Master Training Program on Water (Water Supply, In-house Processing, End-of-Pipe) in Textile and Garment factories

Promoting Sustainability in the Textile and Garment Industry in Asia (GIZ-FABRIC)

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

FABRIC Asia

Day 1: Presentation 6

Raw Water Treatment

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Contents

Contents

- Raw water

- Distinguish between technical options for treatment
  - ✓ Pumping
  - ✓ Pre-treatment (softening, pre-process filtration)

- Raw water quality control

- Select suitable or relevant input water treatment options
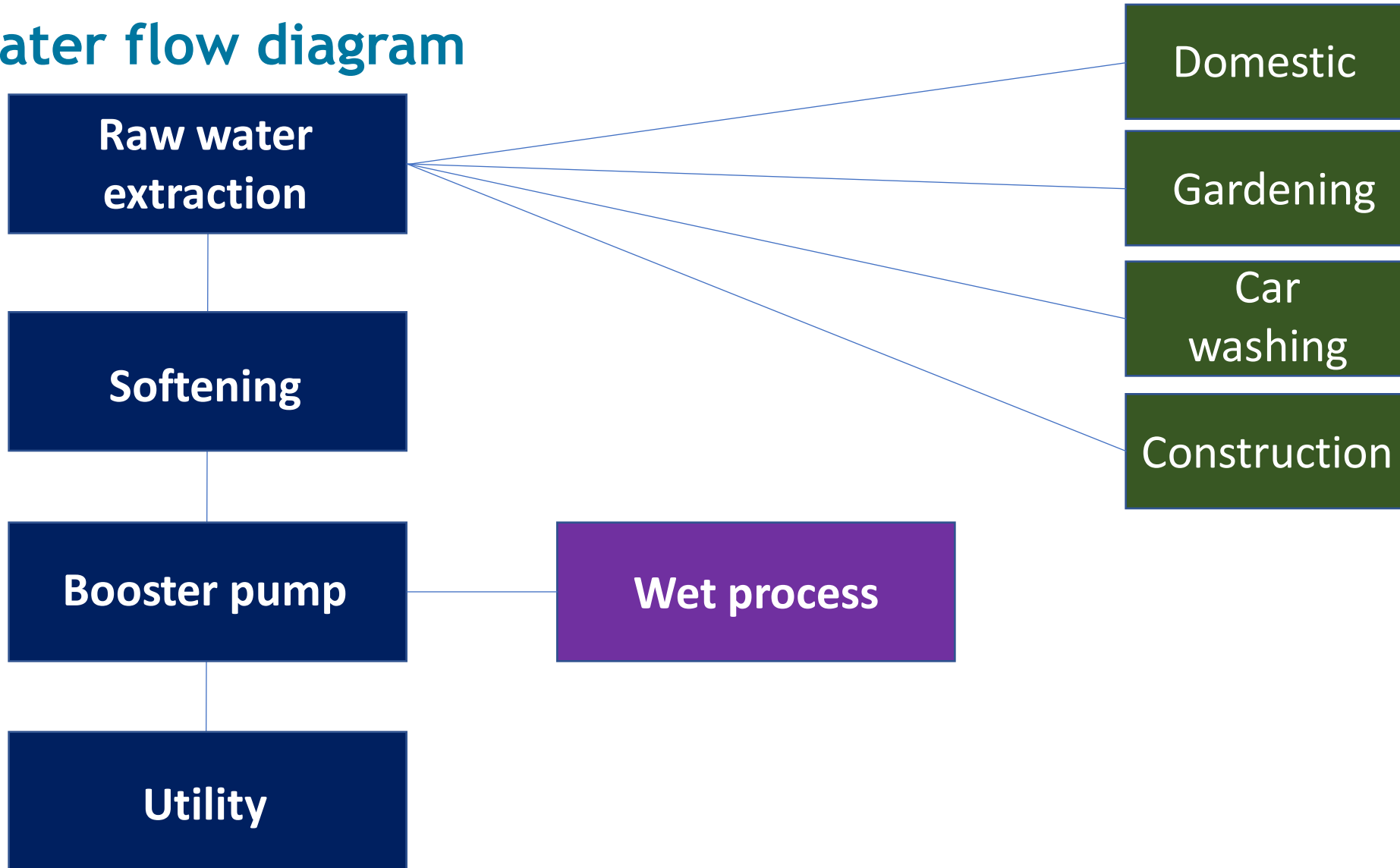
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Raw water

Introduction

Raw water

- Green water: Rainwater

- Blue water: Groundwater and surface water

- Grey water: Polluted water

Raw water

Raw water distribution points

- Extraction

- Softening (if necessary)

- Pumping

- Distribution

- Process water

- Utility

- Domestic

- Others

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Raw water flow diagram

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┌─────────────────┐                        ┌──────────────┐
│  Raw water      │ ─────────────────────→ │  Domestic    │
│  extraction     │ ──────────────────────→│  Gardening   │
└─────────────────┘ ──────────────────────→│  Car         │
         │          ──────────────────────→│  washing     │
┌─────────────────┐                        │ Construction │
│   Softening     │                        └──────────────┘
└─────────────────┘
         │
┌─────────────────┐         ┌──────────────┐
│  Booster pump   │ ──────→ │  Wet process │
└─────────────────┘         └──────────────┘
         │
┌─────────────────┐
│    Utility      │
└─────────────────┘
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Hardness: Prohibit to produce lather or foam

Temporary Hardness
Due to the presence of bicarbonates of Ca and Mg
Can be easily removed simply by boiling

