



# Training Program for Operators of Effluent Treatment Plants in Textile Factories

Promotion of Sustainability in the Textile and Garment Industry in Asia - FABRIC

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH

**FABRIC** Asia

# **Primary treatment – Objective, function and operations**

GIZ FABRIC IS – ETP Operator Course



# Contents

- How to manage screening and grit removal
- How to ensure proper equalization
- How to adjust pH level

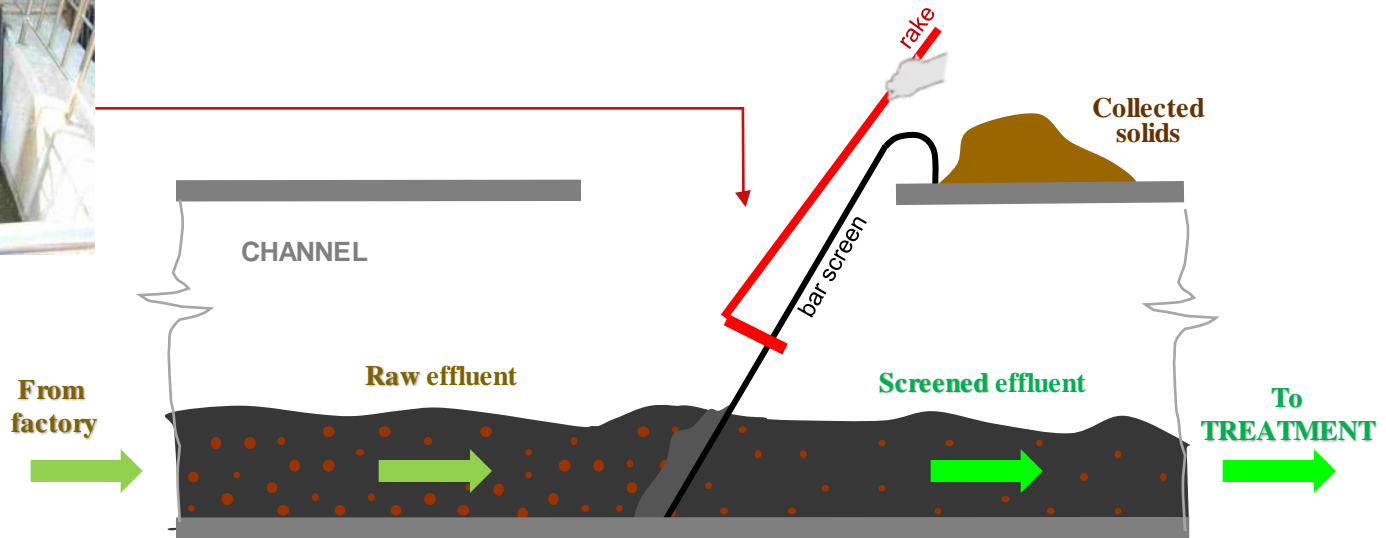
# Key aspects of primary treatment

- To **make effluent fit for treatment** ETP operations and machinery
- **Physical treatment first** part of primary treatment
- Specific units
  - Screening
  - Grit removal
  - Equalisation (including natural neutralization)
  - Cooling



