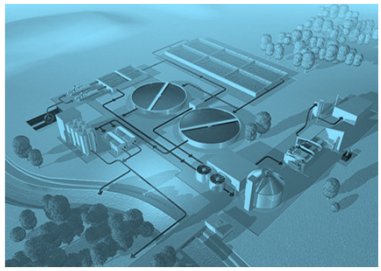
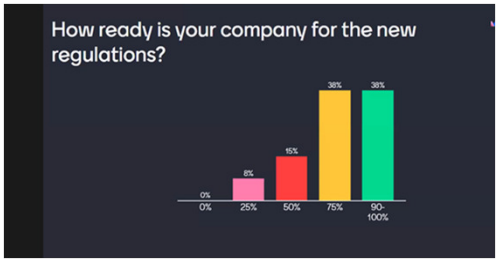
Sustainable wastewater-management



1

- What is your company manufacturing?
- How ready is your company for the new regulations? (Poll)



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Overview

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Basics

Food Processing

Semicon and electronics

Chemicals and plastics

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Waste Water Technologies

Chemicals and plastics
28-07-2021

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Content of this presentation

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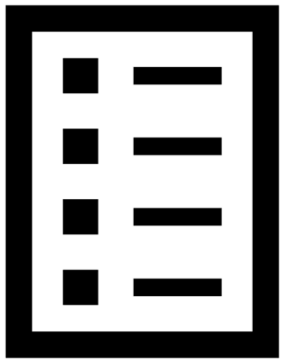
Agenda

- chemical sector
- Wastewater
  - Categories
  - challenges
  - Treatment steps
- Treatment options
- summary



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Water – Waste water

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Introduction

Industrial waste water

- serious pollution problems
- negatives effects to the ecosystem
- human's life

Required limitation for

- Colour
- Turbidity
- Temperature
- Odour
- pH
- total solids (suspended and dissolved)
- Hardness
- chemical oxygen demand (COD)
- …

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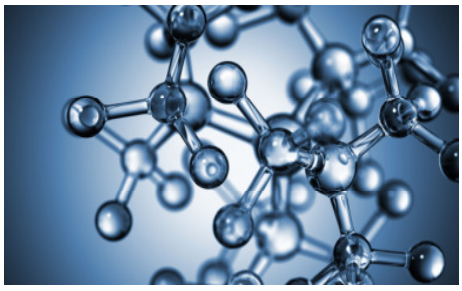
Chemical sector



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Chemical sector

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Chemical sector

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Categories

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High-concentration

- wastewater may sometimes be concentrated further, treated, and recycled or disposed as solid wastes.

Medium-concentration

- may be
- treated on site or discharged into public sewers.

Low-concentration

- such as indirect
- cooling water may be discharged without any
- treatment.

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categories

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organic residual wastes

- sludge from wastewater treatment and
- food wastes or
- garbage accompanied with consumption.

solid wastes

- vessels,
- Containers and
- wrappers.

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Challenges

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Section 7	obligation	Focus
The GES shall be enforced to all pointsources of pollution, regardless of volume, that discharge to receiving body of water or land and be used regardless of the industry category.	The GES established the Significant Effluent Quality Parameters per Sector consistent with the Philippine Standard Industrial Classification(2009).	Industries shall only be required to monitor effluent quality parameters determined to be significant to them.

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Challenges example: for chemistry

