INTERNATIONAL STANDARD

ISO 13373-1

First edition
2002-02-15

Condition monitoring and diagnostics of machines — Vibration condition monitoring —

Part 1: General procedures

Surveillance des conditions et diagnostic des machines — Surveillance relative aux conditions des vibrations —

Partie 1: Procédures générales

Reference number
ISO 13373-1:2002(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 13373 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13373-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 2, *Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures*.

ISO 13373 consists of the following parts, under the general title *Condition monitoring and diagnostics of machines — Vibration condition monitoring*:

— *Part 1: General procedures*

— *Part 2: Data processing, analysis, diagnostics, display and general vibration*

Annexes A, B, C and D of this part of ISO 13373 are for information only.

Introduction

The principal purpose of vibration condition monitoring of machinery is to provide information on the operating condition of the machine for protection and predictive maintenance. An integral part of this process is the evaluation of the vibratory condition of the machine over operating time. The purpose of this part of ISO 13373 is to promote the use of well-accepted guidelines for acquiring and evaluating vibration measurements for condition monitoring.

In contrast to vibration testing used strictly for diagnostic or acceptance purposes, condition monitoring involves the acquisition of data which can be compared over a span of time, and emphasizes the changes in vibration behaviour rather than any particular behaviour by itself.

Changes in vibration behaviour may typically be caused by

— changes in balance,

— changes in alignment,

— wear of or damage to journals or anti-friction bearings,

— gear or coupling defects,

— cracks in the critical components,

— operational transients,

— fluid-flow disturbances in hydraulic machinery,

— transient excitations in electric machinery,

— rubbing, and

— mechanical looseness.

Vibration condition monitoring can provide information for the following purposes:

— to increase equipment protection;

— to improve safety for personnel;

— to improve maintenance procedures;

— to detect problems early;

— to avoid catastrophic failures;

— to extend equipment life;

— to enhance operations.

Vibration measurements for condition monitoring may take many forms from the very simple to the very complex, and can include continuous or periodic measurements. However, they all share the common goal of accurately and reliably assessing the condition of machinery. The instrumentation and procedures recommended in this part of ISO 13373 will assist in achieving that goal.

The measurement methods described in this part of ISO 13373 reflect current common methods of measurements utilizing seismic and non-contacting vibration transducers. However, it is recognized that other methods of assessing the vibration condition of machines are in development. Although not included at this time, this part of ISO 13373 does not preclude the use of such measurement techniques.

ISO/TC 108 is at present also in the process of developing new International Standards on the subject of Machinery Diagnostics. These International Standards are intended to provide guidance on the overall monitoring of the “health” of machines, including factors such as vibration, tribology, oil purity and thermography.

Condition monitoring and diagnostics of machines — Vibration condition monitoring —

Part 1: General procedures

1 Scope

This part of ISO 13373 provides general guidelines for the measurement and data collection functions of machinery vibration for condition monitoring. It is intended to promote consistency of measurement procedures and practices, which usually concentrate on rotating machines.

Because of the diversity of approaches to condition monitoring, recommendations specific to a particular kind of monitoring programme will be addressed in additional parts of ISO 13373.

This part of ISO 13373 is a basic document which presents recommendations of a general nature, encompassing

— measurement methods,

— measurement parameters,

— transducer selection,

— transducer location,

— transducer attachment,

— data collection,

— machine operating conditions,

— vibration monitoring systems,

— signal conditioning systems,

— interfaces with data-processing systems,

— continuous monitoring, and

— periodic monitoring.

The vibratory conditions of a machine can be monitored by vibration measurements on the bearing or housing structure and/or by vibration measurements of the rotating elements of the machine. In addition, measurements can be continuous or non-continuous. This part of ISO 13373 provides guidance on the types of measurements recommended in both the continuous and the non-continuous modes.

It is emphasized that this part of ISO 13373 addresses only the procedures for vibration condition monitoring of machines. In many cases, the complete condition monitoring and diagnostics of a machine can also include other parameters, such as thermography, oil analysis, ferrography, process variations, temperatures and pressures. These non-vibratory parameters will be included in other International Standards.

This part of ISO 13373 covers rotating machines. However, many of the procedures included can be applied to other types of machines, for example reciprocating machines.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 13373. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 13373 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1925, *Mechanical vibration — Balancing — Vocabulary*

ISO 2041, *Vibration and shock — Vocabulary*

ISO 7919-1, *Mechanical vibration of non-reciprocating machines — Measurements on rotating shafts and evaluation criteria — Part 1: General guidelines*

ISO 10816-1, *Mechanical vibration — Evaluation of machine vibration by measurements on non-rotating parts — Part 1: General guidelines*

3 Terms and definitions

For the purposes of this part of ISO 13373, the terms and definitions given in ISO 1925 and ISO 2041 apply.

4 Vibration condition monitoring

4.1 General

Vibration monitoring is conducted to assist in the evaluation of the "health" of the machine during sustained operation. Depending on the machine type and the critical components to be monitored, one or more measurement parameters, and a suitable monitoring system, have to be selected. The objective of such a programme is to recognize an "unhealthy" condition in sufficient time to take remedial action before certain defects in the machine parts significantly decrease equipment operation or projected machine life, or fail completely, thereby establishing a cost-effective maintenance plan.

Several types of condition monitoring systems are described below; depending on the machine, the machine's condition and other factors, any one of the systems, or combinations thereof, may be selected.

4.2 Types of vibration condition monitoring systems

4.2.1 General

Condition monitoring systems take many forms. They utilize permanently installed, semi-permanent or portable measuring equipment.

A decision to select the appropriate measuring system depends upon a number of factors, such as

— criticality of the machine operation,

— cost of machine down-time,

— cost of catastrophic failure,

— cost of the machine,

