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Rotodynamic pumps - Design of pump intakes - Recommendations for installation of pumps

Pompes rotodynamiques - Conception des ouvrages d'aspiration - Recommandations d'installation des pompes

Kreiselpumpen - Gestaltung der Einlaufbauten - Empfehlungen zur Installation der Pumpen

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Foreword

This document (CEN/TR 13930:2009) has been prepared by Technical Committee CEN/TC 197 “Pumps”, the secretariat of which is held by AFNOR.

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Introduction

In addition to the risks of cavitation that may exist at the intake of any pump depending on the NPSH available, pumping from a sump poses specific problems.

In fact, if the water passes from a flow state with an exposed surface to flow under pressure, significant swirling movements may occur and sometimes be amplified, thus creating a sort of funnel or vortex which opens out into the exposed surface of the sump with a risk of air being entrained or creating a swirling chimney, or whirl between the bottom and the intake producing degassing or vaporisation of the liquid in the entrance of the pump (see Figures 1a) and 1b) below).

These phenomena, which are generally unsteady, can have unwanted effects on the plant:

— undesirable vibration of various pump components;

— increased risk of cavitation;

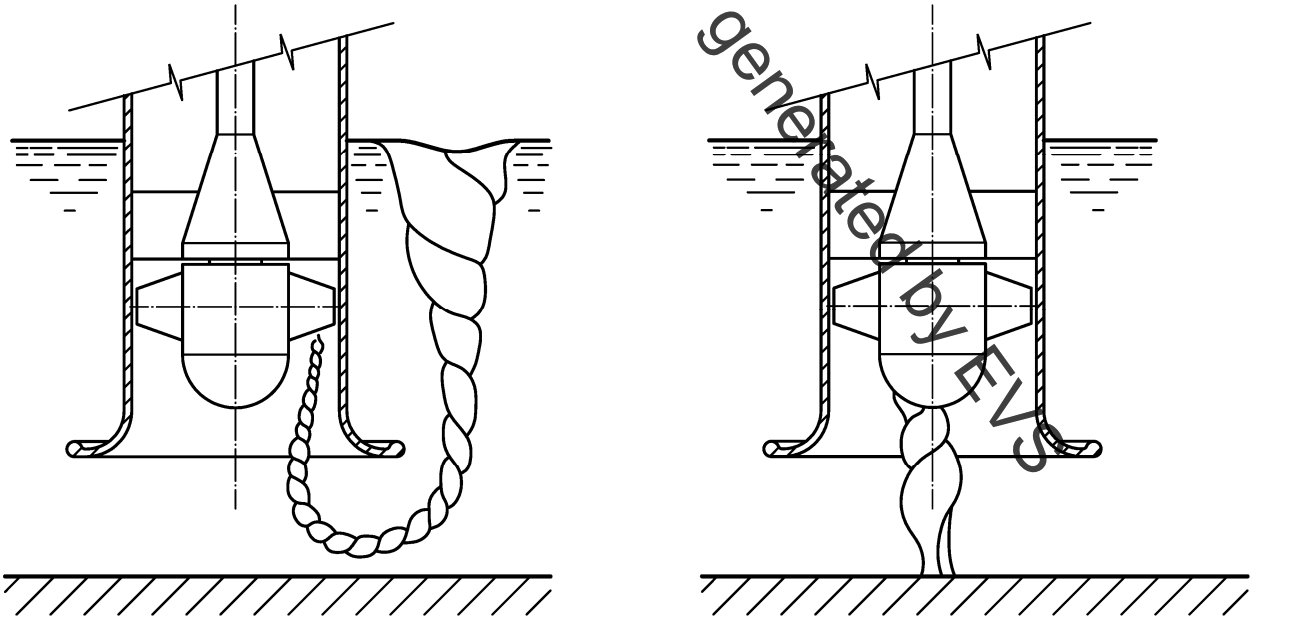
— drop in efficiency;

— reduction in flow rate and/or head;

— risk of floating bodies being sucked in;

— intense and irregular noise.

Compliance with the recommendations in this document makes it possible, in most commonly encountered industrial applications, to avoid or at least limit the phenomena mentioned above.



1a) Vortex causing entrainment of air in suction piping

1b) Chimney or whirl between the floor and the suction inlet

Figure 1 — Types of possible disturbances

1 Scope

1.1 This technical Report contains recommendations for the design of pump intakes and the installation of pumps.

As far as possible, these recommendations should be adhered to in order to obtain correct operation of the plant.

These recommendations are applicable regardless of the flow rate of the plant:

— plant which works with clear water (or relatively unclouded) and relatively non-aerated water or any other liquid having physical and chemical properties which are similar to those of water;

NOTE This document nevertheless contains several general recommendations for operation with cloudy (or very cloudy) water.

— pumping plant which has its own floor.

1.2 This document deals with various intake configurations:

— Clause 3 contains recommendations which apply to intakes with vertical suction inlet;

— Clause 4 contains recommendations applicable to intakes with top suction inlet;

— Clause 5 contains recommendations applicable to intakes with floor suction inlet;

— Clause 6 contains recommendations applicable to intakes with side-wall suction inlet.

2 General

2.1 Factors which influence the operation of the plant

The following factors have an effect on the operation of the plant:

a) Characteristics and position of the suction inlet:

   — arrangements of the suction inlet (vertical with bellmouth or tapered suction, top, floor or side-wall intake);

   — presence or absence of a bellmouth or tapered suction;

   — distance between suction inlet and floor;

   — distance between suction inlet and side-walls;

   — submergence (level of liquid relative to suction inlet);

   — strainer.

b) Inflow of liquid to the intake:

   — inflow velocity of the liquid;

   — shapes and dimensions of inflow;