



Education and Culture

Leonardo da Vinci

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# **Sustainability in commercial laundering processes**

Module 1  
**Usage of water**

Chapter 4

## **Reasons for waste water load and possibilities of improving waste water quality**

- Sources of waste water load
- Parameters influencing on waste water load
- Optimisation of washing process
  - Temperature, pH
  - Phosphates
  - Reduction of chlorine/AOX
- Reduction of waste water load (by treatment)
  - Other parameters

# Learning targets

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After finishing this chapter, you will

- know and be able to name sources of waste water load
- know influencing parameters of washing process on waste water parameters
- know how to influence these parameters in order to improve waste water quality

# Sources for waste water load

## Detergents and laundry aids

especially surfactants,  
bleach agents, chlorine, alkalinity,  
phosphate

+

## Soil from laundry

(especially from work wear, mats,  
wiping cloth)  
mineral oils, heavy metals, particles,  
sand, lint generation

## Steam

for washing machine heating  
metals

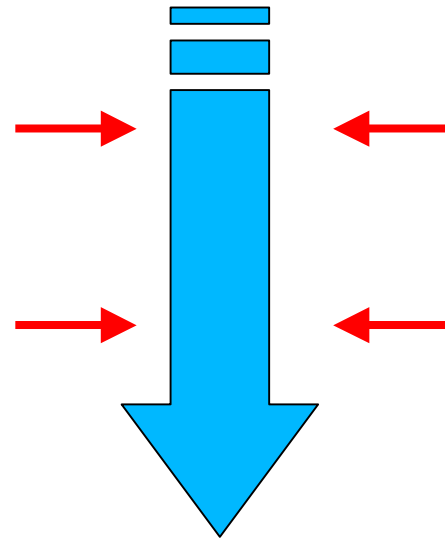
## Fresh water

particles, sand,  
micro-organisms

## Washing process

heat

**Reactions** between soil  
and detergent/water  
ingredients: **AOX**



**Waste water**

# Sources for waste water load

| <b>parameter\Origin</b> | <b>washing process</b> | <b>soil</b> |
|-------------------------|------------------------|-------------|
| pH                      | X                      |             |
| Temperature             | X                      |             |
| Organic load            | X                      | X           |
| Phosphates              | X                      | X           |
| Sulphates               | X                      | X           |
| Lipophilic<br>Compounds |                        | X           |
| Organic Solvents        |                        | X           |
| Chlorine                | X                      |             |
| Hydrocarbons            |                        | X           |
| AOX                     | X                      | X           |
| Heavy Metals            |                        | X           |

- Measures for improvement of waste water quality dependent on the origin of waste water load
- Parameters that can be traced back to washing process can be influenced by modifying the washing process
- Parameters in consequence of soil demand waste water treatment methods

# Optimisation of washing process

## temperature, pH

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- Kind and dosage of washing agent influence pH-value (see 4-1, 4-2)
- Reduction of detergents and laundry aids (“right” dosage)
  - Saves resources
  - Minimises waste water load, not only in relation to pH but also to other waste water parameters
  - Costs for waste water load possibly decrease (to be considered for each laundry individually)⇒ Twofold benefit
- Cold washing process may help in cases of problematically high temperatures (see 3-4)

# Optimisation of washing process

## Phosphates

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- Washing agents may contain different content of phosphates
- Therefore, the phosphate-content in waste water can be influenced by kind of washing agent and dosage
- Too many phosphates in waters lead to eutrophication; growth of algae increases which leads to absence of oxygen in waters and collapse of ecosystem as a consequence
- Phosphate-free alternatives have to contain alternative water-hardness-removing agents, e.g. complexing agents (sequestrants) (see 4-1, 4-2)



# Optimisation of washing process

## reduction of chlorine/AOX

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- Chlorine is very reactive
- Chlorine in washing liquor forms chlorine-organic compounds
- Those can be analytically quantified (AOX-measurements)
- Some AOX-compounds are regarded as toxic, that is why AOX values are limited for waste water
- Public authorities may take random samples

## AOX-formation depends on

- Active chlorine concentration
- Kind of chlorine carrier
- Organic load of wash liquor

# Optimisation of washing process

## reduction of chlorine/AOX

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### Practical measures to minimise AOX-values

- Substitution of chlorine by chlorine-free alternatives
  - Hydrogen peroxide
  - Peracetic acid
- Application of chlorine in later phase of the rinse process
- Chlorine dioxide

- The parameters
    - Organic Load, phosphates, sulphates, lipophilic compounds, organic solvents, hydrocarbons, AOX and heavy metals
- Also depend on kind of laundry soiling
- Therefore, those parameters can be influenced by waste water treatment
  - Waste water treatment methods are explained in 1-5