Paddlewheel Flocculator



Power Transmission Solutions

PTS Process Engineering Co

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Flocculation is a critical stage in water and wastewater treatment processes, where fine suspended particles aggregate into larger, settleable flocs through gentle and controlled mixing.

In treatment systems, microflocs are initially formed through rapid mixing. During the flocculation stage, these particles grow into larger flocs as a result of gentle hydrodynamic motion and progressive particle collisions.

Flocculation systems are generally classified into two main categories: mechanical and hydraulic systems. Mechanical methods include paddlewheel and turbine mixers, while hydraulic methods include jet pumps and aeration systems.



Paddlewheel Flocculator

Today, horizontal and vertical paddlewheel flocculation is recognized as one of the most common and effective flocculation methods in the water and wastewater treatment industry. These systems provide gentle and uniform mixing, achieving high efficiency in floc formation and suspended solids removal.

Despite higher initial capital investment and maintenance costs compared to some alternative methods, paddlewheel flocculators remain among the most reliable and widely used systems in treatment plants.

In conventional designs, paddlewheel flocculation systems are typically arranged in a three-stage configuration (three tanks in series), where the velocity gradient (G) is gradually reduced from the first stage to the final stage to provide optimal conditions for floc growth and stability.

The table below provides a general comparison of different flocculation methods

Description	Paddle Flocculation	Turbine method	Hydraulic Flocculation
Floc Size	Large & Stable	Small to medium	Very Large
Head Loss / Pressure Drop	Negligible	Moderate	Very Large
Process flexibility	High	Very High	Limited
Capital Expenditure	Medium to High	Medium	Low
Operating & Maintenance Cost	Medium	Low	Medium
Design & Construction Complexity	Relatively High	Medium	Relatively High

The company, with several years of experience in the design and manufacturing of paddlewheel flocculation systems, is fully capable of providing complete engineering services, including design, fabrication, installation, and commissioning.

Process Design

Water and wastewater treatment plants are designed based on the required Velocity Gradient and process conditions. Utilizing specialized engineering and design software, the company performs all required flocculator calculations after receiving process data and tank dimensions. These calculations include power requirement determination, gearbox selection, paddle dimensions, number of arms, paddle tip speed, and other operational parameters.

All design criteria and engineering calculations are carried out in accordance with internationally recognized standards used in the water and wastewater treatment industry.

Paddle Mechanical Design

Following completion of the process design phase, the mechanical structure of the mixer is developed by the engineering department. Prior to finalization, all critical components are evaluated using Finite Element Method (FEM) analysis. These evaluations include stress, strain, fatigue, natural frequency, deformation, and other mechanical assessments to ensure safe, stable, and reliable operation under continuous-duty conditions.

Housing Mechanical Design

The housing and bearing assembly represent one of the most critical sections of a paddlewheel flocculator and therefore require careful engineering consideration. The assembly is designed to fully absorb and withstand all radial and axial loads while ensuring stable and reliable long-term operation under continuous-duty service conditions.

The optimized housing and bearing system minimizes the transfer of mechanical stresses to the power transmission system, resulting in improved reliability, reduced maintenance costs, and extended equipment service life.

Paddle wheel mixer advantages

Process Performance

- High efficiency in large and stable floc formation
- Stable operation under continuous-duty conditions
- Precise Tip Speed control to prevent floc breakage
- Variable speed control through VFD systems



Reliability & Maintenance

- High operational reliability in long-term service
- Excellent resistance to wear and corrosion
- Low requirement for periodic maintenance
- Easy maintenance and replacement of wear parts

Design & Construction

- Available in stainless steel construction
- Engineered for continuous industrial operation