



ITT

Water & Wastewater

# Design recommendations

For installation of Flygt ultra-low-head,  
high-flow pumps



*Engineered for life*

# Introduction

**The principal benefit of the Flygt ultra-low-head, high-flow pump is efficient flow generation with low specific energy consumption and minimal power demand.**

These pumps have a proven history of successful installations worldwide wherever there is a need for large flow and low head conditions.

Reliable and efficient operation depends on its proper installation. The brochure presents guidelines for correct placement of the pumps and a means to calculate outlet loss which is most often the major loss in this type of installation. Friction loss from long pipe runs and losses from other system components (valves, etc.) should be determined as well.

## General installation considerations

The most common uses for this pump installation are to pump water from one basin to another in wastewater treatment plants, to recirculate wastewater or to pump sludge, often with a variable speed drive. Other applications in wastewater treatment are the emptying of large buffer tanks (rain water retention basins). These pumps can also be used advantageously to pump water in irrigation ditches. This type of pump has also been used to transport sea water into a bay for oyster farming or into a harbor to have better water conditions inside. Another enjoyable application is for boat rides in amusement parks.

The flow at the pump inlet should be uniform and steady, and it should be without swirl, vortices and entrained air:

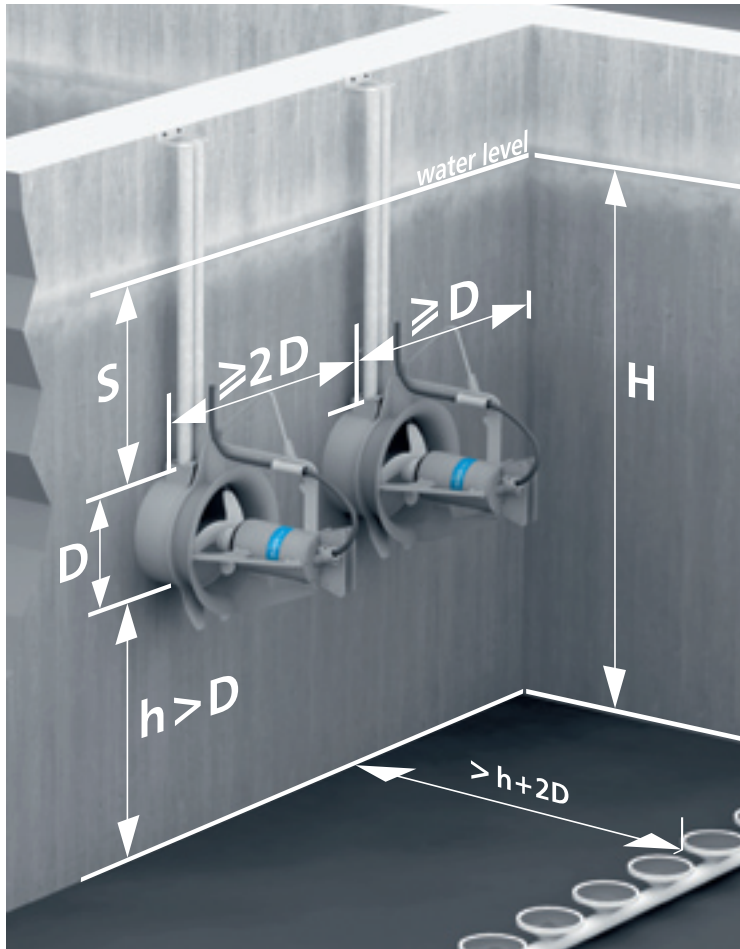
- Non-uniform flow at the pump intake can reduce efficiency, cause pulsating loads and produce both noise and vibrations.

- Vortices emanating from the free surface can become strong enough to draw air and floating debris into the pump. Vortices originating at solid surfaces can cavitate and release air into the pump.
- Entrained air can reduce the pump flow and efficiency and it can cause vibration and noise.

Flow conditions at the pump are initiated in the approach-flow region. The guidelines are based on the assumptions that the approaching flow is steady and that the velocities in the approach are less than 0,5 m/s (1,5 ft/s). No obstacles that may produce rotational wakes should exist and entrainment of air should be avoided.