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PSIC Code	Industry Category	Significant Parameters
56	Restaurants, food chains, bars and other food/beverage services	BOD, Total Suspended Solids, Oil and Grease, Surfactants
L. Real Estate Activities		
681	Real estate activities with own or leased property	BOD, Fecal Coliform, Ammonia, Nitrate, Phosphate, Oil and Grease, Surfactants
M. Professional, Scientific and Technical Activities		
71200	Technical testing and analysis	All significant parameters depending on the nature of their activity
7210	Research and experimental development on natural sciences and engineering	All significant parameters depending on the nature of their activity
75	Veterinary activities	Color, pH, COD, Total Suspended Solids, Fecal Coliform, Oil and Grease, Surfactants
P. Education		
85	Public and private education (including support activities)	BOD, Fecal Coliform, Ammonia, Nitrate, Phosphate, Oil and Grease, and all significant parameters depending on the nature of their activity
Q. Human Health and Social Works		
86, 87	Hospitals, clinics, nursing homes and other human health and residential care activities	Color, Temperature, pH, BOD, Total Suspended Solids, Fecal Coliform, Ammonia, Nitrate, Phosphate, Oil and Grease, Surfactants
86900	Other human health activities - medical laboratories inside and outside of medical facilities	All significant parameters depending on the nature of their activity
S. Other Service Activities		
96210	Washing and dry cleaning of textile and fur products	COD, Total Suspended Solids, Ammonia, Chloride, Barium, Oil and Grease, Surfactants, Trichloroethylene
96300	Funeral and related activities	COD, Total Suspended Solids, Total Coliform, Ammonia, Phosphate, Sulfate
Other Classifications		
OC1	Public markets	Color, Temperature, pH, BOD, Total Suspended Solids, Ammonia, Nitrate, Chloride, Oil and Grease
OC2	Scrubbing of flue gases from firing systems (primarily in scrubbing of flue gases from firing systems). This shall not apply to wastewater from other industrial waste-	Color, Temperature, pH, COD, Sulfate, Fluoride, Chromium, Nickel, Copper, Cadmium, Mercury

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Challenges

The most important waste water collection points in the chemical industry are:

- chemical syntheses,
- exhaust gas treatment systems,
- Treatment of process water,
- sludge removal from boiler feed water systems,
- sludge removal from cooling circuits,
- backwash water from filters and ion exchangers,
- landfill leachate,
- Rainwater from contaminated areas, etc..

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Challenges

Chemicals and physical parameters of concern

- Organics-Biochemical Oxygen Demand (BOD)
- Suspended Solids (SS)
- Fat, Oil and Grease (FOG)
- pH
- Nitrogen
- Phosphorus
- Temperature

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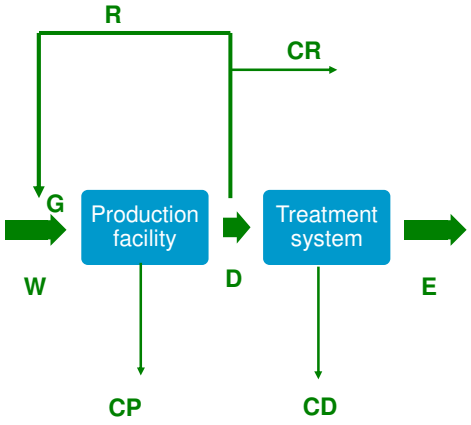
Water and sanitation cycle



	description
W	Intake Water
R	Recirculated water
G	Gross watter applied
CR	Consumtive use for recirculation system
CP	Consumtive use for production system
CD	Consumtive use for waste water disposal s system
D	Waste water discharge from the production process
E	Final effluent from the production unit (available for reuse?)

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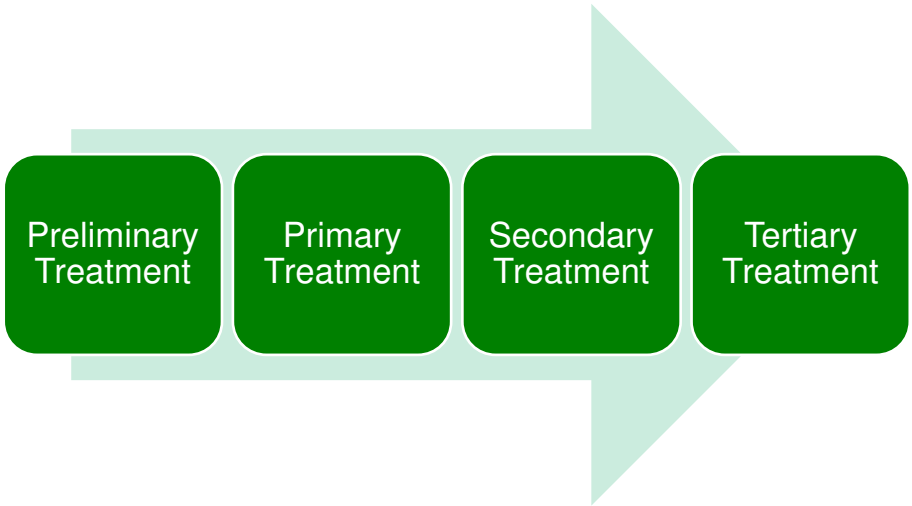
Treatment steps



