Complete instructions for correct and effective cleaning and control programmes.

HANDBOOK OF HYGIENE AND CLEANING FOR MICROBREWERIES

Developed by
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NOVADAN®

HANDBOOK OF HYGIENE AND CLEANING

Novadan has prepared this handbook specifically for microbreweries. The handbook is meant to be used as a reference manual.

The table of contents provides a quick overview of the areas covered by the handbook. For each area, thorough instructions are given for product use and the cleaning process.

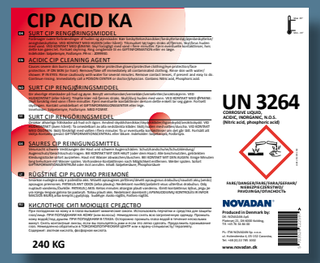
In addition, requirements on cleaning, Sinner's circle and chemicals and safety are also described among other things.

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

LABELS

Novadan's labels are colour-coded, reflecting the pH of the products.

If the label is red, the product is acidic, while a blue label indicates an alkaline product. A green label indicates a neutral product. A yellow label indicates a disinfectant.



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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, must NOT be mixed with chlorine and are corrosive.
Properties: Dissolve mineral coatings (limestone, $CaCO_3$) and corrode metal.

NEUTRAL

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

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.

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PRODUCTION HYGIENE

WHY BOTHER CLEANING; IT'LL ONLY GET DIRTY AGAIN!

- To assure the production of top-quality products
- To prevent microbiological contamination
  – Dirt and grime are growth media for microorganisms
- To maintain production efficiency
  – Dirt and grime may impair production efficiency
- Legislation – the Danish Food Act
  – Intended to assure consumers basic protection against health risks associated with food
- Visually clean – odourless
  – Working environment and the company's image

Cleaning should remove:
- Product residues
- Other forms of organic material
- Dirt and grime
  - Nourishment for bacteria and other microorganisms
- Bacteria and other microorganisms
  - Risk of diminished product quality
  - Risk of biofilm formation and contamination

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

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

Sterilisation – complete absence of living microorganisms

Cleaning – removal of dust and dirt

MICROBIOLOGY:

Bacterial reproduction

- Generation times can vary between a few minutes to several hours. The average generation time is approx. 30 minutes.

- Under favourable conditions, more than 7 million bacteria can be formed in the space of 7 hours if the generation time is 20 minutes.

- The generation time depends on the presence of dirt, room temperature, pH and surface moisture.

GROWTH CONDITIONS:

Microorganisms need water to grow.

- The possibility of microbial growth on clean production equipment can therefore be limited by rapid drying of facilities and equipment.
- Good ventilation and self-draining/wiped surfaces thus help prevent microbial growth.
- It is easier to kill microorganisms in a wet production environment than in a dry.
- A higher concentration of disinfectant and/or higher temperature may therefore be needed to kill microorganisms in dry production environments.

TYPES OF MICROORGANISM:

Bacteria

- Gram positive – Often found in cooked or otherwise prepared foods.
- Gram negative – Often found in raw foods that are not cooked or otherwise prepared.

Bacterial spores
Yeast / mould (including wild yeast)
Virus

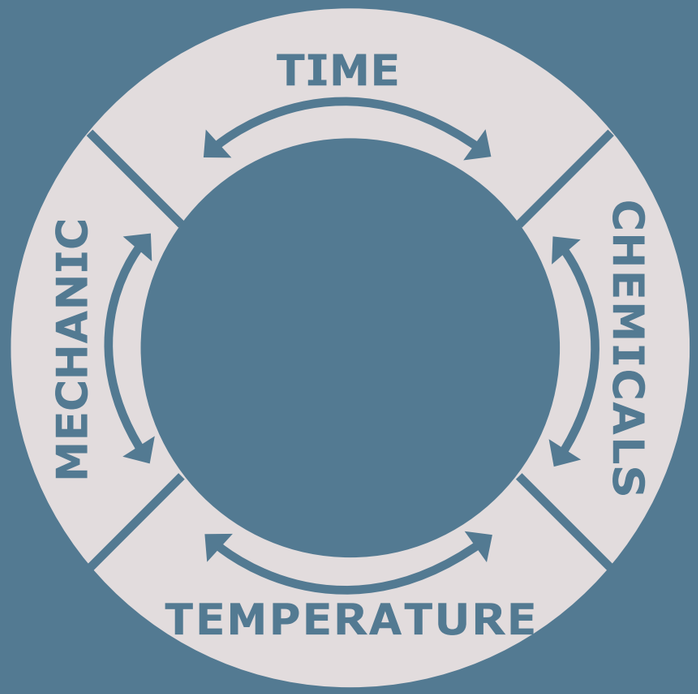
Typical gram positive
- Lactobacillus
- Pediococcus