# Screening and grit removal

# Screening and grit removal



# Screening and grit removal

## Mechanical bar screens (Example)



# Screening and grit removal

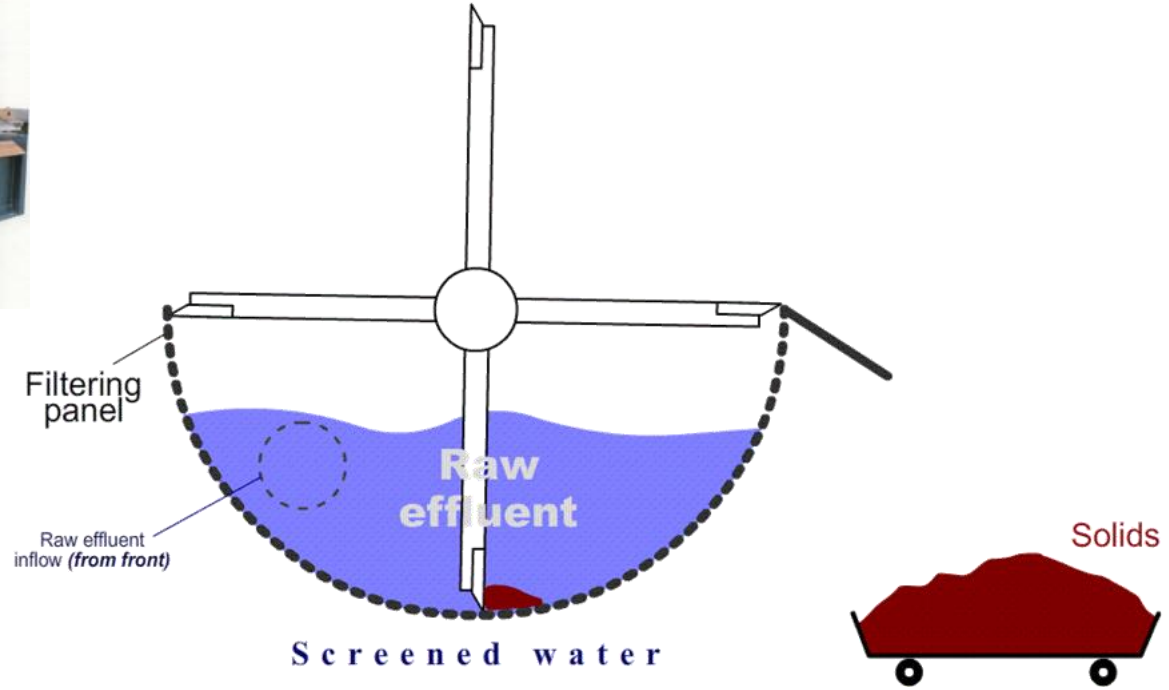
## Mechanical bar screens (Example)





# Screening and grit removal

## Self-cleaning screen (Parkwood type)



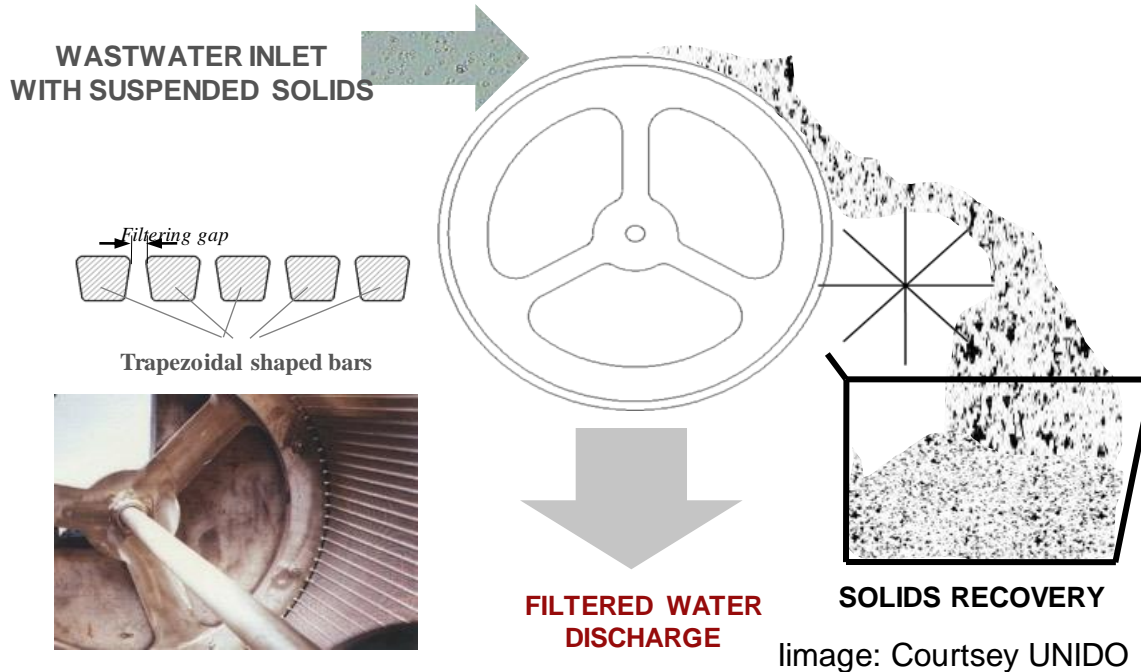
# Screening and grit removal

## Rotary brush screens



# Screening and grit removal

## Rotary drum screen (Konica type)



# Screening and grit removal

## Mechanical screen (Example)



# Screening and grit removal

## Mechanical screen (Example)



# Screening and grit removal

## Grit removal system

To **remove sand-like minerals** for avoiding tear and wear in subsequent treatment units

