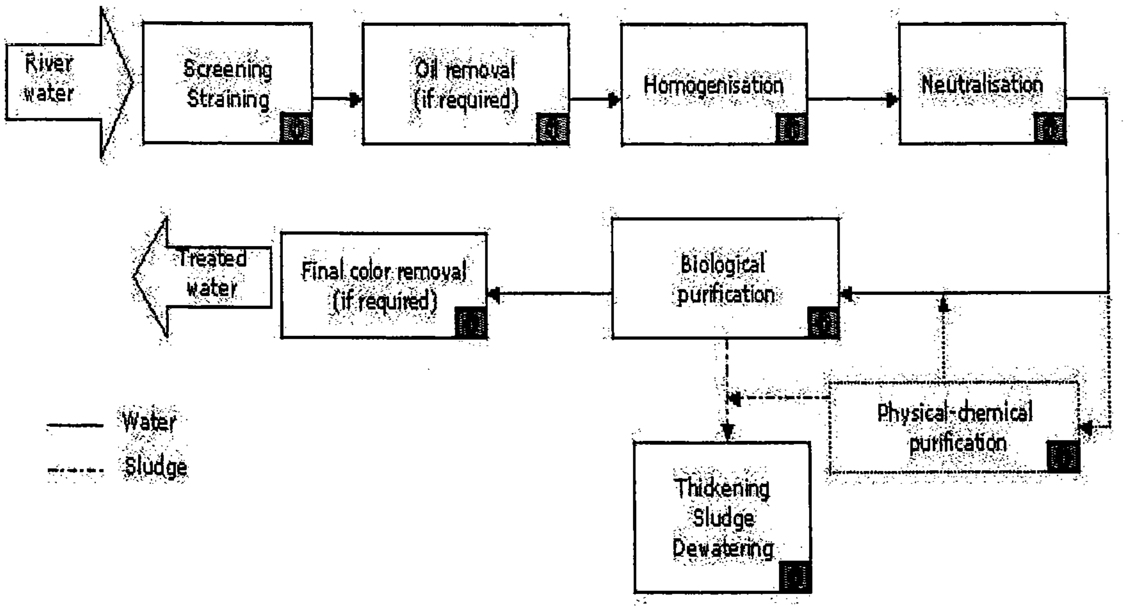
WWM UNIT = 1

PROCESS WATER FOR TEXTILES

Water is used in technological processes and also steam generation and cooling systems in textile industry. Water quality affects lifetime and performance of equipment used in technological processes, as well as the quality of products

The textile industry is very water intensive. Water is used for cleaning the raw material and for many flushing steps during the whole production. Produced waste water has to be cleaned from, fat, oil, color and other chemicals, which are used during the several production steps. The cleaning process is depending on the kind of waste water (not every plant use the same way of production) and also on the amount of used water. Also not all plants uses the same chemicals, especially companies with a special standard (environmental) try to keep water cleaned in all steps of production. So the concepts, to treat the water can differ from each other.

Water treatment with different kind of pollutants, is large-scale, because of many cleaning and removing steps involved.



The diagram above shows a general overview over the several steps in water treatment in the textile industry.

Screening, straining

This first step of treatment is to remove small particles from the process water. In this way the water will cleaned from fibers, fluff and cotton flock. Fore these filter steps drum- and bag filters are used.

Oil removal (if required)

If during the step of wool treatment, solvents like white spirit or others are used they have to be removed from the waste water. Membranes or oil removers are useful. Because of oil or other organic solvents in the water, microorganisms can be killed.

Homogenization

This step is useful to mix the water. With this step, the pollution is better distributed. That makes it easier for microorganisms to treat the water. Result is a more effective biological cleaning step.

Neutralization

After homogenization, the solution has a pH of around 9 to 10. Neutralization of the water can be done by acid or air flow injector depending on the pH value.

Physical- chemical- treatment

If the concentration of dissolved solids is very high (sulfides, chromates, etc.) and/ or color is also in the water, the kind of treatment is various.

Possible are the following procedures:

- catalyzed oxidation of sulfides
- flocculation
- De-coloring with flotation

Biological purification

The type of biological treatment depends on the concentration and kind of pollutant. Two biological steps are used:

Trickling filter

The construction is a great reservoir, which is filled with plastic "pieces", crushed siliceous rocks or other materials which have a very large surface. The large surface gives microorganisms an easy chance to grow. The trickling apparatus sprinkles the waste water over the loaded material. Air is blowing into the pool from top or from below to give the aerobe bacteria the right living conditions. With the growing of the bacteria the biologic dismantlement particles in the waste water will be treated.