Typical gram negative
- Hafnia protea
- Enterobacteria
- Pectinatus
- Megasphaera
- Zymomonas

GOOD HAND HYGIENE:

Good personal hygiene is important when you work in the food industry. Good personal hygiene can prevent the transfer of bacteria and virus. Begin by washing your hands thoroughly with soap and finish by disinfecting them.

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 a 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.

MASH TUN

PRODUCT NAME
CIP Alka 60
CIP Alka 95
CIP Alka 96

PROCESS
Only water, as CIP cleaning is used here. Breweries are equipped with a mash tun and whirlpool among other pieces of equipment. Here there is no boiling at high temperatured or 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 minutes.
4. CIP with 1-2% CIP product at 60-70°C for at least 30 minutes.
5. Rinse finally with clean water to neutral pH.

Product choice and recommended concentration depend on water quality and dirtiness.
All concentrations are weight percent.

BREW KETTLE

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

PROCESS
The wort, which contains large amounts of sugar, starch and protein, is boiled in the brew kettle. Due to the high temperatures, material 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 stubborn burnt residues, add 0.5% Game Addi Oxi.
3. Rinse finally with clean water to neutral pH.

To remove limescale, we recommend cleaning with CIP Acid KA in cold water as required.

COOLER

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

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 crucial HACCP areas. If not cleaned very carefully, deposits can accumulate with subsequent risk of bacterial growth.

INSTRUCTIONS
1. Pre-rinse with water.
2. CIP with 3% CIP product at 60-70°C for at least 40 minutes.
3. Rinse intermediately with water to neutral pH
4. CIP with 2.5% CIP Acid KA at 60°C for at least 20 minutes.
5. Rinse with clean water to neutral pH.
6. Disinfect with 0.5% Oxidan Extra in water for 10 minutes. Recirculate the solution and leave it in place.
7. Leave the solution in the heat exchanger until the next batch, at which time the exchanger should be flushed with water to neutral pH.

   In case of stubborn deposits, add 0,5% Game Addi Oxi.
   Remember to descale the heat exchanger on the water side.

WHIRLPOOL

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

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 for approx. 5 minutes.
2. CIP with 1-2% CIP product at 60-70°C for at least 30 minutes.
3. Rinse to neutral pH.
4. Disinfect with 0.5% Oxidan Extra in cold water.
5. 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 in the whirlpool. If this is the case, add 0.5% Game Addi Oxi.