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Premilary treatment

- Removal of coarse solids by interception – racks and coarse screens (hand-cleaned or mechanically cleaned);
- Removal of grit, sand and gravel - grit chambers;
- Equalization (equalization of flow and mass loading of BOD and TSS) -equalization tanks;
- Removal of oil and grease – oil and grease tanks.
- Pre-aeration (control of odors, improve treatability, removal of grease and grit)
- Flocculation

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Secondary treatment (Biological)

Attached-growth treatment (Bio-film) processes

- Biological treatment processes
- Microorganisms responsible for the conversion of the organic matter are attached to some inert medium,
- Materials: rocks or specially designed ceramic or plastic materials

Suspended-growth treatment (active sludge) processes

- Biological treatment processes
- Microorganisms responsible for the conversion of the organic matter are maintained in suspension within the liquid

Pond processes

- Biological treatment by natural processes, involving the use of bacteria (and/or algae)
- Several ponds: anaerobic, facultative, aerobic, maturation

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Tertiary treatment

Removal	Treatment method
Total suspended solids (TSS)	• Filtration and microscreening
Microorganisms	• Sand filtration • UV disinfection • Maturation ponds • Disinfection with chlorine or ozone • Membrane technologies (microfiltration)
Nitrogen	• Nitrification /denitrification
Phosphorus	• Chemical precipitation • Biological processes
Special substances	• Physical-chemical processes

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- What kind of waste is your main challenge? (Word Cloud)
- How will you deal with it/ are you dealing with it? (Open ended/Speech Bubbles)
- What change in policies would help in treating more problematic waste water? (Speech bubbles)