This easiest step of biological treatment is reducing the BOD_5 between 50 and 70%. A disadvantage is a very good filtrated water without particles which could clog the spray nozzles. Depending on this fact a flocculation process before trickling is necessary.

Activated sludge

With this kind of procedure the waste water does not have to be flocculated because the bacteria live in the sludge. The principle is easy, waste water is filled into a pool where the bacteria are living. By a fan air is blowing into the water to give the aerobe bacteria the right growing conditions. The sludge, together with the bacteria are the activated sludge. BOD_5removal rates reach 90 to 95%.

To dump the sludge, it has to be thickening. This can be done by different procedures, depending on the amounted sludge, which have to be dumped.

WATER & WASTEWATER TREATMENT IN THE FOOD INDUSTRY

Water is one of the key components of most products in food industry. It influences product's taste and qualitative properties. Besides, water is widely used in the production process itself. Usually, the entire production is sensitive to biological contamination. Therefore, the proper water disinfection is required.

Analyzing water use among food producers

In food processing plants, water use starts with conditioning raw materials such as soaking, cleaning, blanching and chilling. It continues with cooling, sanitizing, steam generation for sterilization, power and process heating, and, finally, direct "in-process" use. The water classification categories used in the food and beverage industries are general purpose, process, cooling and boiler feed.

Sanitary conditions always have been a concern for food products created in the manufacturing process. Disinfection through chlorination has been the quickest means of disinfecting wastewater, which has come under criticism due to chlorination byproducts and toxicity concerns that residual chlorine poses to aquatic life. The two principal means of disinfecting wastewater without using chlorination are ozone disinfection or UV disinfection. Ozonation works on the same principles as chlorination, but leaves no residual in the treated wastewater and does not produce the magnitude of disinfection byproducts that chlorination does.

General Purpose Water

General purpose water includes all of the water used in washing and sanitizing raw materials, processing equipment, plant facility and ancillary equipment. It is used in the largest amounts and it should be potable, clear, colorless and free of contaminants that affect taste or odor. In-plant chlorination usually is the only treatment required.

The main advantage of in-plant chlorination of general purpose water is microbe reduction on raw materials, prepared products and equipment surfaces in the plant. There is no action as important to food and beverage processing as control of microorganisms.

Process Water

Water used for cooking or added directly to the product must be potable and of sufficient quality so as not to degrade product quality. This includes being free of dissolved minerals that make water excessively hard or affect taste.

Most of the product in beverage production consists of process water, so treatment to achieve taste objectives is especially important. Often, treatment beyond that required to meet safe drinking water standards is essential for consistent quality.

Treatment processes used in bottled water often include softening, reverse osmosis and deionization. Many other beverages require similar treatment.

Hard water contains minerals that can affect the texture of the raw materials to be processed; such as certain vegetables. Iron, manganese or sulfate can have an undesirable affect on the taste of the product.

The methods used for terminal disinfection include chemical, thermal, radiation, and ultrasonic treatment or cell disruption.

Cooling Water

Cooling water not in contact with food products or sealed containers does not have to be potable or meet the requirements of process water, as the removal of staining minerals and odors is not as important. However, preventing the accumulation of scale in pipe and equipment is important, especially when cooling water is recycled.

The most efficient processing systems include recycling circuits to reduce cooling water waste, thus reducing processing costs. Potable water, even from public supplies, often has to receive additional treatment such as softening to avoid scale and deposits to be suitable for cooling.

Boiler Feedwater

Boiler feedwater requires the removal of hardness. This may be the only treatment process applied to the water; if this water is not in contact with food, it does not have to be potable. Boiler feedwater for high-pressure boilers requires demineralization or the removal of all dissolved solids. Almost all potable water must have minerals removed through additional treatment to be suitable for boiler feed. Not only can microorganisms produce color and odor in water, but, if they are introduced into the production process, they can contaminate the equipment and finished product. Process contamination could damage and spoil foodstuffs. If pathogenic bacteria is introduced in the contamination, food poisoning could occur.

Wastewater

Food wastewater contains residues that deplete the oxygen in receiving streams.

Chemical oxygen demand (COD) and biochemical oxygen demand (BOD) are common measurements used to determine water quality. They measure the strength of the waste stream by measuring the oxygen required to stabilize the wastes. COD and BOD5 are important to the food processing industry because they can be used to indicate lost product and wasteful practices. High BOD and COD levels indicate increased amounts of product lost to the waste stream. Measurements at various process locations can help locate sources of waste.

At any point in a particular food processing operation, the relationship between BOD5 and COD is fairly consistent. However, the ratios of these two measures vary widely depending on the type of product.