FERMENTATION/STORAGE

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

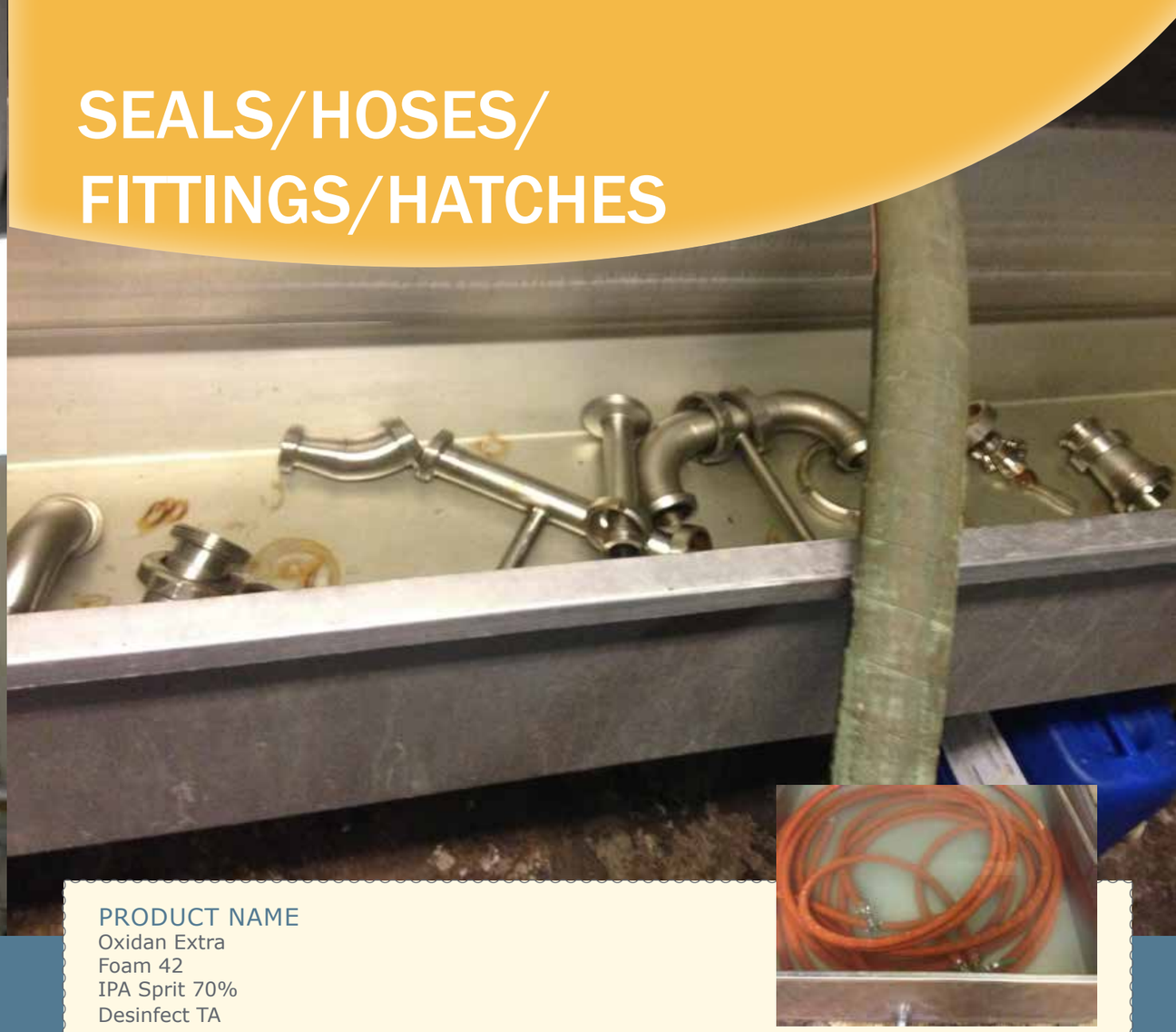
PROCESS
In fermentation/storage tanks, fermentation causes a rim of yeast, which can be very difficult to remove. Beer stone is also formed, which consists of limestone and small amounts of organic material.

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% CIP product at 40-60°C for at least 30 minutes.
3. Rinse intermediately to neutral pH.
4. Wash with acidic CIP Acid CC or CIP Acid KA.
5. Rinse intermediately to neutral pH.
6. Disinfect with 0.3-0.5% Oxidan Extra for at least 10 minutes (can be done before starting the next batch if the tank is not to be used immediately after cleaning).
7. Finally rinse with clean water to neutral pH.

Stubborn deposits can be removed by adding 0.5% Game Addi Oxi in step 2.

SEALS/HOSES/ FITTINGS/HATCHES



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

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

INSTRUCTIONS
1. Clean fittings and seals manually with 1% Foam 42.
2. Rinse with water.
3. Disinfect with 0.5% Oxidan Extra (soaking).
4. Rinse with water.
5. Disinfect with IPA Sprit 70% before refitting.