- Flow velocity control with proportional flow weirs or Parshall flumes
- Aerated grit chamber:
  - Spiral flow aeration tank with air diffusion tubes on one side
  - Controlled separation of inorganic and organic particles
  - Settling section for heavier particles





# Screening and grit removal

## Grit removal system



# Equalisation



# Equalisation

To **homogenise incoming effluent** from different production areas with different pollutants and pH levels

- Equalisation tank
  - Collecting and storing incoming streams (also equalizing peak and low inflows)
  - Mixing different streams
  - Cooling of effluent
  - Naturally neutralizing pH-levels



# Equalisation



# Equalisation

## Equalisation tank - set up

- Usually concrete (RCC) tank – circular or rectangular
- Usual below ground level
- **Adequate capacity** for normal retention time of 16 - 24 hours
- **Aeration system**



# Equalisation

## Equalisation tank – set up

### For consideration:

- Poor equalization in case of low retention time
- Loss of volume (free board) in case of gravity inflow
- Pumping required in case of too low inflow levels after screens and grit chamber



# Equalisation

## Equalisation tank - aeration systems

- To facilitate complete mixing
- Type of aeration systems
  - diffused aeration
  - jet aeration
  - turbine aerators and
  - floating aeration.

### Remember:

- **Fixed surface aeration not suitable!**



Equalization tank with jet aeration

# Equalisation

## Equalisation tank - aeration systems

### Diffused aeration elements

- Main air pipes from blower house along/under walls and walkways to equalisation tank
- Lateral header pipes to diffuser
- Arrangement for lifting air headers and diffusers to avoid emptying tank for cleaning or repair.



Diffusers in equalization tank

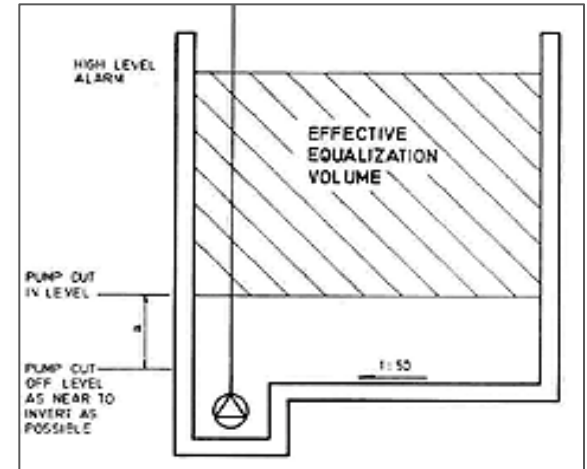


# Equalisation

## Equalisation tank - pumping

Pumping to primary (chemical) treatment or biological treatment required.

- Pumping rate to allow flow distribution throughout day.
  - Effluent inflow of full day in 8 - 10 hrs. into equalisation tank
  - Equalisation pumping continuous for 16 - 24 hours/day
- Directly from equalisation tank or via separate pump well.



# Equalisation

## Equalisation tank – pumping

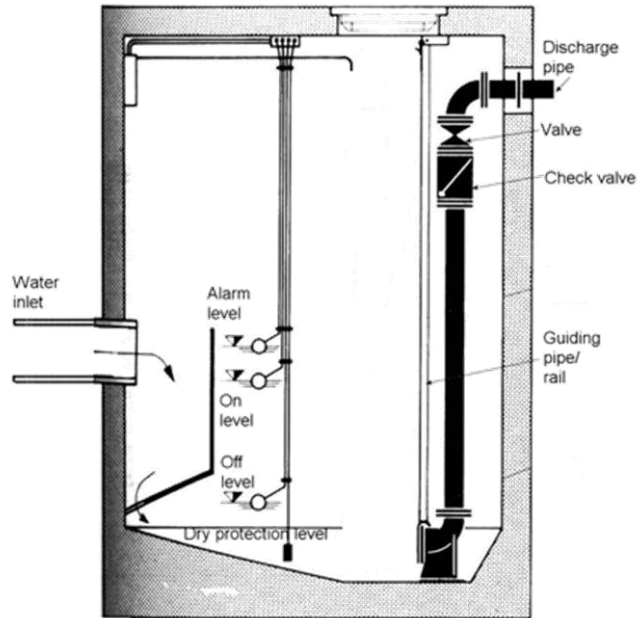
- Pumping pit for complete emptying of tank
- Set of pumps for rotating operation based on specified timings
- Automatic level sensors for pumping in equalization tank
- Alternative manual switching on/off by ETP operator before full level and minimum levels





