AMX AGITATORS
IN WATER AND WASTEWATER TREATMENT

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The following topics are discussed in this document:

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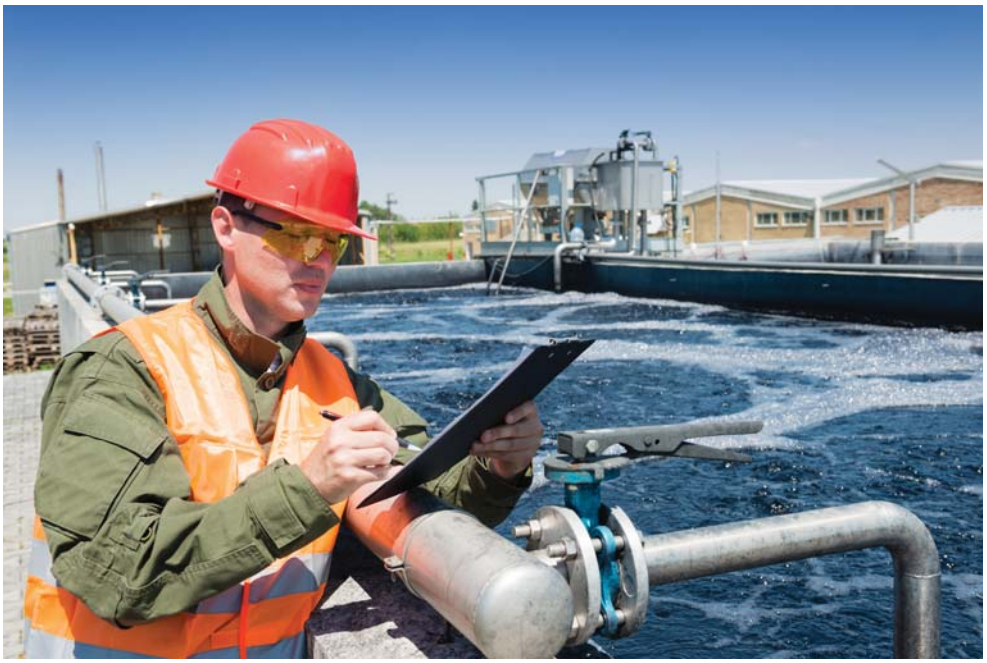
wwtp

Water and Wastewater Treatment (WWTP) is specific to cleansing water or making it acceptable for its intended use. Water and wastewater treatment remove contaminants. In some cases, the process may only reduce the contaminant concentration for the water to be fit for its intended use of either industrial water supply, irrigation or even safe return to the environment.



water treatment

Focusing on the desired outcome of potable water, there are several processes, both of a physical and chemical nature, which ensure that water is fit for human consumption. Substances removed during treatment include bacteria, algae, suspended solids, viruses, fungi as well as iron and manganese minerals.

Physical processes or settling and filtration are accompanied by chemical processes, namely disinfection and coagulation. Water quality measures do not only account for the treatment of the water but the distribution there of. Residual disinfectants are commonly kept in treated water to kill any types of bacterial contamination during the distribution phase.

During the purification, the following processes are encountered:

- Pre-chlorination
- Aeration
- Coagulation for flocculation
- Slow-sand filtration

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wastewater treatment plants

WWT is either of a domestic or industrial process, and it is accomplished by a process of wastewater selection procedures. This refers to the decision of disposal or reuse, although this is the last step, it is decided before any water is processed through the plant.

Domestic water treatment is commonly known as sewage treatment works. WWTP commonly have the following stages, phase separation, oxidation and polishing. Phase separation is divided further into sedimentation and followed by filtration. Oxidation is too, further divided into the biochemical and chemical oxidation.

Although both water and wastewater treatment industries have a vast array of process applications where agitators are installed and commissioned, only a few are highlighted, focusing in particular on problematic and difficult mixing applications, where AFX have industry proven solutions.

coagulation and flocculation

Through the water treatment process, coagulation destabilises particles through chemical reactions between colloids and coagulants. Flocculation is the transport mechanism of the destabilised particles, causing the collisions with the flocculent. Flocculation is a mixing technique which promotes agglomeration as well as assisting with particle settlement. Flocculent is sensitive and affected by mixing speed, intensity and residence time. Each of these aspects is taken into account when designing the high flow, low shear mixer for the process.

mixing of polyelectrolytes

Polyelectrolytes are used as thickeners, emulsifiers, conditioners and clarifying agents. These are most typically used to initiate flocculent make up. These are similar to electrolytes (salts) with mixing, and similar to polymers and may often be referred to as ‘polysalts’. The solutions are charged and most often viscous. Mixing in these applications is rather ‘easy’ and gentle, should all process data be provided regarding the polyelectrolytes.

aeration tanks and lagoons

Split into surface and subsurface, aerators are commissioned to mix, dissolve or circulate air into the water. The use of the mixers assists with providing the oxygen required for bacteria to properly function and decreases the requirements and volume of chemicals which may have previously been employed.

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aeration tanks and lagoons

Surface aerators commonly require flow and radial dispersion. The water is dispersed up into the air, and the droplets fall back into the water thus inducing the oxygen. AFX size's the aerators using a modified FS4 or R type impeller, which is a combination impeller. These impellers provide the desired radial flow as well as the requirement of dispersed water on the surface through an upward (up pumping) projection into the air.

AFX delved further into finding a more energy and process efficient solution, predominantly focused on subsurface aerators. Using a combination impeller agitator with an F3 hydrofoil impeller at the first stage and an up pumping P3 pressure impeller. Although the P3 has a variation of applications, the impeller in the up pumping configuration causes turbulence on the surface. Thus entraining air into the water and drawing it back into the tank or lagoon. The F3 impeller distributes the oxygen-rich water throughout the tank due to the axial flow generated.

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fouled impellers

Throughout the WWTP industry, agitators are most often seen failing, either mechanically or in a process delivery. This is due to the buildup of rags and solid debris found through the process stages. This build up collects on the leading edge of the impeller and continues to grow and become more entangled throughout the constant operation. The large mass, which has fouled the impeller, restricts the flow of the liquids as well as solids. The mass created additional loads on the drive chain of the agitator which accounts for the premature mechanical failures. The collection of rags around the impeller requires continuous maintenance and shut down, which is costly and requires a large amount of equipment and labour.

AFX have introduced a new clean edge or 'ragless' impeller to their high flow range of impellers. The FCE3 was designed to eliminate commonly experienced issues of buildup. It will eliminate the expensive costs involved with maintenance and shut down or even premature agitator failure. The clean edge impeller does not have a protruding leading edge which the rags would commonly catch on. The impeller, much like the F3 hydrofoil impeller, promotes axial flow for solid suspension throughout the tank. Most WWTP applications do not require air entrainment, which is required in anaerobic, anoxic and de-nitrification tanks. The FCE3 impeller provides high flow and low shear conditions, proving successful throughout the applications in WWT. The impeller, like the F3, has a low power number, which means that the power installation is significantly less than other agitators seen through similar applications.

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