

Design Recommendations

FOR INSTALLATION OF FLYGT ULTRA-LOW-HEAD, HIGH-FLOW PUMPS



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 high-flow and low-head conditions.

Reliable and efficient pump operation depends on its proper installation. This brochure presents guidelines for the 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 type of pump installation are to transport water between basins 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, and 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:

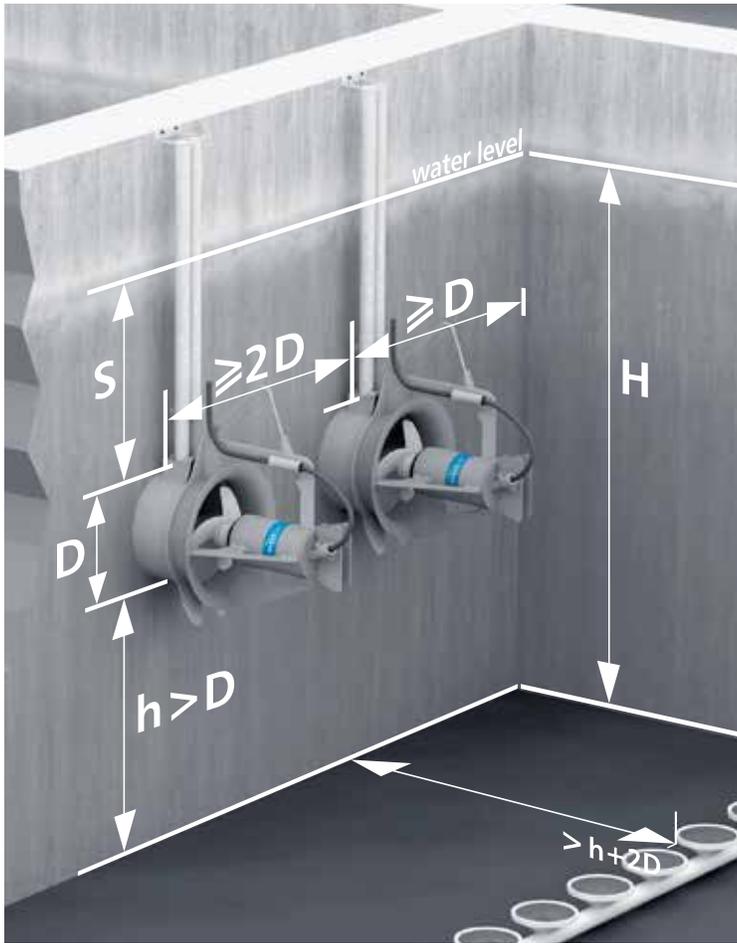
- Non-uniform flow at the pump intake can reduce efficiency, cause pulsating loads, and produce both noise and vibrations.

- 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 affected by the flow profile in the approach-flow region. These guidelines are based on the assumptions that the approaching flow is steady and that the velocities in the approach are less than 0.50 m/s (1.5 ft/s). This region should not include any obstacles that may produce rotational wakes, 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. there is no special consideration for Flygt PP pump installation.

Installation dimensions

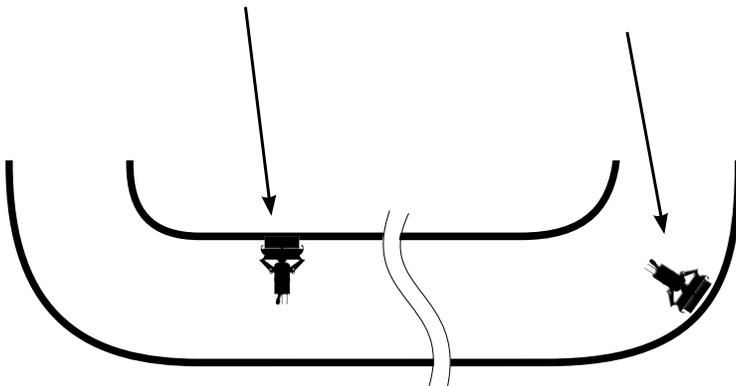


The following guidelines can be used to determine the minimum distances for this type of pump installation. Should your conditions differ please contact your Xylem representative.