The discharge pipe should be designed in the same way as for a centrifugal pump installation, i.e. no special consideration for Flygt PP pump installation.

## Installation dimensions

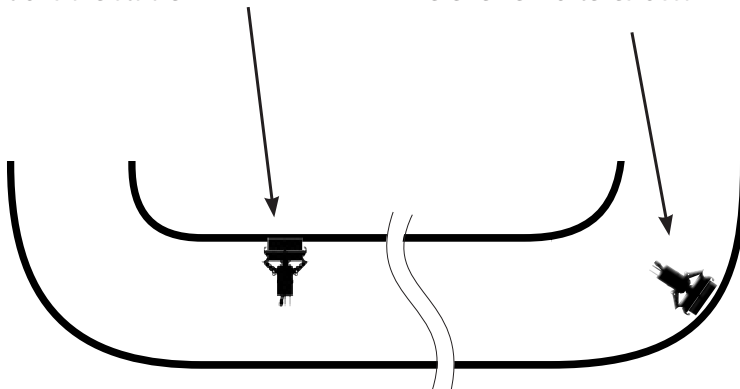


The following guidelines can be used to determine the minimum distances for this type of pump installation. Should your conditions differ please contact your ITT Water & Wastewater representative for a satisfactory solution.

### Racetrack

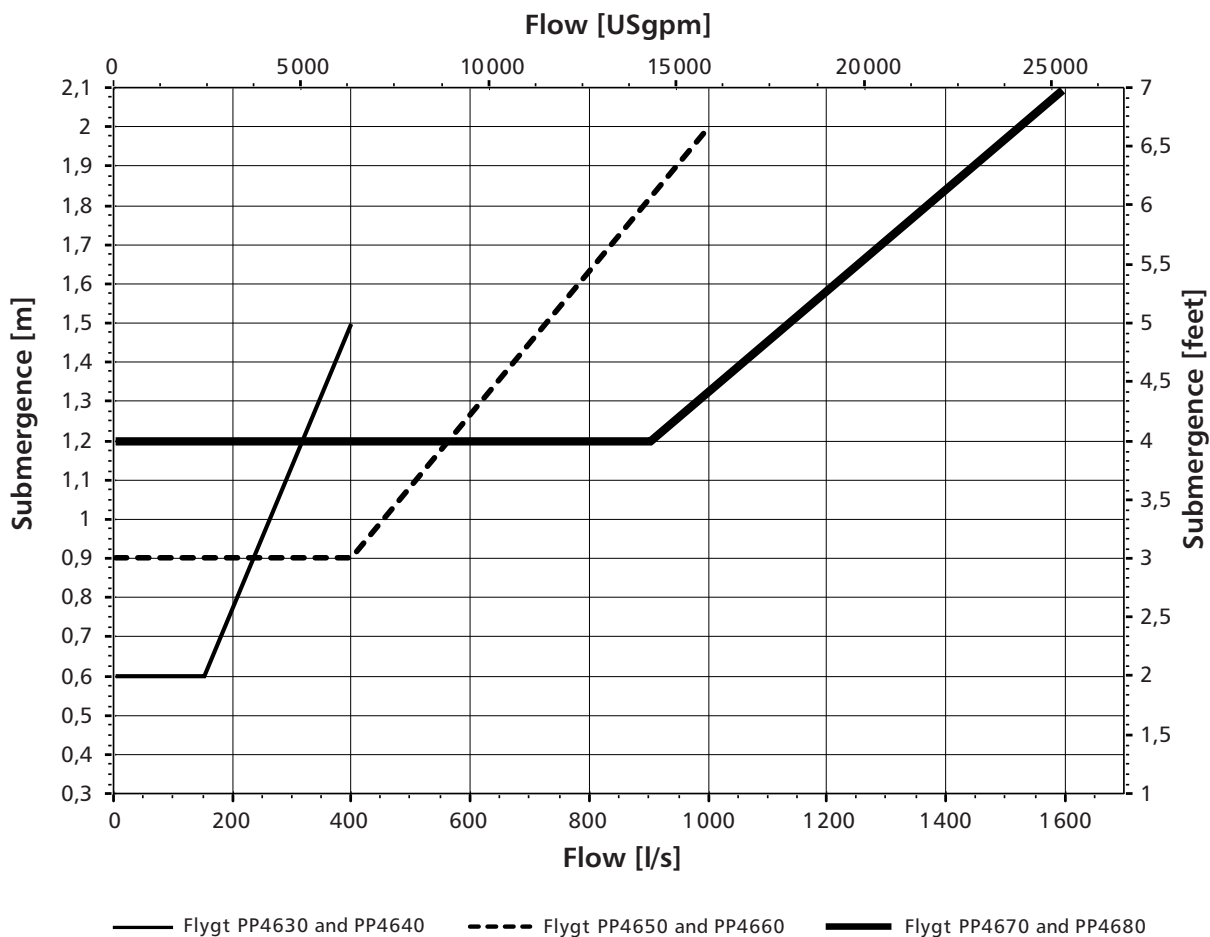
The best location for the pump is usually on a straight wall some distance away from the bend where flow conditions are stable.