1. Store hoses in 0.5% Oxidan Extra when not in use.
2. Rinse with water.

RINSING MACHINE

PRODUCT NAME
Oxidan Extra
Natriumhypochlorit (NaOH)
Natronlud
Game Addi 1
Game Antifoam 51
Game Antifoam 52

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

INSTRUCTIONS
1. Add caustic soda until a NaOH concentration of 1.8-2% is obtained.
2. Add 0.2% Game Addi 1 to the caustic soda solution. (NOTE: Calculate the 0.2% on the 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. Rinse finally with clean water.

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

BOTTLE WASHER

PRODUCT NAME
Oxidan Extra
Natriumhypochlorit

PROCESS
Rinse new bottles to remove dust and foreign objects.

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

BOTTLING MACHINE

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

PROCESS
The bottling machine is a crucial HACCP area. When bottling is complete, clean all pipes between the pressure/storage tanks and the bottling machine.

INSTRUCTIONS
1. Pre-rinse with water.
2. CIP with 2-3% alkaline CIP product in 70-80°C hot water for at least 30-40 minutes.
3. Rinse intermediately to neutral pH.
4. CIP with 2.5% acidic CIP product for 30 minutes at max. 40-60°C.
5. Rinse intermediately to neutral pH.
6. Disinfect with 0.2% Oxidan Extra in cold water for 5-10 minutes.
7. Finally rinse with clean water.

   If the bottling machine is not to be used again immediately after disinfection, it should be flushed with water containing 0.2% Oxidan Extra and then rinsed before reuse.

TUNNEL PASTEURISER

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

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

INSTRUCTIONS
TUNNEL PASTEURISER
1. Clean the tunnel pasteuriser periodically with 2% alkaline CIP product at 70-80°C for one hour.
2. Rinse intermediately.
3. Disinfect with 0.5% Oxidan Extra for 5-15 minutes.
4. Empty the system.

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

FLASH PASTEURISER:
5. Pre-rinse with clean water.
6. CIP with 3% alkaline CIP product at 70-80°C for at least 40 minutes.
7. Rinse intermediately with clean water to neutral pH.
8. CIP with 2% CIP Acid KA at 40-60°C for 30 minutes.
9. Rinse with clean water to neutral pH.
10. Disinfect with 0.5% Oxidan Extra in cold water for 5-15 minutes.
11. Finally rinse with clean water.

BÅNDSMØRING

PRODUCT NAME
Con Lube 600
Danalub 14
Foam 42
Foam 32T

PROCESS
The purpose of 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 one and the same process.)
2. For dry lubrication: Spray Danalub 14 using special dosing equipment. More frequent cleaning is necessary here. (We recommend daily cleaning of conveyor belts with Foam 42 or Foam 32T.)

KEGS

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

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

INSTRUCTIONS
1. Kegs should be cleaned in accordance with the machine's instructions.
2. CIP with 2% alkaline CIP product in 50-70°C hot water in accordance with the machine's CIP programme.
3. CIP with 1% acidic CIP product in 50-60°C hot water in accordance with the machine's CIP programme.

   Keg posts should be disinfected with 1% Oxidan before the cap is fitted.

SURFACE CLEANING

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

PROCESS
It is important to maintain good standards of hygiene throughout the brewery, particularly in sensitive areas such as the bottling hall 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 CHEMICALS PLAN FOR SURFACE CLEANING AND DISINFECTION

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

Day	Rinsing	Detergent/surface cleaning	Rinsing	Disinfection	Final rinsing
Monday	X	Foam 32 T (alka)	X	Des Foam PAA	X
Tuesday	X	Foam 32 T (alka)	X	Des Foam PAA	X
Wednesday	X	Foam 19T (acid)	X	Des Foam PAA	X
Thursday	X	Foam 32 T (alka)	X	Des Foam PAA	X
Friday	X	Foam 32 T (alka)	X	Des Foam PAA	X

Use Foam 42 on light metals, e.g. the labelling machine.