Permanent hardness
Due to the presence of chlorides and sulphates of Ca and Mg
cannot be easily removed

Hardness varies from place to pace

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Raw water

Classification of water hardness

Classification	mg/L or ppm (hardness as calcium carbonate)
Soft	0-17
Slightly hard	17-60
Moderately hard	60-120
Hard	120-180
Very hard	180 & over

Hardness needs to be removed based on process requirement

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Problem associated with hardness

- Form scale in the boilers, pipelines

- Cause corrosion

- Reduce dye pickup

- Cause fabric defects

- Required extra soaping agent

- Waste energy and resources

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Raw water quality control

Raw water quality control

Hardness: removal

1. Inorganic ion exchange (permutit) method
   Sodium aluminium silicate ($Na_2Al_2Si_2O_8.x.H_2O$) are known as zeolites or permutit

2. Organic ion exchangers (ion exchange resins)
   Organic polymers having –COOH or –SO_3H or–NH^{3+} OH^- groups act as ion exchange resins

   • Cation ion exchange resin (Resin-H)
   • Anion ion exchange resin (Resin –OH)

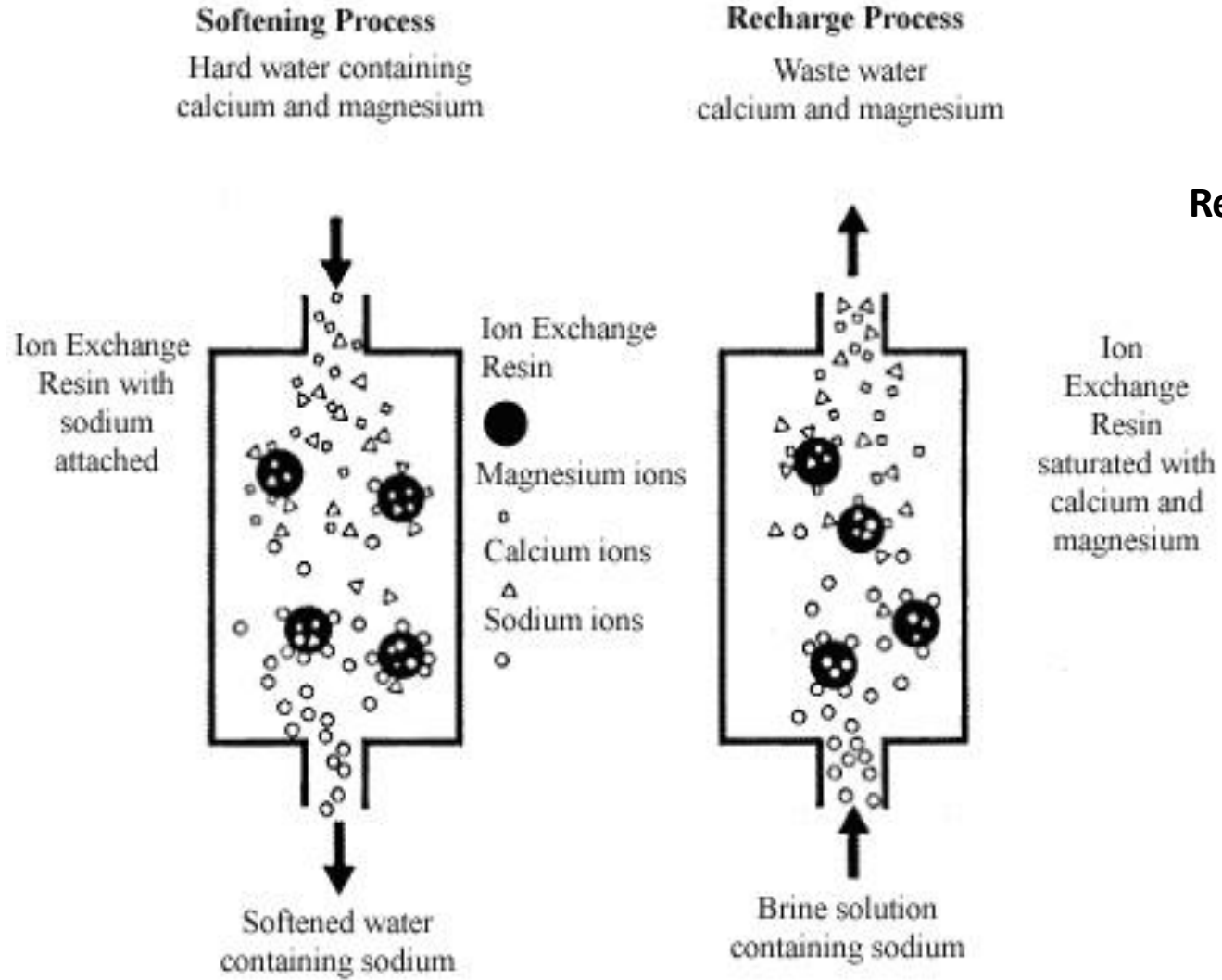# Raw water quality control

Hardness: removal

Softening process

Regeneration/backwash process

Softening Process
Hard water containing calcium and magnesium

Recharge Process
Waste water calcium and magnesium

Ion Exchange Resin with sodium attached

Ion Exchange Resin

● Magnesium ions

○ Calcium ions

△ Sodium ions

Softened water containing sodium

Ion Exchange Resin saturated with calcium and magnesium

Brine solution containing sodium

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Select suitable water treatment options

Select suitable or relevant input water treatment options

Depends on:

- Degree of raw water hardness
- Hardness type: anions, cations
- Required process parameters: dyeing, steam etc.

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