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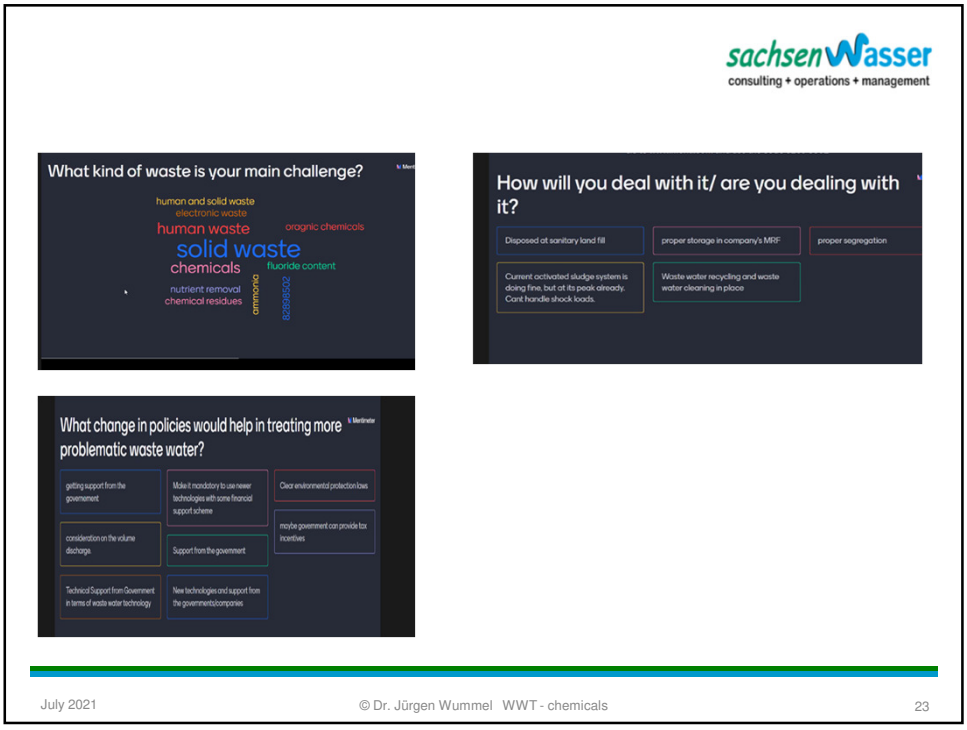
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What kind of waste is your main challenge?
human and solid waste
electronic waste
human waste
oragnic chemicals
solid waste
chemicals
fluoride content
nutrient removal
chemical residues
ammonia
82898502
How will you deal with it/ are you dealing with it?
Disposed at sanitary land fill
proper storage in company's MRF
proper segregation
Current activated sludge system is doing fine, but at its peak already. Cant handle shock loads.
Waste water recycling and waste water cleaning in place
What change in policies would help in treating more problematic waste water?
getting support from the government
Make it mandatory to use newer technologies with some financial support scheme
Clear environmental protection laws
maybe government can provide tax incentives
consideration on the volume discharge
Support from the government
Technical Support from Government in terms of waste water technology
New technologies and support from the governments/companies
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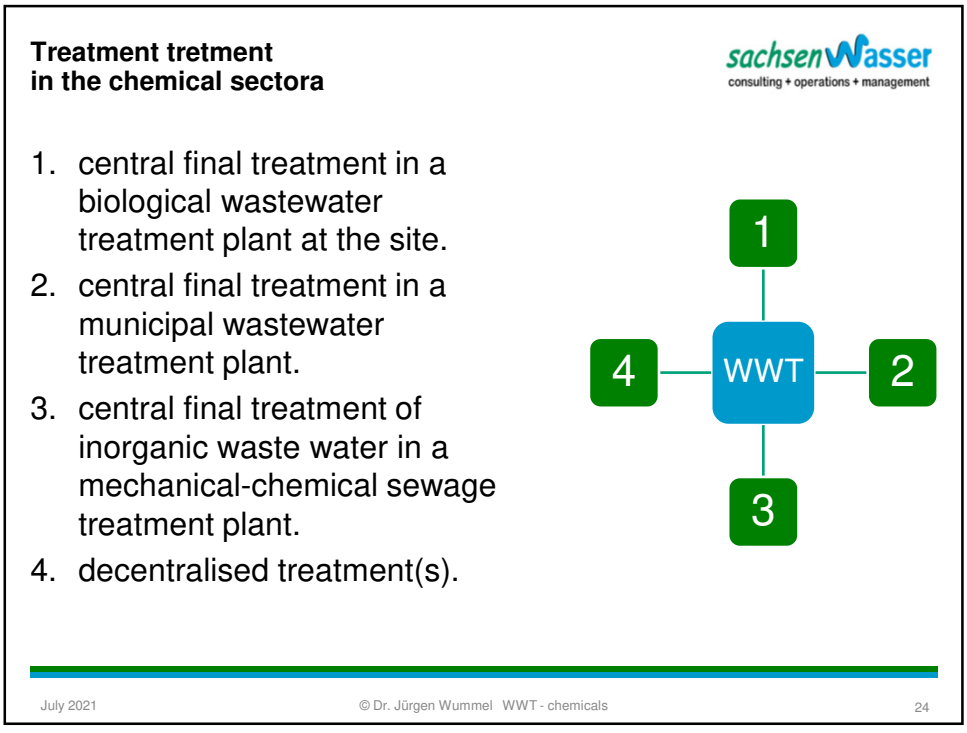
Treatment tretment
in the chemical sectora
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1. central final treatment in a biological wastewater treatment plant at the site.
2. central final treatment in a municipal wastewater treatment plant.
3. central final treatment of inorganic waste water in a mechanical-chemical sewage treatment plant.
4. decentralised treatment(s).
1
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WWT
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Treatment options for chemical sector

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Separation or clarification processes

- Mainly used in combination with other processes, either as a first stage (to protect downstream treatment plants from damage, clogging or contamination by solids) or for post-clarification (to remove solids or oils formed in a previous treatment stage)

(sand separation, sedimentation air flotation, filtration, microfiltration/Ultrafiltration, Oil/water separation)

Physico-chemical treatment methods

- for non-biodegradable waste-water, which are mainly used for inorganic or only biodegradable (or inhibiting) organic pollutants, often as a pre-treatment stage before a (central) biological wastewater treatment plant

(precipitation / sedimentation / filtration, crystallization, Chemical oxidation, wet oxidation, oxidation with supercritical water,…)

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Treatment options for chemical sector

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Biological treatment

- Anaerobic degradation processes, such as anaerobic contact processes, UASB processes, fixed-bed processes, fluidized bed processes, and biological elimination of sulfur compounds and heavy metals;
- Aerobic degradation processes such as processes with fully mixed activated sludge, membrane bioreactor process, drip filter process, fluidized bed process, biofilter/fixed bed process;
- nitrification/denitrification;
- Central biological wastewater treatment

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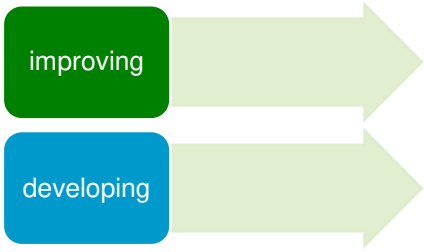
Treatment

trickling filters,
rotating biological contactor
activated sludge, or lagoons

- improving the existing
- Developing combinations of various processes.