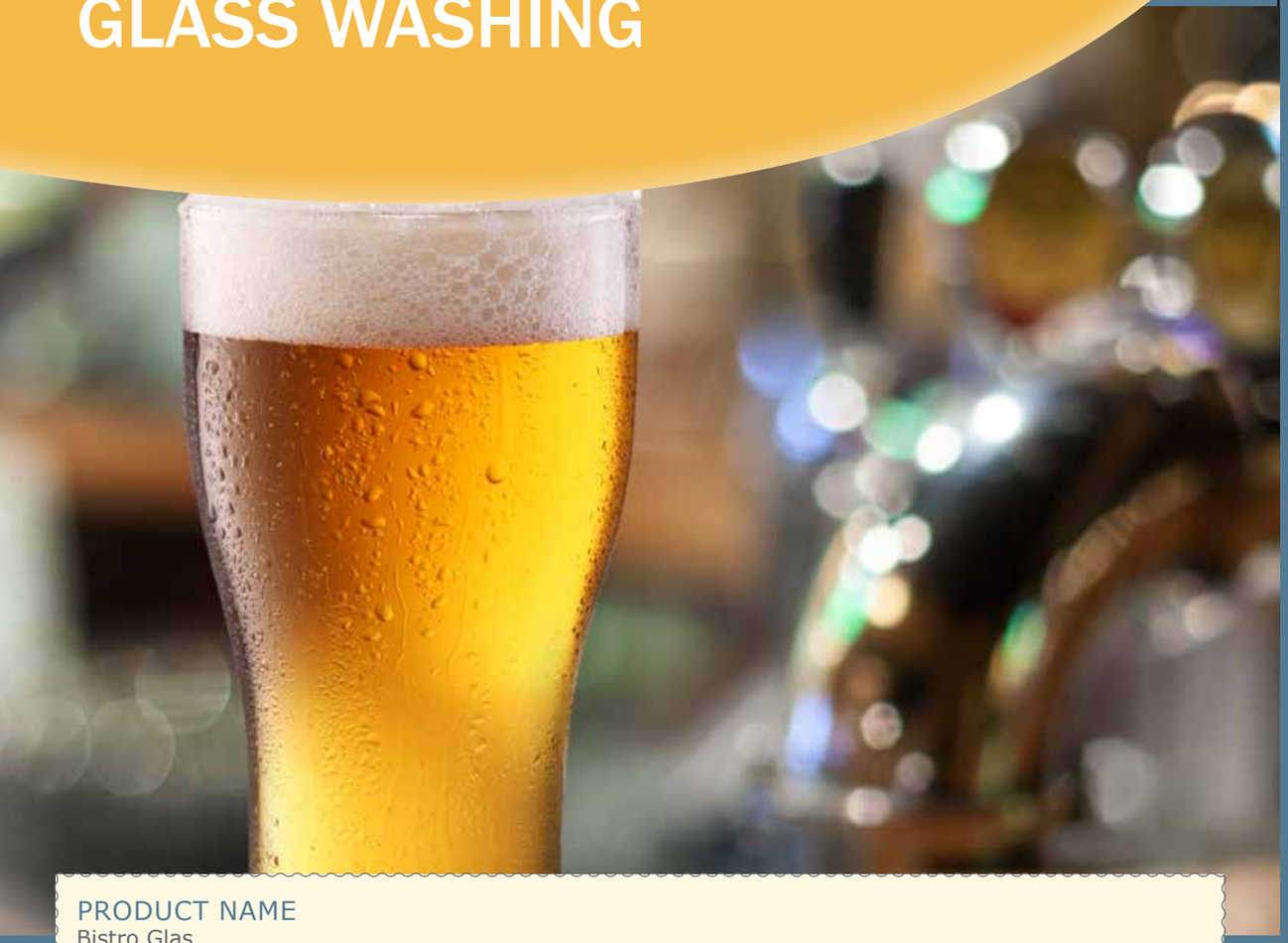
DRAUGHT BEER EQUIPMENT

PRODUCT NAME
Beer Line Cleaner Color

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

INSTRUCTIONS
1. Mix the product with warm water. Switch off the chiller.
2. The solution should be approx. 3% (1.5 dl to 5 litres of water). If the equipment is very dirty, a 5% solution can be used.
3. Attach the container with cleaning 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 cloudiness or particles should be visible when the glass is held up to the light. If cloudiness/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.