Breweries processing water

Cooling Water in Brewery Plants

In the brewing process, both cooling towers and heat exchangers require protection from microbiological proliferation, deposition, scaling
and corrosion. GE provides a range of applications and technologies to address these forces and keep operations running smoothly.

Microbiological: Bacteria Counts

Cooling towers are prone to microbiological contamination from the high airborne contaminant levels drawn in by induction fans.Process-related contamination can also occur, which then allows for rapid bacterial growth and associated fouling in the cooling
tower's nutrient-rich environment. When bacteria growth is not controlled, biofilms interfere with equipment performance. Biofouling reduces, or in some cases blocks, water flow, reducing heat transfer and increasing microbiologically induced corrosion (MIC) rates. Some biofilm organisms attack wood, which weakens structural components of wooden cooling towers. Dirty cooling systems also increase the risk of contracting airborne disease from inhalation of
microorganisms that are present in cooling tower drift.

Deposit Control

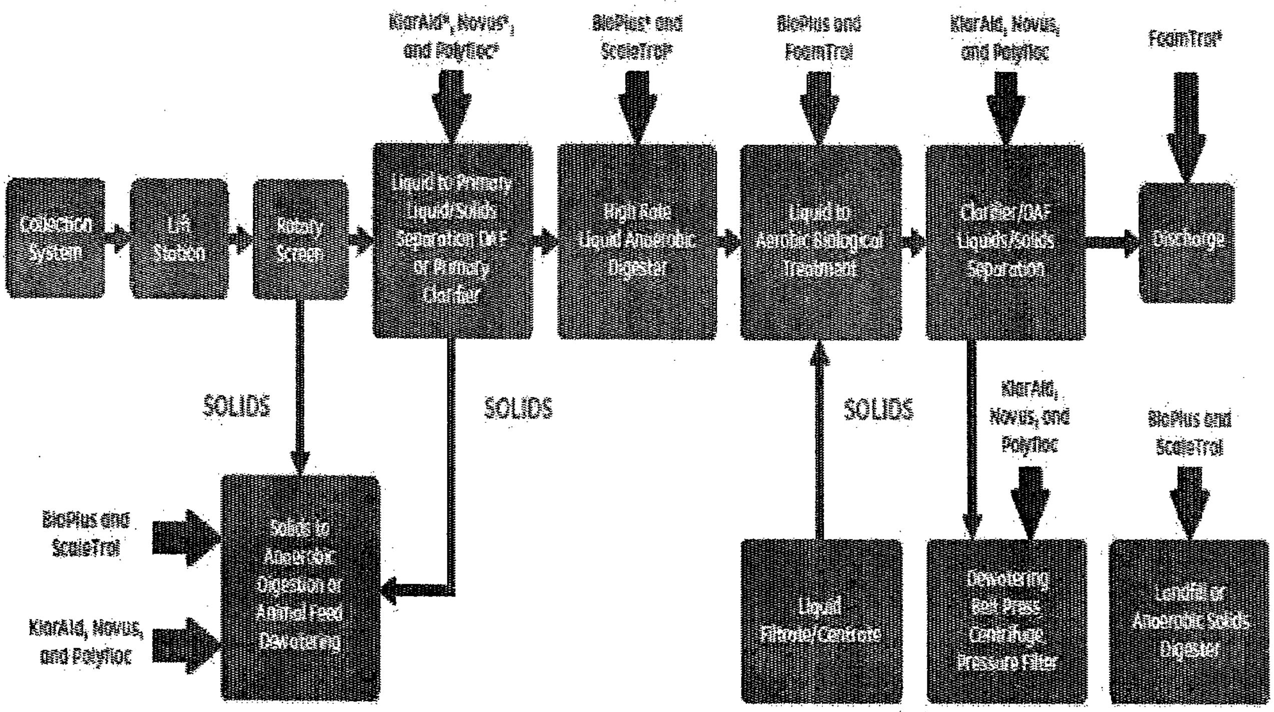
The gradual accumulation of deposits in cooling water systems directlyaffects production. Process heat exchangers are usually the prime sites for deposition since most scaling species have retrograde solubility characteristics. Simply put, scale forms at the hottest
locations in the system—the heat exchange surfaces—including the shell/tube and plate/frame variety. Deposition problems can lead to reduced tower efficiency and decreased heat transfer
rates, and can reduce the carrying capacity of pipelines. If unchecked, deposition can result in production loss, excessive energy usage, shortened equipment life and increased costs
due to frequent cleaning or added pumping requirements.

