ANSI/HI 12.1-12.6-2016

American National Standard for

Rotodynamic Centrifugal Slurry Pumps

for Nomenclature, Definitions, Applications, and Operation

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Hydraulic Institute

6 Campus Drive
First Floor North
Parsippany, New Jersey
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American National Standard

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Foreword (Not part of Standard)

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Hydraulic Institute are to promote the advancement of the pump manufacturing industry and further the interests of the public, and to this end, among other things:

a) Develop and publish standards;

b) Address pump systems;

c) Expand knowledge and resources;

d) Educate the marketplace;

e) Advocate for the industry.

Purpose of Standards and Guidelines

1) Hydraulic Institute Standards and Guidelines are adopted in the public interest and are designed to help eliminate misunderstandings between the manufacturer, the purchaser, and/or the user, and to assist the purchaser in selecting and obtaining the proper product for a particular need.

2) Use of Hydraulic Institute Standards and Guidelines is completely voluntary. Existence of Hydraulic Institute Standards does not in any respect preclude a member from manufacturing or selling products not conforming to the Standards.

Definition of a Standard of the Hydraulic Institute

Quoting from Article XV, Standards, of the By-Laws of the Institute, Section B:

“An Institute Standard defines the product, material, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, quality, rating, testing and service for which designed.”

Definition of a Hydraulic Institute Guideline

A Hydraulic Institute Guideline is not normative. The guideline is tutorial in nature, to help the reader better understand the subject matter.

Comments from users

Comments from users of this standard will be appreciated, to help the Hydraulic Institute prepare even more useful future editions. Questions arising from the content of this standard may be directed to the Technical Director of the Hydraulic Institute. If appropriate, the inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

Revisions

American National Standards of the Hydraulic Institute are subject to constant review, and revisions are undertaken whenever it is found necessary because of new developments and progress in the art. If no revisions are made for five years, the standards are reaffirmed using the ANSI canvass procedure.

Disclaimer

This document was prepared by a committee of the Hydraulic Institute and approved by following ANSI essential requirements. Neither the Hydraulic Institute, Hydraulic Institute committees, nor any person acting on behalf of the Hydraulic Institute: a) makes any warranty, expressed or implied, with respect to the use of any information, apparatus,

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This document does not contain a complete statement of all requirements, analyses, and procedures necessary to ensure safe or appropriate selection, installation, testing, inspection, and operation of any pump or associated products. Each application, service, and selection is unique with process requirements that shall be determined by the owner, operator, or his designated representative.

Units of measurement

Metric units of measurement are used, and corresponding US customary units appear in brackets. Charts, graphs, and sample calculations are also shown in both metric and US customary units. Because values given in metric units are not exact equivalents to values given in US customary units, it is important that the selected units of measure to be applied be stated in reference to this standard. If no such statement is provided, metric units shall govern.

Consensus

Consensus for this American National Standard was achieved by use of the canvass method. The following organizations, recognized as having an interest in the standardization of pumps, were contacted prior to the approval of this revision of the standard. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

Black & Veatch (B & V)
Brown and Caldwell
Chevron
DuPont Company
Ekwestrel Corp
Fluid Sealing Association
GIW Industries, Inc. (A KSB Company)
Healy Engineering, Inc.
Hidrostal
John Anspach Consulting
Kemet Inc.
LVVWD- Las Vegas Valley Water District
Outotec
Parametrix, Inc.
Patterson Pump Company
Pentair – Fairbanks Nijhuis
Pumps Positive
Rotating Equipment Repair, Inc
Sulzer Pumps (US) Inc.
Syncrude Canada
Weir Minerals North America
WorleyParsons

Committee list

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Vice-Chair – Robert Visintainer, GIW Industries, Inc. (A KSB Company)

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Marc Buckler	Flowserve Corporation
Charles Cappellino (retired)	ITT - Industrial Process
Ralph Gabriel (retired)	John Crane Inc.
Thomas Grove	AESSEAL Inc.
Thiru Veeraraghavan	A.W. Chesterton Company

Alternates	Company
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Michael Cugal	Weir Minerals North America
Randy Kosmicki	Weir Minerals North America
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12 Rotodynamic centrifugal slurry pumps

12.1 Introduction

This standard covers rotodynamic slurry pumps used for pumping and/or transporting mixtures of solids and liquids or so-called “slurries.” Slurries are often abrasive and, if not considered, may cause high wear and shortened life of pumps. Unlike clear water, slurries alter the performance of the pumps and cause wear to the wet-end parts. Below a certain velocity, some slurries also settle out in the piping, causing blockages. These differences are such that if they are not taken into account, the pumps will not work satisfactorily or not at all. For this reason, this standard includes information about slurries and their effects, which is necessary to select, apply, operate, and maintain slurry pumps of different designs and materials of construction.

12.1.1 Scope

This standard is for rotodynamic centrifugal, single-stage, overhung impeller slurry pumps, horizontal and vertical of industrial types used for abrasive slurries, herein referred to as slurry pumps. It includes types and nomenclature; definitions; design and application; installation, operation and maintenance; and guidelines on testing.

12.1.2 Purpose

This standard is normative and sets out requirements, recommendations, and statements to define, select, apply, operate, and maintain slurry pumps. Requirements convey criteria to be fulfilled if compliance with the document is to be claimed and from which no deviation is permitted. Recommendations convey that, among several possibilities, one is particularly suitable, without excluding or prohibiting others.

12.1.3 Pump types and nomenclature

Figure 12.1.3 shows classifications of rotodynamic slurry pumps based on mechanical configuration. Figures 12.1.13a–12.1.13p show typical constructions commonly used for each pump type. Lowercase letter part designations are for different manufacturer variants of the same type. Other variations are also acceptable.

While there are no rigid rules about where different mechanical configurations are to be applied, initial cost, wear parts (maintenance) cost, and arrangement convenience are such that mechanical configurations tend to be aligned to certain services.

Separately coupled, frame mounted mechanical configurations are preferred for the heavier solids transport wear services (described as class 3 and class 4 in Section 12.3.4.2). Hard metal pumps are preferred for services involving the largest sizes of solids. Elastomer pumps, by virtue of the needed support, must be of the lined type.

Cantilevered wet pit pumps are used in plant mining process service (described as class 3 in Section 12.3.4.2) but are more widely used in the lighter-class wear services (described as class 1 and class 2 in Section 12.3.4.2) for cleanup and lower concentration slurries. These pumps usually are limited to no more than 300-mm (12-in) discharge size.

Close-coupled submersible pump types are similar to the cantilevered wet pit pumps, mostly used in cleanup services, but there may be areas where they are used as process pumps. These are also limited to smaller discharge sizes.