GLASS WASHING



PRODUCT NAME
Bistro Glas
Bistro Powder – solution with dispenser.

PROCESS
If customers are to be satisfied, it is important that their glasses are clean.

INSTRUCTIONS
Novadan has developed special products for washing beer glasses.

PRODUCTS/APPLICATIONS

Process/ Product	Mash tun	Brew kettle	Cooler Whirlpool	Fermenta-tion/storage tanks	Rinsing machine	Bottling machine	Tunnel pasteuriser	Conveyor belt 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*					
Natrium-hypochlorit				x						
Game Addi 1					x*					
Game Addi 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		

*** Boost caustic soda with Game Addi 1.**

CHEMICALS AND SAFETY

Novadan has prepared an A3 poster on Chemicals and Safety which describes simple yet important precautions, protective equipment when using chemicals and the conversion of orange hazard symbols to CLP labelling.

The poster is available in laminated form from Novadan.

CHEMICALS AND SAFETY

- CONCENTRATED CLEANING AGENTS AND DISINFECTANTS

Hazard symbols

OLD SYMBOLS	NEW SYMBOLS CLP HAZARD	PHYSICAL/HEALTH RISK/ENVIRONMENTAL DANGER
Extremely and highly inflammable	Extremely and highly inflammable	PHYSICAL HAZARDS: Flammable, self-reactive, pyrophoric liquids & solids, self-heating reactive, emit flammable gases, organic peroxides.
Oxidising	Oxidising	PHYSICAL HAZARDS: Gas, liquid or solid which may cause or contribute to the combustion of a second material.
Corrosive	Corrosive	PHYSICAL HAZARDS: Corrosive to metals HEALTH HAZARDS: Skin corrosion and serious eye damage.
Harmful and irritating: Serious eye damage. Skin and respiratory sensitizer, lowest categories of CMR, acute toxic and irritating substances.	Acute toxicity, dermal sensitizer	HEALTH HAZARDS (ACUTE): Acute toxicity, skin irritation, eye irritation, skin sensitisatio, respiratory tract irritation, specific target organ toxicity.
	Carcinogen, mutagenicity and reproductive toxicity	HEALTH HAZARDS (CHRONIC): Respiratory sensitisation, germ cell mutagenicity, carcinogenicity, reproductive toxicity, specific target organ, aspiration hazard.
Dangerous for the environment: Hazardous to the aquatic environment. Acute and chronic.	Hazardous to the aquatic environment	ENVIRONMENTAL HAZARDS: Hazardous to the aquatic environment.

FIRST AID

See the label for information

If the discomfort persists, contact the doctor or the National Poisons Information Service.

Remember to bring the safety data sheet to the doctor.

Always observe the company's internal contingency plan in case of fire, spill or accident

- Notice the hazard symbols and labelling
- Use suggested personal protection
- Never mix different products - toxic gasses may develop
- When diluting: Pour product slowly into water - never in reverse order
- Follow the given guidelines and instructions
- Store cleaning agents and disinfectants in original containers
- Keep different products apart
- Do not smoke, eat or drink when handling chemical substances

Personal protection

Eyes
- Eye protection or
- Face protection

Hands
- Chemically resistant gloves

Body
- Suitable protective clothing or
- Suitable protective apron

Feet
- Slip resistant safety boots

Respiratory
- In case of inadequate ventilation wear respiratory protection

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NOVADAN® Innovators in Cleaning

ABOUT NOVADAN

Novadan is an international manufacturer of cleaning agents and disinfectants with many years' experience in cleaning breweries.

Our experts in the optimisation of brewery cleaning can ensure that all steps in your cleaning processes are efficient, cost-effective and of highest quality.

Novadan's disinfectants are approved by the Danish Veterinary and Food Administration and meet the guidelines of the Biocidal Products Regulation.