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**Acoustics -- Recommended practice for the design of low-noise
machinery and equipment -- Part 1: Planning**
(English Translation)

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Foreword

GB/T 25078 Acoustics - Recommended practice for the design of low-noise machinery and equipment consists of 2 parts:

- Part 1: planning;
- Part 2: Introduction to the physics of low noise design.

This Part is Part 1 of GB/T 25078. This Part is identical to ISO/TR 11688-1:1995, Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (English version).

For ease of use, this Part makes editorial modifications to ISO/TR 11688-1:1995, and adds newer references such as the "Noise and Vibration Control Engineering Handbook" edited by Ma Dayou published in 2002 to the Bibliography.

Annex A and Annex B of this Part are normative.

Annex C of this Part is informative.

This Part is proposed by the Chinese Academy of Sciences.

This Part shall be under the jurisdiction of National Technical Committee on Acoustics of Standardization Administration of China (SAC/TC 17).

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Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning

1 Scope

This Part of GB/T 25078 is an aid to understanding the basic concepts of noise control in machinery and equipment.

The recommended practice presented here is intended to assist the designer at any design stage to control the noise of the final product. Methodical development of products was chosen as a basis for the structure of this document (see Clause 4).

The list of design rules given in this Part is not exhaustive. Other technical measures for reducing noise at the design stage may be used if their efficacy is identical or higher.

To solve problems beyond the scope of this Part, the designer can refer to the bibliography in this Part, which presents the general state of acoustic handbooks at the time of publication. Furthermore, reference is made to the numerous technical publications dealing with acoustical problems.

2 Normative references

The terms in the following documents become the terms of this Part by reference to this Part of GB/T 25078. For dated references, all subsequent amendments (not including errata content) or revisions do not apply to this Part. However, parties to agreements that are based on this Part are encouraged to study whether the latest versions of these documents can be used. For undated references, the latest edition applies to this Part.

GB/T 3767-1996, Acoustics - Determination of Sound Power Levels of Noise

Sources Using Sound Pressure - Engineering Method in an Essentially Free Field over a Reflecting Plane (eqv ISO 3744:1994)

GB/T 3768-1996, Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (eqv ISO 3746:1995)

GB/T 14574-2000, Acoustics - Declaration and verification of noise emission values of machinery and equipment (eqv ISO 4871:1996)

GB/T 16404-1996, Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points (eqv ISO 9614-1:1993)

c) The dominant structure-borne noise transmission paths were those between the pump and motor and pump and reservoir;

d) The dominant radiating surfaces were those of the electric motor and the reservoir.

The hydraulic pump used in this example is not typical of the equipment currently available. Replacing the hydraulic pump with one having less structure-borne and liquid-borne source strengths would have reduced the overall sound power level.

5.3.1 Airborne noise sources

All streaming gases (e.g., air) can cause noise by turbulence, shock and pulsation.

5.3.1.1 Turbulence

Turbulence is a noise generating mechanism which has many different forms.

Turbulence can create pure tone components in flows over a cylinder, such as a chimney pipe. Tones are also generated by flow over a cavity which is seen for instance in a flute or in cutters in woodworking machines. In channel flows, noise can be generated by sharp corners, struts or valves.

Flows with high velocities at the nozzle exit or the tips of fans generate vortices due to the shear forces in the contact region between the air which is not moving near the nozzle and the exciting flow. This gives rise to broad band noise. The noise level and the spectrum of the noise depend on the flow velocity, the viscosity of the medium and

the geometry of the nozzle.

Reductions are achieved by lowering the flow velocity in the contact region. This can be done by lowering the pressure difference, by using larger diameters or by providing a bypass flow, e.g., in nozzles or tube exits.

Noise sources are localised by analysing the flow system for possible obstacles.

Reduction is effected by changing diameters of rods, by introducing spoilers on chimney stacks, by aerodynamic shaping or by reduction of flow velocity.

A fan should be designed to operate with the tip speed as low as possible. Use variable speed instead of throttling. Too little clearance between rotor and housing can increase noise generation.

Turbulence behind obstacles is avoided by removing obstacles, by minimising their number or by aerodynamic shaping (avoid sharp edges).

Changing the geometry of nozzles or valves by using a branched or slit type will increase the frequency of the generated sound which makes sound absorption and isolation easier.

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