NR Vertical Shaft Flocculators

High performance Napier-Reid flocculators designed to meet your process requirements.

Since 1950
NAPIER-REID
Water & Wastewater Treatment

Flocculation Process

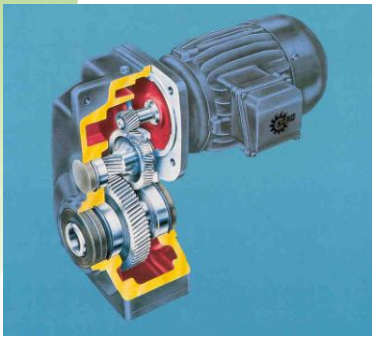
Flocculation is a process that consists of gently mixing the water/wastewater in order to agglomerate and form larger composite particles or flocs. The efficiency of removal of solid and other impurities by the solid-liquid separation process that follows flocculation process, increases if the raw water is properly flocculated. A well-designed flocculator provides good flocculation and years of trouble-free operation.

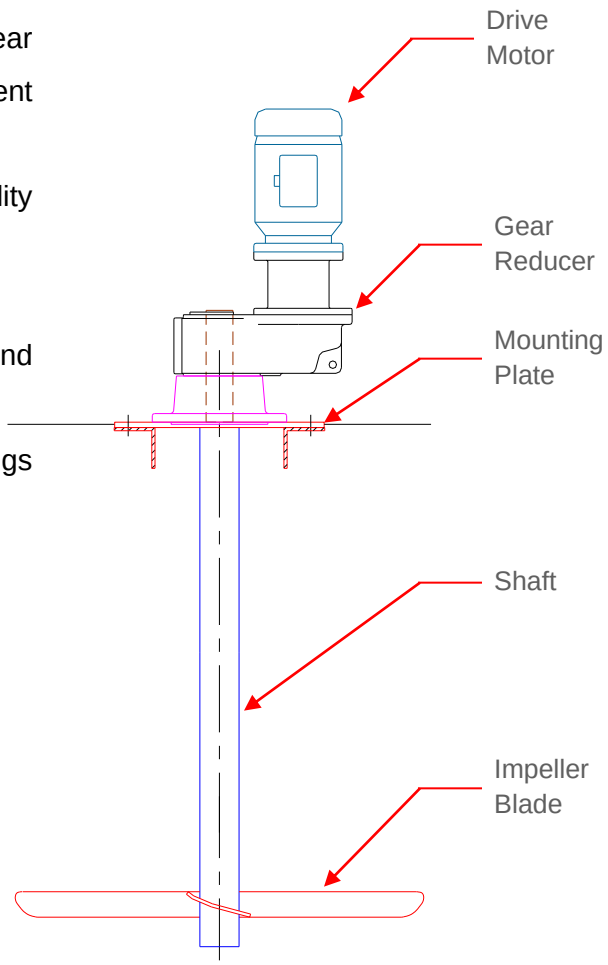
Napier Reid is a leading designer and manufacturer of high quality, well-designed vertical shaft flocculators.

Standard Features of the main components of NR's Flocculator

GEAR REDUCER

- ✓ High efficiency, heavy duty helical / bevel gear reducers built and rated in accordance with current international gear manufacturing standards.
- ✓ Robust in design and built with high quality components.
- ✓ Drive housing fabricated in high quality cast iron.
- ✓ Oversized bearings for severe duty application and long bearing life.
- ✓ All bearing are antifriction type, ball or roller bearings with minimum L-10 life of 100,000 hours.
- ✓ Drywell feature provided if required.
- ✓ Noise level is within 85 dBA at full operating load.
- ✓ Drive unit is provided with mounting base plate.





Schematic Diagram of Flocculator

Standard Features of main components of NR Flocculator

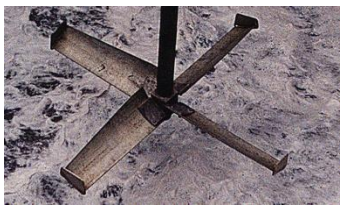
ELECTRIC MOTOR

- ✓ High efficiency electric motors from known manufacturers.
- ✓ TEFC AC electric motors are of all cast iron body construction, continuous and inverter duty rated, minimum service factor of 1.15, chemical resistant and come with class ‘F’ insulation.
- ✓ Capable of running at variable speed to attain range of velocity gradient (G) value.

