disinfectant.