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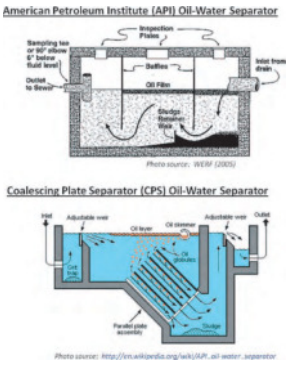
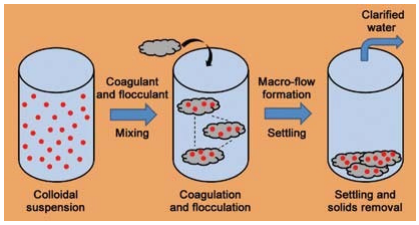
Seperator

- Oil –Water Separator
- Coagulation–flocculation





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Biological treatment of chemical industry

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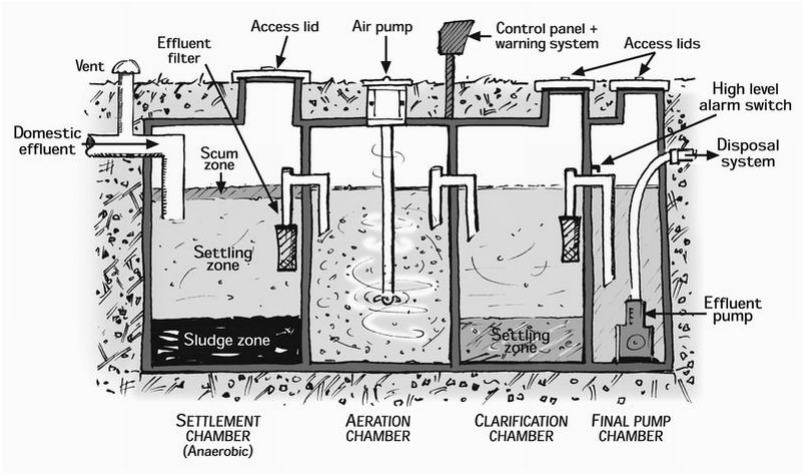
wastewater –aerobic treatment



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Biological treatment of chemical industry

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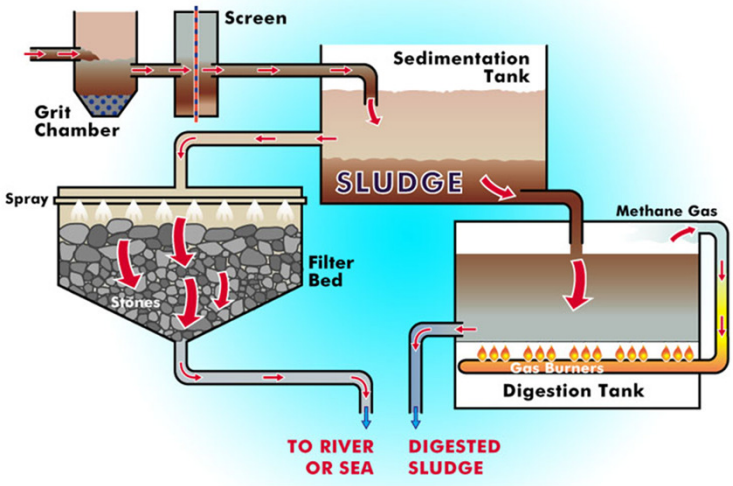
wastewater –anaerobic treatment



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Integrated treatment process:

Comparing parameter	Anaerobic processes	Aerobic processes
energy consumption	low	high
construction	simple	complex
biomass production	low	high
nutrition demand	low	high
reaction speed	low	high
nutrient removal	minimal	very good
starting period	long	short

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Wastewater Treatment Technologies for high COD load

- WW treatment method: Anaerobic Treatment Process
- Anaerobic wastewater treatment is mainly restricted to wastewater with a high organic loads with a COD concentration of 3,000 to 40,000 mg/l.
- Overview of different types of anaerobic reactors for treatment of industrial wastewater from industry.