# Equalisation

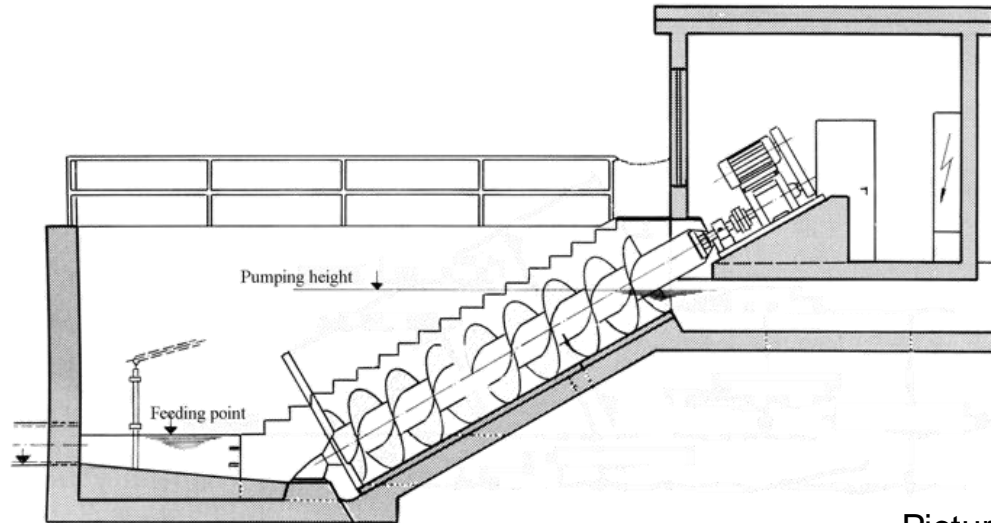
## Equalisation tank – submersible pumping arrangement



Picture courtesy: UNIDO

# Equalisation

## Equalisation tank – Screw (Archimedes) type pump for effluent lifting



Picture courtesy: UNIDO

# pH control of equalised effluent

# pH control of equalised effluent

Effluent to be in neutral to **avoid interference with biological treatment**

- Usually, pH adjustment needed after equalisation.
- pH adjustment part primary treatment.
- Additional final pH adjustment before biological treatment

Controlled pH adjustment options:

- in equalization tank (occasional)
- aeration tank inlet (more common) e.g. by acid dosing



# pH control of equalised effluent

## pH adjustment

- Alkali (e.g. caustic soda, soda ash, if effluent acidic.
- Hydrochloric acid or sulphuric acid, if effluent alkaline (more common)

## Dosing and control methods

- Pumps with variable controls
- Direct dosing from chemical barrel (small ETPs)
- Automatic pH control with online pH meter coupled with PID control of dosing valves
  - Alternatively dosing based on laboratory studies



# Effluent cooling

# Effluent cooling

- **Hot effluents** from production to be cooled, particularly before biological treatment
  - Incoming dyeing waste streams  $< 50^{\circ}\text{C}$
  - Bacteria in biological treatment dying if temperature  $< 40\text{-}42^{\circ}\text{C}$  resulting in **aeration** efficiency
- **Cooling system** at aeration tank inlet **for full biological ETPs** required



# Effluent cooling



Cooling tower at aeration tank inlet



Cooling system at aeration tank inlet



# To remember



- Good physical treatment prerequisite for efficient ETP operation
- Screening to prevent clogging pumps and piping, best by combination of one manually cleaned and one mechanical screen
- Grit remover system to extend life of mechanical equipment and reduce built-up of sedimentations in tanks
- Good equalization or homogenisation with aeration for achieving good mixing, natural neutralisation and cooling
- Size of equalization to be based on expected peak volumes and required retention time
- Effective pH neutralization required for biological treatment systems

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