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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 15469.2-2007

**Hydraulic turbines, storage pumps and pump-turbines --
Cavitation pitting evaluation -- Part 2: Cavitation pitting
evaluation in storage pumps and pump-turbines**

水轮机、蓄能泵和水泵水轮机空蚀评定第2部分：蓄能泵和水泵水轮机的空蚀评
定

(English Translation)

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Foreword

GB/T 15469 "turbines, storage pumps and pump - turbines cavitation assessment" is divided into the following three parts.

--- Part 1. reaction turbines cavitation assessment;

--- Part 2. storage pumps and pump - turbines cavitation assessment;

--- Part 3. Pelton turbine cavitation assessment.

This section GB/T 15469 Part 2.

The partial modification of the International Electrotechnical Commission IEC 60609-1:2004 "turbines, storage pumps and pump - turbines cavitation pitting evaluation 1 Part I. reaction turbines, storage pumps and pump turbines assessment, "and depending on the circumstances of storage pumps and pump turbines were Changes related to technical differences in the terms they are involved in the margin of a single vertical line identified by. These techniques are given in Appendix B List of differences and the reasons for the reference.

Appendix A of this section is normative appendix, Appendix B is an informative annex.

This part is proposed by the China Electrical Equipment Industrial Association.

This part of the National Standardization Technical Committee turbine (SAC/TC175) centralized.

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Introduction

This section provides cavitation assess storage pumps and pump turbines.

Storage pumps, pump turbine cavitation extent depends on the following five factors.

Type and design a) equipment;

b) material and surface state of the site of action of cavitation;

c) Install the elevation equipment, namely power stations cavitation coefficient (σ_{map});

d) duration of operation and operating conditions;

e) water quality.

a), b) depending on the status of the device, and c), d), e) depending on the conditions of plant operation. Thus, cavitation guaranteed only by the supply and demand sides Power plant planning and design stage or agreed in the contract. When the rotor/impeller renovation or require a wider operating range for the tender side in response cavitation performance assurances recommendations.

Cavitation can use the following two methods to ensure the consultation.

First, according to the contract in a given installation elevation device (corresponding to the power plant cavitation coefficient σ_{map}), according to the storage pump or pump turbine size, Speed, material, surface condition and operating conditions and other consultations cavitation guaranteed value (see Figure 1a));

Second, in determining the maximum allowable amount of cavitation conditions negotiated unit installation elevation (see Figure 1b)).

In most cases, the unit normal operation without cavitation conditions, or be required to operate without cavitation conditions, sometimes for economic Reasons, but also it allows a slight cavitation, installing the elevation device can be higher than the elevation of cavitation-free operation.

Since each station a) ~ e) the items are different, so the development of a common acceptable cavitation allowable value is not appropriate. because this is recommended economic assessment based on conditions of each plant. For example, the installation of a deeper elevation (greater station cavitation coefficient σ_{map} Values require higher costs of civil engineering) and/or more expensive rotor/impeller (shape and/or materials) can reduce the amount of cavitation. Higher costs associated with Benefits are lower operating costs and reduce maintenance frequency, and can reduce downtime because of power loss.

Cavitation depth, volume and mass of the rotor/impeller diameter and function, see Appendix A.

1 hydro-mechanical cavitation in the flow diagram a certain amount as a function of power

plant cavitation coefficient Turbines, storage pumps and pump - turbines cavitation pitting evaluation Part 2. storage pumps and pump turbines Cavitation assessment

1.1 Overview

This section provides storage pumps and pump turbines in the given conditions (as specified in the contract power, hydro energy density, speed, material, Operating conditions and running time) measurement and evaluation methods flow components due to cavitation caused by the loss of material.

In the contract should specify whether the presence of cavitation hydraulic machinery in all or part of the operating range.

Regardless of whether cavitation occurs, it should be clearly defined in the contract cavitation guaranteed.

Described in this section also apply to the relevant station storage pumping station.

1.2 Content does not contain

This section does not include the potential impact on other cavitation performance equipment to produce, for example.

--- Power, efficiency, vibration, noise and the overall mechanical properties;

--- In operation exposed material defects.

Operation due to excessive wear of flow parts and exposed material defects not included in the cavitation guarantee.

Coating with a protective layer over the surface of the abrasive flow is not included in the cavitation guarantee.

1.3 Effect of chemical composition of the water to cavitation

This section assumes that the water does not contain corrosive chemicals, if you want to consider aggressive chemicals contained in the water, should be given in the agreement the results of the analysis of water quality, and based on this make cavitation guarantee. Because the chemical resistance relates to the chemical composition of materials and equipment, and many other reason Su, within this scope of this section to determine the limits.

If the show corrosive water is greater than a given value of the agreement was in the process of further analysis, in assessing the cavitation guarantee are met, it must consider the impact of corrosive water. If the area appears cavitation can be distinguished due to the effects of chemical etching or electrochemical corrosion the increase, which will increase the destruction of part of the cavitation should be excluded from the scope of assessment.

1.4 Effect of water containing solid particles

Water and solid particles such as silt caused by wear and tear are not considered as cavitation. When the device is running in water containing a large amount of solid particles when, Material loss due to cavitation (if present) with the combined effects of wear and intensified. Further, when the surface of the material due to abrasion changed as a result of water Force profile changes may be caused by cavitation and intensified. Cavitation damage and wear are not similar in appearance, location and mechanism, so in measuring damage when can distinguish between the two is very important. If the area appears cavitation can be distinguished due to the impact of the increased wear and tear, which increases Plus damaged parts should be assessed in addition to the cavitation.

Cavitation case volume and measurement methods given in this section apply only to cavitation. Every year at least for some period of time in a solid containing a large amount Hydropower is running water particles, the extent of damage due to wear caused by solid particles depends on many aspects of factors, such as particle concentration Degree, mineral composition, particle size gradation and impact parameters (such as the relative speed and angle of impact) as well as material properties and operating conditions of hydraulic machinery Etc., which is beyond the acceptable in this part of the definition of the quantity of solid particles range.

Cavitation general water quality assessment is based. When water contains a small amount of solid particles, and wear and tear caused by the slight, it can be regarded as general water quality.

The water situation should be described in the contract documents the amount of particulate solids, and the corresponding types of minerals, particle size gradation. If the ratio is large, should be a special agreement, the agreement could be considered cavitation wear and damage area caused by solid particles separate, when it is difficult to distinguish between the two, it is recommended Evaluation of the contract cavitation wear uniform consideration of solid particles and material loss caused by cavitation.