Types of Reactor	COD-Loading Rate
Anaerobic Contact Process	2 – 4 kg COD/(m³ * d)
UASB-Reactor	5 – 15 kg COD/(m³ * d)
EGSB-Reactor	15 –25 kg COD/(m³ * d)
Anaerobic Filters/Fixed Bed Reactors	5 – 15 kg COD/(m³ * d)
Fluidised bed reactors	up to 50 kg COD/(m³ * d)

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Heterogeneous use of water

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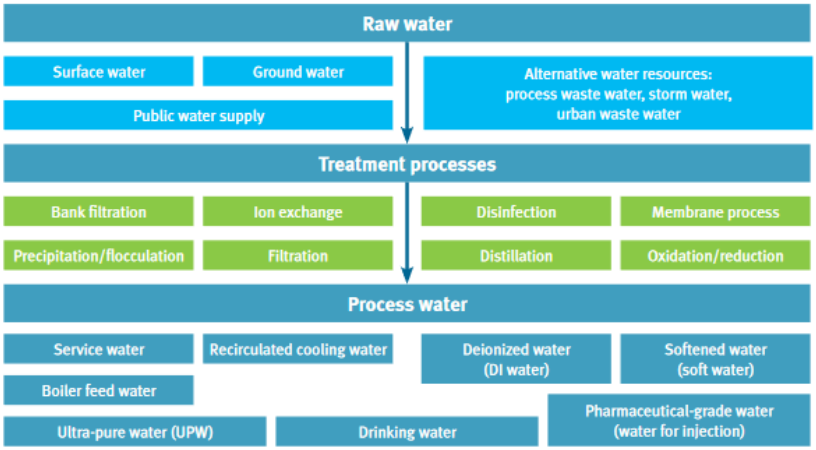

Fig. 3: Industrial process water supply

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Membranes for Water and Waste Water Treatment

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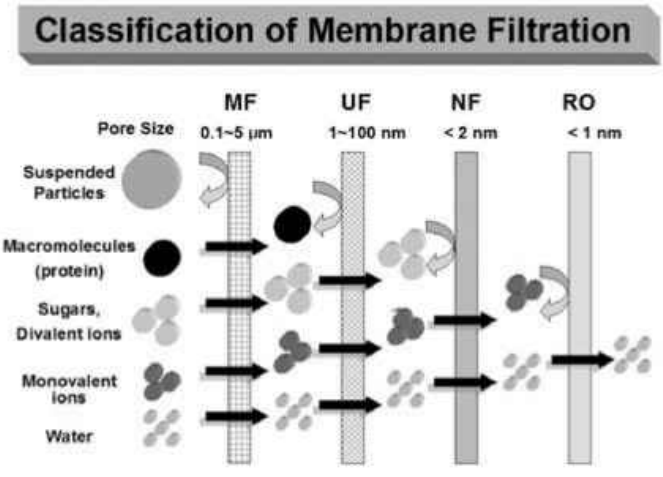

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Process optimization

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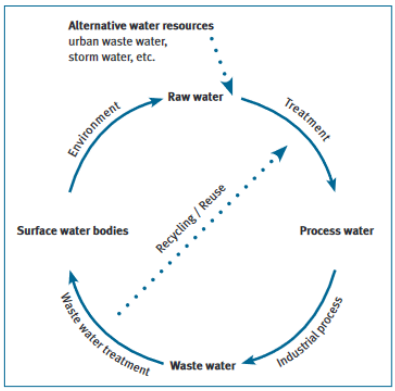

Fig. 5: The industrial water cycle, conservation of natural water resources through recycling/ reuse of water and use of alternative water resources