SHAFT

- ✓ Shaft designed to handle the loads occurring including the transmission of torque, thrust, hydraulic forces, and overhung moment.
- ✓ Maximum stress in any component does not exceed 9000 psi under maximum operating load.
- ✓ Hollow shaft design of high strength but comparatively less weight compared to equivalent solid shafts.
- ✓ Hollow shaft results in less deflection of shaft and less thrust transmitted to drive bearings increasing its bearing life significantly.
- ✓ Shaft-impeller system designed to operate at minimum 25% away from its first lateral critical speed.
- ✓ 304 SS / 316 SS standard material of construction.

IMPELLER



- ✓ Large diameter axial flow impellers provide bulk fluid motion and dissipate the imported horsepower over a wide area.
- ✓ Wide range of impeller blades: flat blade turbine; constant angle of attack (32^{o} and 45^{o} pitched blade turbine) or variable angle of attack (3-blade or 4-blade hydrofoil) to meet the process requirements.
- ✓ Where required, impellers blades provided with proplets to reduce shear.
- ✓ 304 SS / 316 SS standard material of construction.

Why Napier-Reid Flocculators

Flocculation Tank
Sedar WWTP, Poland

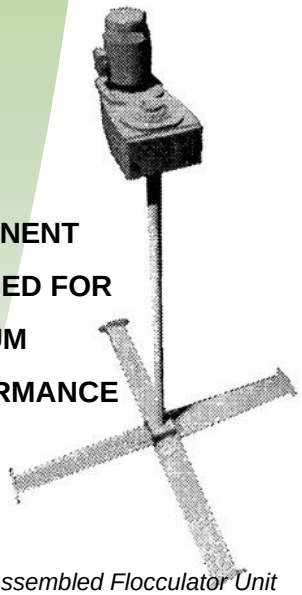
ROBUST DRIVE UNIT

- Robust gear-drive for reliable, long life.
- Oversized bearing for severe duty application.
- Minimum L-10 life of drive bearing 100,000 hours.
- High efficiency gear-drive and electric motors, resulting in less power consumption.

ROBUST SHAFT & WELL-DESIGNED IMPELLER TO ENHANCE FLOCCULATION

- Heavy-duty TEFC AC electric motors, cast iron construction, continuous and inverter duty rated, minimum service factor of 1.15, chemical resistant and with class ‘F’ insulation.
- Strong shaft with high stiffness and less weight to transmit energy.
- Adjustable impeller blade height.

EACH COMPONENT DESIGNED FOR OPTIMUM PERFORMANCE



Assembled Flocculator Unit

- Flocculator designed for a range of G-values with variable-speed drive.
- Impeller designed to enhance flocculation while creating least possible shear.
- Large diameter impeller blades coupled with low RPM provides necessary superficial velocity with minimal shear.

Why Napier-Reid Flocculators

> "Your service, efficiency and courtesy in handling our concerns were obviously a priority. We appreciate the co-operation we received in meeting all of our objectives, and thank you for all your efforts on our behalf."

Arnold Entz,
BRETHREN of Early Christianity, Ontario

Flocculation Basin

Belize City WTP Central America,

OVER 1000 FLOCCULATORS INSTALLED WORLDWIDE

- Flocculators tested for performance at our own testing facility.
- Standard material of construction is stainless steel.
- Over 1000 flocculators installed worldwide.
- Existing equipments are operating smoothly and at very high efficiency.

TECHNICAL & FIELD SUPPORT OF CORE TEAM OF EXPERTS

- Easy installation, operation and maintenance.
- Full support of experienced process designers and field personnel before, during and after installation

Besides all of the above, N-R's flocculator has the technical and field support of Napier-Reid, a leading innovative supplier of engineered solution and equipment for over 50 years. The combined cumulative experience of Napier Reid's process designers in water and wastewater treatment field is over 300 years.

Photo Gallery

DID YOU KNOW?

Unlike some manufacturers who try to adjust their standard product to suit your process requirement, Napier-Reid specifically designs and manufactures all the key components including the type and blade diameter of impeller to optimize the flocculation process for which they are intended.