Corrosion

Corrosion most often occurs in both the process heat exchangers and system transfer piping. It is the result of an electrochemical reaction that is accelerated in the presence of higher temperatures, low flow or stagnant water conditions and in cases where

the cooling water possesses a high concentration of dissolved solids. Causing heat exchangers to leak and rust to form, corrosion shows up as thinning of the tubes or pitting of the base metal. Failure of a critical heat exchanger can mean unscheduled downtime, loss of productivity and increased operational costs. The objective of an effective corrosion control program is

to reduce metal corrosion to an acceptable level. Success depends on effective mechanical design, acceptable exchanger metallurgies, and selection and application of an effective chemical treatment program, based on existing system operational and water conditions.



Power Plant Water Treatment:

In energy production water is used for producing steam, heat and electricity. It is integral part of technological process. Water quality affects lifetime and performance of equipment used in technological processes

Turbidity

Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality

Clarifier

A clarifier is a settling tank used to remove solid waste particles from water. When the clarifier separates the concentrated impurities, the sludge formed by the process discharges from the bottom of the tank.

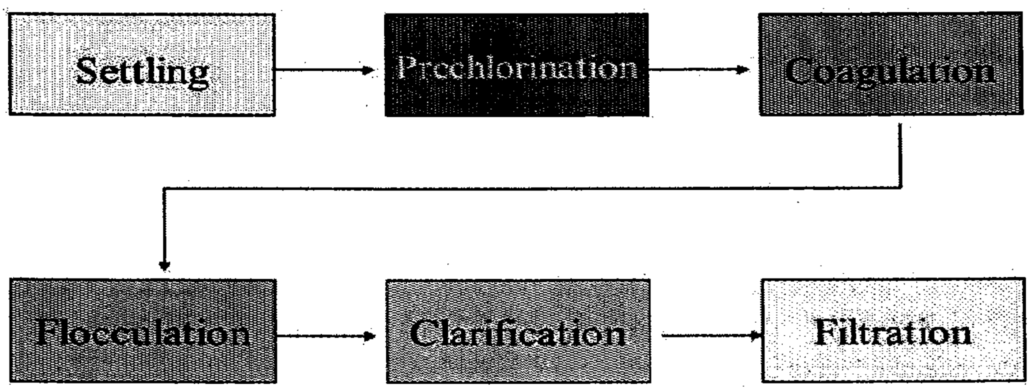
Thickener

An apparatus for the sedimentation of solids from suspension in a liquid.

Decanter Centrifuge

A centrifuge is a device, which employs a high rotational speed to separate components of different densities. A decanter centrifuge separates solid materials from liquids in slurry and therefore plays an important role in wastewater treatment.

Operations involved in removal of un-dissolved Impurities

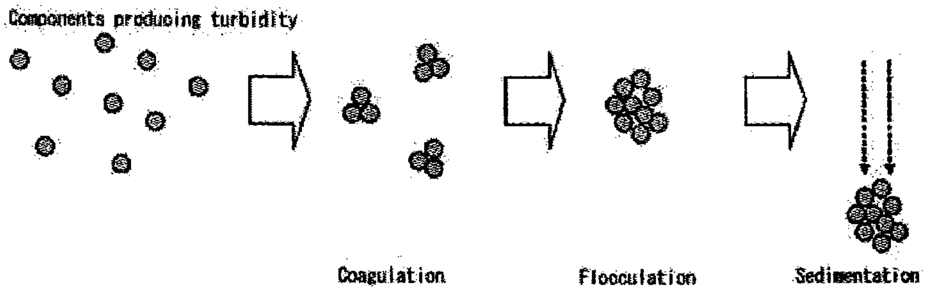


Coagulation

Coagulation is a process to neutralize charges and then to form a gelatinous mass to trap particles thus forming a mass large enough to settle or be trapped in the filter.

Flocculation

Flocculation is gentle stirring or agitation to encourage the particles thus formed to agglomerate into masses large enough to settle or be filtered from solution.



Raw Water Quality Parameters for Power Plants

Sl.No	Parameters	results	Units
1	PH	8.40	-
2	Conductivity	335	µs/cm
3	Total Dissolved Salts	201	ppm
4	Total Suspended Salts	200	ppm
5	Turbidity	200	NTU
6	Alkalinity	74	ppm
7	Chloride	30	ppm
8	Silica	11	ppm
9	Colloidal Silica	33	ppm
10	Sulphate	29	ppm
11	Sodium	21	ppm
12	Magnesium	21	ppm
13	Calcium	47	ppm
14	Iron	2	ppm

- Water is used in steam, heat and power production in fertiliser industry. Water quality affects lifetime and performance of equipment used in technological processes.