If the pumps must be placed in a bend or close to one, then they should be installed on the outside wall of the bend where fewer vortices occur.



# Submergence

The following diagram shows the minimum recommended submergence (S).



In tanks that are shallow or have poor inflow conditions, it may be impossible to provide the amount of submergence specified in the guidelines above. In such cases, the pump can be equipped with a vortex protection shield. Such shields are designed to reduce the tendency to form vortices and swirl and to make it possible to operate with less than the prescribed submergence.



# Outlet losses

The outlet loss is more significant in this type of installation compared to conventional pump installations. The following tables can be used to estimate this head loss.

Diameter [mm]	Flow [l/s]	Outlet head loss (k=1) [m]	Non-return valve head loss (k=0,5) [m]
400	200	0,13	0,06
	250	0,20	0,10
	300	0,29	0,15
600	400	0,10	0,05
	500	0,16	0,08
	600	0,23	0,11
	700	0,31	0,16
	800	0,41	0,20
800	900	0,52	0,26
	1 000	0,20	0,10
	1 200	0,29	0,15
	1 400	0,40	0,20
	1 600	0,52	0,26

Diameter [inch]	Flow [USgpm]	Outlet head loss (k=1) [inch]	Non-return valve head loss (k=0,5) [inch]
16	3 000	4,4	2,2
	4 000	7,9	4,0
	5 000	12	6,2
24	6 000	3,6	1,8
	8 000	6,4	3,2
	10 000	10	5,0
	12 000	14	7,2
	14 000	20	10
32 (steel) or 30 (CI/DI)	16 000	26	13
	16 000	7,9	4,0
	19 000	11	5,7
	22 000	16	7,8
	25 000	20	10

# Systems engineering

ITT Water & Wastewater offers in-depth expertise in the design and execution of comprehensive solutions for water and wastewater transport and treatment.

Our know-how and experience are combined with a broad range of suitable products for delivering customized solutions that ensure trouble-free operations for customers. That is why our engineers utilize own specially developed computer programs, as well as commercial, for design and development projects.

Scope of assistance includes a thoroughgoing analysis of the situation and proposed solutions—together with selection of products and accessories.

We also provide hydraulic guidance and assistance for flow-related or rheological issues. Customers turn to us, as well, for analysis of complex systems for network pumping, including calculations for hydraulic transients, pump starts and flow variations.

## Additional services:

- Optimization of pump sump design for our products and specific sites
- Assistance with mixing and aeration specifications and design of appropriate systems
- System simulation utilizing computational fluid dynamics (CFD)
- Guidance for model testing—and organizing it
- Guidance for achieving the lowest costs in operations, service and installation
- Specially developed engineering software to facilitate designing

The range of services is comprehensive, but our philosophy is very simple: There is no substitute for excellence.







### What can ITT Water & Wastewater do for you?

Integrated solutions for fluid handling are offered by ITT Water & Wastewater as a world leader in transport and treatment of wastewater. We provide a complete range of water, wastewater and drainage pumps, equipment for monitoring and control, units for primary and secondary biological treatment, products for filtration and disinfection, and related services. ITT Water & Wastewater, headquartered in Sweden, operates in some 140 countries across the world, with own plants in Europe, China and North and South America. The company is wholly owned by the ITT Corporation of White Plains, New York, supplier of advanced technology products and services.

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