Flocculators impeller

2600mm diameter

1

2

3

1. **IJU Water Treatment Plant, Nigeria**
2. **Flocculator in DAF process tank PDVSA, Orimulsion Venezuela**
3. **Flocculators Installed at Rockpoint Provincial Park, Ontario, Canada**

N-R impeller design and selection

The sizing and selection of vertical shaft flocculator impeller includes the following criteria:

- Velocity Gradient (G)
- Impeller tip speed (Ts)
- Superficial velocity (SV)
- Ratio of impeller diameter (D) to equivalent tank diameter (Te)
- Viscosity

Velocity Gradient (G)

The difference in velocity between adjacent layers of the fluid over a unit distance is known as velocity gradient. Velocity gradient is most frequently used to express the energy input and ranges from 20 to 80 s^{-1} value for flocculation. It can be calculated from the equation:

$$Pw = \mu V G^2$$

Where:

Pw = the energy dissipated in water (watt)

μ = absolute dynamic viscosity of liquid (kg per metre-second)

V = volume of tank (cubic metre)

G = velocity gradient (s^{-1})

Impeller Diameter to Tank Diameter Ratio (D/Te)

Napier-Reid large diameter impellers provide bulk fluid motion and dissipate the imported horsepower over a wide area. The impellers have D/Te ratio in range of 0.35 to 0.40. The large impellers rotate at low operating speed resulting in low shear of fluid but provide more motion to fluid.

For a rectangular tank, the equivalent tank diameter (Te) can be calculated from the equation:

$$T_e = 1.13\ (L \times W)^{0.5} \text{ metre}$$

Where:

L = length of tank (metre)

W = width of tank (metre)

Impeller Tip Speed (Ts)

The maximum impeller tip speed is 2.4 m/s for a three or four blade hydrofoil impeller and 2.1 m/s for 32° or 45° pitched blade turbine impeller. The tip speed of the impeller can be calculated from the equation:

$$Ts = \frac{\pi N D}{60} \text{ m/s}$$

Where:

N = impeller speed, revolution per minute

D = impeller diameter (metre)

Superficial Velocity (SV)

It is the average velocity of the fluid over the entire cross sectional area of tank. Napier-Reid flocculators are designed to provide a minimum velocity of 0.015 m/s at the lowest operating speed that ensures the entire floc particle in the flocculation basin is kept in gentle motion and “dead zone” is not created where floc can settle. The superficial velocity can be calculated from the equation:

$$SV = \frac{Nq \times N \times D^3}{60 \times L \times W} \text{ m/s}$$

Where:

Nq = impeller pumping number (dimensionless)

N = impeller speed, revolution per minute

D = impeller diameter (metre)

L = length of tank (metre)

W = width of tank (metre)

Applications

NR Flocculators mainly find application in the following areas:

- Municipal water treatment plants
- Municipal wastewater treatment plants
- Industrial water and wastewater treatment plants

Control Panel for Flocculators

Flocculators in Municipal Water Treatment Plant

About Napier - Reid

Over 60 years of excellence in water & wastewater treatment

Napier-Reid is located in the greater Toronto area in the Province of Ontario, Canada. We supply engineering services and process equipment for water and wastewater treatment.

We have the technology, resources and experience to design, manufacture and implement innovative water and wastewater treatment solutions worldwide. We have completed over 3000 projects since our inception in 1950. This stands as a testament of our ongoing commitment of providing the highest quality service, products and after sales support in the industry. Our capabilities include engineering, manufacturing, installation and field support. We have in-house personnel for complete mechanical, electrical and instrumentation process and control system design. As a manufacturer, our designs focus on cost-effective solutions, simplicity of installation and ease of maintenance.

Napier-Reid has developed an excellent team with many years of experience. We have a well-deserved reputation for innovation, service and integrity. A significant portion of Napier-Reid's revenue comes from export to areas such as the Caribbean, Central America, South America, Middle East, Eastern Europe, Africa, and Asia. Some of these projects are financed by Canadian government or International financing institutes. As a Canadian manufacturer, we are eligible for Canadian governmental funding and EDC export credit. We have the capability to handle a large range of projects, from engineering, equipment supply, installation, start-up, to turnkey projects. Let Napier-Reid be your solution for water and wastewater purification.

NAPIER-REID Since 1950
Water & Wastewater Treatment

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