Racetrack

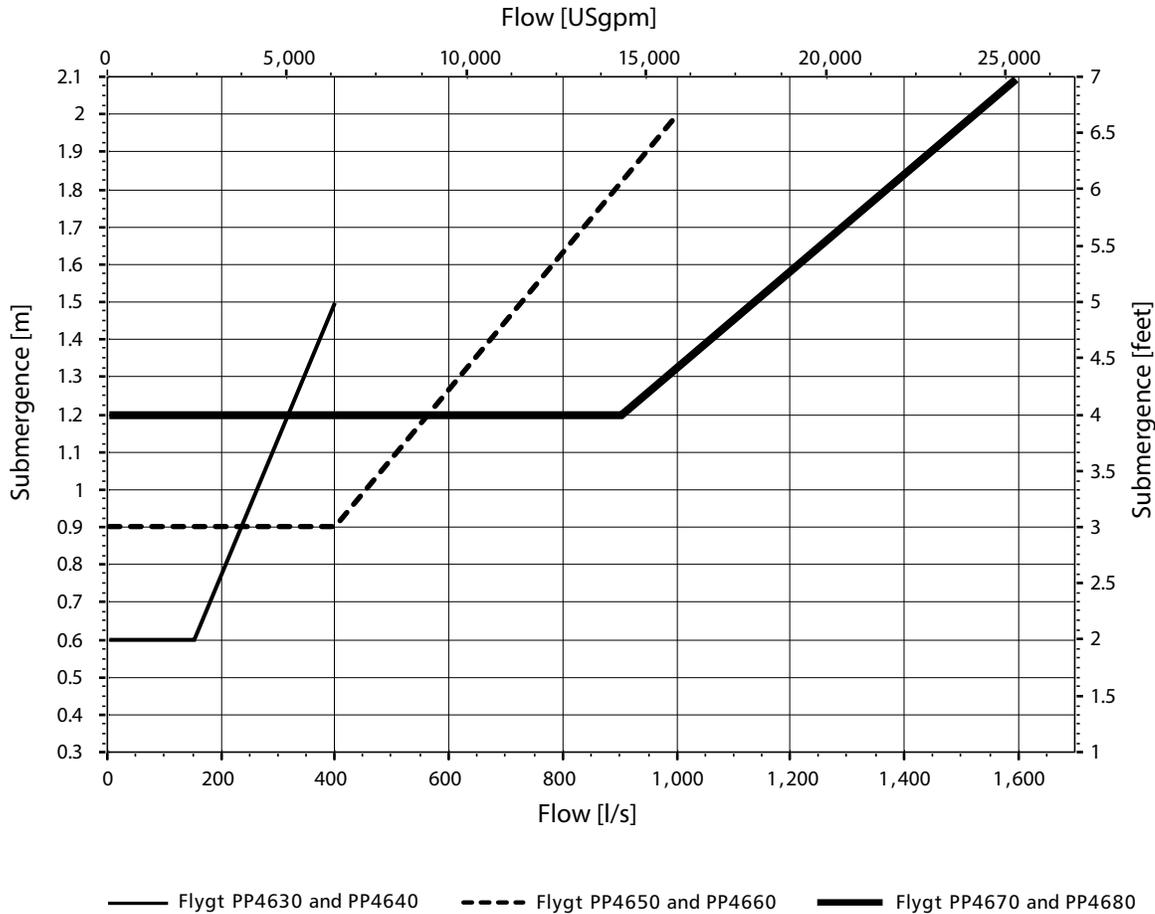
The best location for the pump is usually away from the bend of a straight wall where the flow conditions are stable.

If the pumps must be placed in or close to a bend, 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
	19,000	7.9	4.0
	22,000	11	5.7
	25,000	16	7.8
	25,000	20	10

Systems engineering

Xylem 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 our own specially developed computer programs, as well as commercially available programs, for design and development projects.

Scope of assistance includes a thorough 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 the design of appropriate systems
- System simulation utilizing computational fluid dynamics (CFD)
- Guidance for model testing
- Guidance for achieving the lowest costs in operations, service, and installation
- Specially developed engineering software for system design

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



Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

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Xylem, Inc.
14125 South Bridge Circle
Charlotte, NC 28273
Tel 704.409.9700
Fax 704.295.9080
855-XYL-H2O1 (855-995-4261)
www.xylem.com

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