ANSI/HI 9.6.5-2016

Approved American National Standard

ANSI

American National Standard for

Rotodynamic Pumps

Guideline for Condition Monitoring

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Hydraulic INSTITUTE

6 Campus Drive
First Floor North
Parsippany, New Jersey
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Rotodynamic Pumps

— Guideline for Condition Monitoring

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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 Institute are to promote the continued growth and well-being of pump manufacturers and further the interests of the public in such matters as are involved in manufacturing, engineering, distribution, safety, transportation, and other problems of the industry, and to this end, among other things:

a) To develop and publish standards and guidelines for pumps;

b) To collect and disseminate information of value to its members and to the public;

c) To appear for its members before governmental departments and agencies and other bodies in regard to matters affecting the industry;

d) To increase the amount and to improve the quality of pump service to the public;

e) To support educational and research activities;

f) To promote the business interests of its members but not to engage in business of the kind ordinarily carried on for profit or to perform particular services for its members or individual persons as distinguished from activities to improve the business conditions and lawful interests of all of its members.

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 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 guideline will be appreciated, to help the Hydraulic Institute prepare even more useful future editions. Questions arising from the content of this guideline may be directed to the Hydraulic Institute. It will direct all such questions to the appropriate technical committee for provision of a suitable answer.

If a dispute arises regarding contents of an Institute publication or an answer provided by the Institute to a question such as indicated above, the point in question shall be sent in writing to the Technical Director of the Hydraulic Institute, who shall initiate the Appeals Process.

Revisions

The Standards and Guidelines 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 and guidelines are reaffirmed using the ANSI canvass procedure.

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. Since 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 guideline. If no such statement is provided, metric units shall govern.

Consensus

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

Black & Veatch (B & V)
Brown and Caldwell
DuPont Company
Dyna Tech
Flowserve Corporation
Fluid Sealing Association
Kemet Inc.
Leistritz Advanced Technologies Corp.
Las Vegas Valley Water District (LVVWD)
Paterson Pump Company
Pentair - Berkeley
Pentair - Fairbanks Nijhuis
WEG Electric Corp.
Weir Floway, Inc.

Committee list

Although this guideline was processed and approved for submittal to ANSI by the Canvass Method, a working committee met many times to facilitate its development. At the time it was developed, the committee had the following members:

Chair – Mike Cugal, Weir Minerals North America
Vice-Chair – Greg Case, TACO

Committee Members	Company
Tim Albers	Nidec Motor Corporation
Jack Bagain	John Crane Inc.
Randal Ferman	Ekwestrel Corp
Thomas Grove	AESSEAL Inc.
Mark Heiser	Xylem Inc. - Applied Water Systems
Gary Koopman	KCF Technologies, Inc.
William Marscher	Mechanical Solutions, Inc.
Scott Wilde	Leistritz Advanced Technologies Corp.

Alternate Members	Company
Eric DeWilde	Weir Minerals North America

9.6.5 Rotodynamic Pumps for Condition Monitoring

9.6.5.1 Introduction

9.6.5.1.1 Scope

This guideline is for rotodynamic pumps, including both sealed and sealless pump designs as stated in each section.

9.6.5.1.2 Purpose

This document is intended to give the pump user a tool for condition monitoring of the pumps in his or her systems, but does not directly address process management systems.

9.6.5.1.3 Use of this document

It is the user's responsibility to identify the need for implementing pump condition monitoring practices. The user is also responsible for identifying those parameters he or she wishes to monitor. *This document does not require any specific monitoring be done on the pumping system*, but will provide a guideline and information relevant to making such decisions, and provides suggestions for carrying out the monitoring process.

Condition-based maintenance (CBM) of machines by monitoring the output of various sensors and/or indicators as diagnostics tools allows technicians to assess the condition of a machine while in operation. Successful application of CBM enables identification of existing, impending, or potential problems prior to component failure. CBM not only helps plant personnel reduce the possibility of catastrophic failure, but also allows them to order parts in advance, schedule manpower, and plan other repairs during the downtime.

Every machine has a unique path to failure that condition monitoring can track. The potential-to-failure interval (P-F Interval) is commonly used to help establish the right maintenance to perform at the right time.

The P-F intervals vary by type of machine and type of detection technology employed. Once a problem has been identified using a diagnostic technology, there is no guarantee of continued operation through the typical P-F interval. In addition, there is no guarantee that the failure will indeed occur at some specified time in the future. Experience tells us that there is a potential for failure based the basic physics behind the diagnostic technology. The basis for this comes from the many case studies that have related diagnostic indication to machine defects. When employing P-F logic in specifying monitoring intervals, it is important that we recognize that in some cases the technology does not provide enough lead time for the detection to be of practical use.

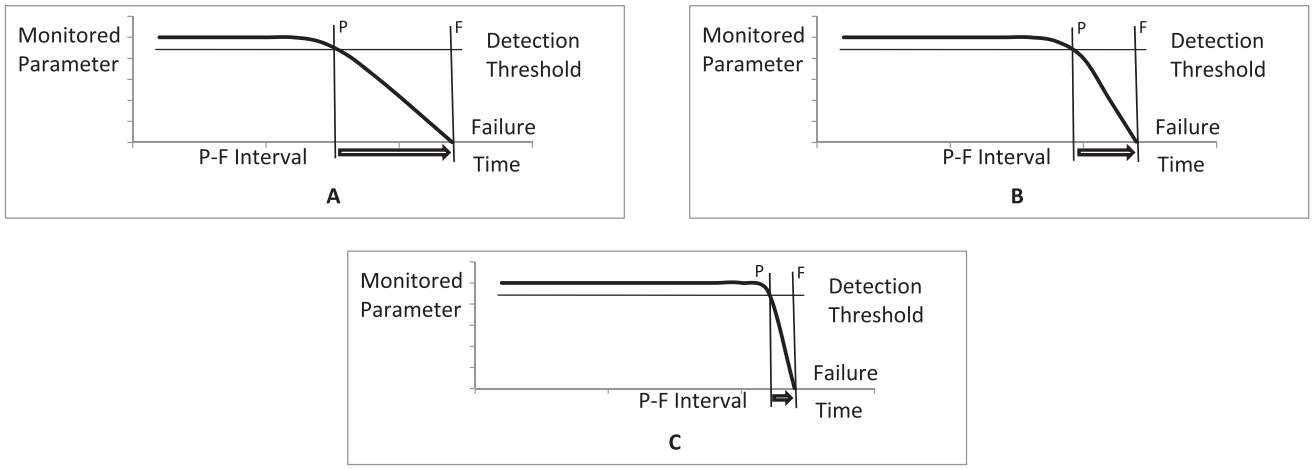

Figure 9.6.5.1.3 — Typical P-F interval curves

The three curves shown in Figure 9.6.5.1.3 demonstrate that the P-F interval can vary and is specific to a given diagnostic test and failure mode combination. Curve A shows a long P-F interval and the organization may opt to wait for a second measurement before taking action. Curve B shows a shorter P-F interval, but still gives sufficient