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Integration

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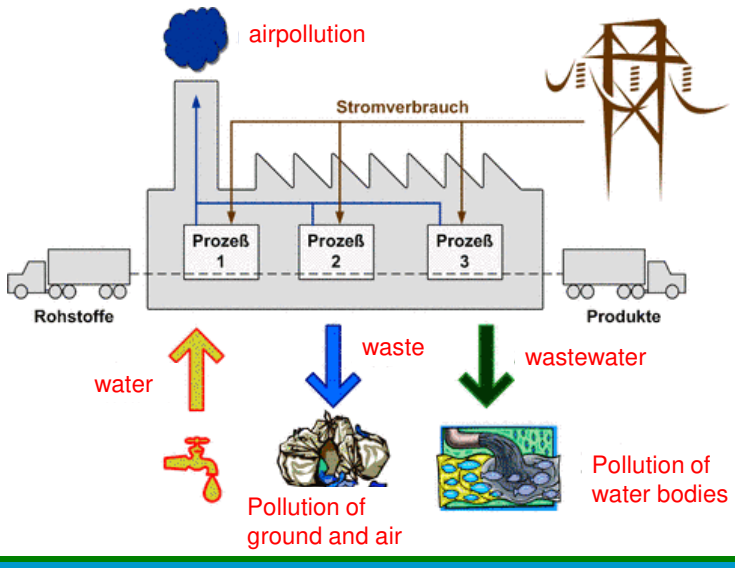

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solutions

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Short term **Medium term** **Long term**



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conclusion

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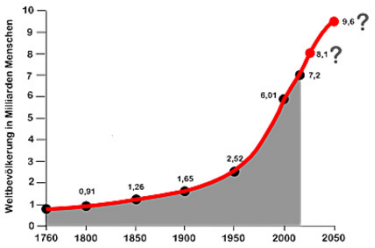

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DENR Administrative Order

PSIC Code	Industry Category	Significant Parameters
17013	Paper and paperboard milling	Color, Temperature, pH, COD, Total Suspended Solids, Nitrate, Phosphate, Ammonia, Barium, Boron, Chloride, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Zinc
18110	Printing	Color, pH, COD, Total Suspended Solids, Cadmium, Chromium, Zinc, Oil and Grease
19100	Manufacture of coke oven products	Temperature, pH, COD, Total Suspended Solids, Ammonia, Sulfate, Cyanide, metals (except Arsenic and Barium), Oil and Grease, Phenol & Phenolic Substances, Polychlorinated Biphenyls, Benzene, Toluene, Ethylbenzene, Xylenes, Benzo(a)pyrene
19200	Manufacture of refined petroleum products	Temperature, pH, COD, Total Suspended Solids, Ammonia, Nitrate, Sulfates, Phosphate, Cyanide, Fluoride, Chloride, Chromium, Iron, Nickel, Copper, Zinc, Lead, Oil and Grease, Benzene, Toluene, Ethylbenzene, Xylenes, Benzo(a)pyrene, Phenol & Phenolic Substances

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Summary
General criteria for WWTP selection

- Wastewater quality and quantity
- Typical efficiency and performance of the technology
- Reliability of the technology
- Manageability (by own or external)
- Financial sustainability, application in reuse schemes
- Regulatory determinants, special conditions

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Summary Requirements

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Preparation of Compliance Action Plan

- Minimum content of the compliance action plan to avail of the maximum 5-year grace period under Section 10 of DAO 2016-08:
  - a) description of the establishment,
  - b) process production flow (including flow rate, volume of discharge),
  - c) characterization or nature/description of wastewater,
  - d) modification of the WWTF, and
  - e) timeline of the project (corrective action), among others

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Summary Planning stage analysis

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- Invest time in **assessing needs, resources and capabilities**.
- Evaluate the **characteristic factors** of the neighborhood.
- **Consider alternatives** for cluster WWT solutions (Off-site treatment), disposal and management
- Bear in mind the **cost** and **complexity** of **operations**, **maintenance**, and **management.**

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Summary Recommendations

- Rather than letting water literally go down the drain, this precious commodity has to be reused, recycled and used as efficiently as possible. Most especially, wastewater MUST be reduced.
- Wastewater should no longer be seen as a problem, but as part of the solution to challenges that all societies are facing.
- Treated wastewater can be a cost-efficient, sustainable, safe and reliable alternative source of water for a variety of purposes – from irrigation and industrial uses to drinking water, particularly under conditions of water scarcity.
- For this, we need to change mind-sets, to raise awareness and redouble educational efforts to share the benefits of wastewater reuse

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QUESTIONS & ANSWERS

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Thank you for your attention

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