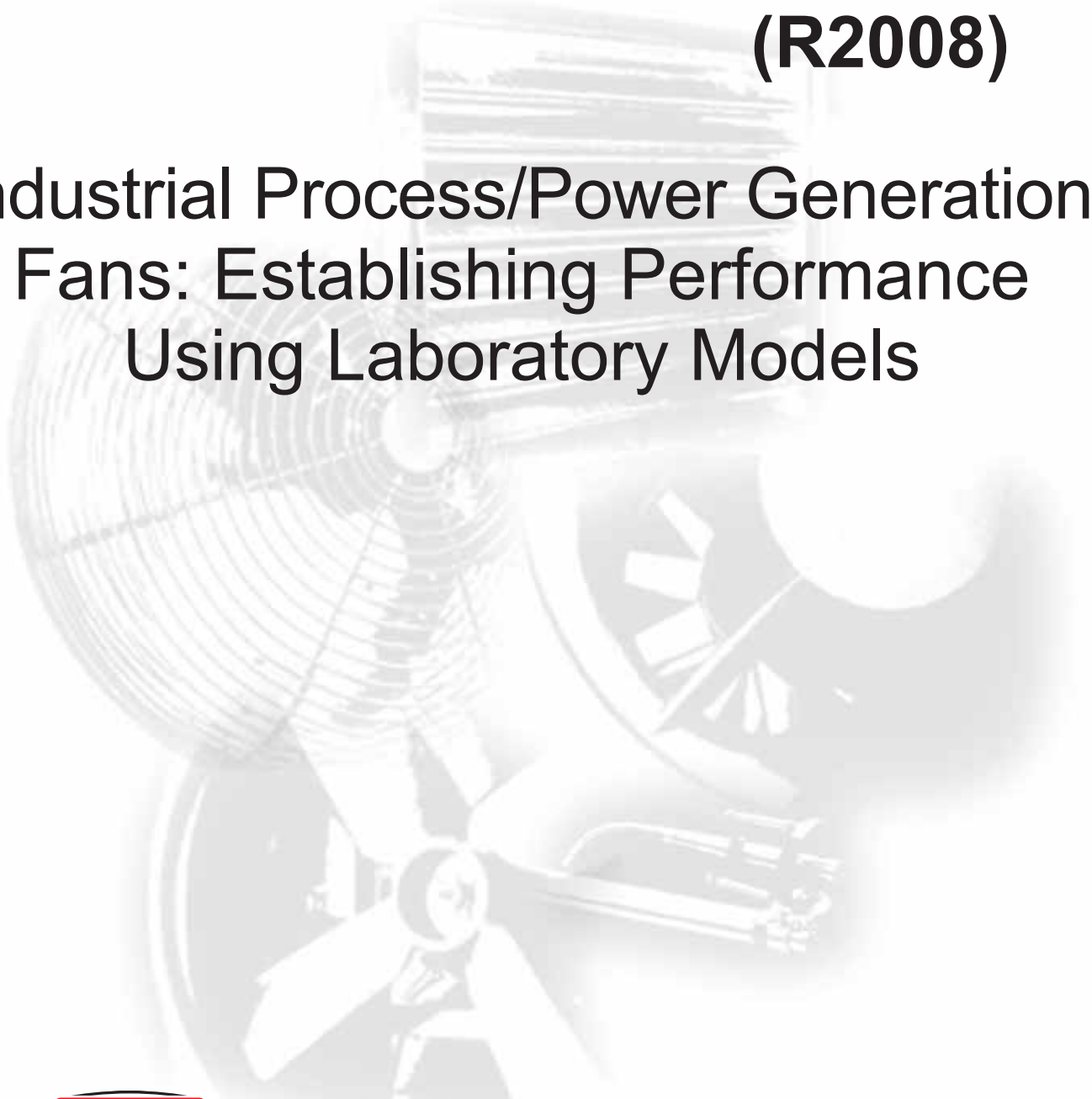
AMCA Publication 802-02 (R2008)

Industrial Process/Power Generation Fans: Establishing Performance Using Laboratory Models



AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

The International Authority on Air System Components

AMCA PUBLICATION 802-02 (R2008)

Industrial Process / Power Generation Fans: Establishing Performance Using Laboratory Models

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Authority

This edition of AMCA Publication 802-02 was adopted by the membership of the Air Movement and Control Association International on October 19, 2001. It was reaffirmed on May 4, 2008.

Foreword

AMCA (Air Movement and Control Association International, Inc.) is a trade association representing manufacturers of fans used in industrial, power generation, and commercial applications; other air control devices such as louvers, dampers, and shutters; and airflow measurement stations.

This publication was written by engineers of member companies of AMCA International. AMCA member companies constitute the majority of fan manufacturers supplying the industrial process and electric power generation industry throughout the world.

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RELATED AMCA STANDARDS

For Aerodynamic Performance:

ANSI/AMCA Standard 210	*Laboratory Method of Testing Fans for Aerodynamic Performance Rating*
AMCA Standard 803	*Industrial Process/Power Generation Fans: Site Performance Test Standard*

For Sound:

AMCA Standard 300	*Reverberant Room Method for Sound Testing of Fans*
AMCA Standard 301	*Methods for Calculating Fan Sound Ratings from Laboratory Test Data*
AMCA Standard 320	*Laboratory Methods of Sound Testing of Fans Using Sound Intensity*

RELATED AMCA PUBLICATIONS

For Balance and Vibration:

ANSI/AMCA Standard 204	*Balance Quality and Vibration Levels for Fans*

Industrial Process / Power Generation Series:

AMCA Publication 801	*Industrial Process/Power Generation Fans: Specification Guidelines*
AMCA Publication 802	*Industrial Process/Power Generation Fans: Establishing Performance Using Laboratory Models*
AMCA Standard 803	*Industrial Process/Power Generation Fans: Site Performance Test Standard*

Fan Application Manual:

AMCA Publication 200	*Air Systems*
AMCA Publication 201	*Fans and Systems*
AMCA Publication 202	*Troubleshooting*
AMCA Publication 203	*Field Performance Measurement of Fan Systems*

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Industrial Process / Power Generation Fans: Establishing Performance Using Laboratory Models

1. Purpose

The purpose of this publication is to outline present methods used by fan manufacturers in determining the performance of full size industrial process and power generation fans used in the world. These methods include:

a) Predicting full size fan ratings using base performance data already obtained from a standard model.

b) Building and testing a model of a proposed fan or already existing full size fan to verify the performance of the full size fan.

This publication provides a detailed insight into the variables that influence a fan rating and establishes the rules to be used and their limitations in converting performance from one geometrically similar fan to another. It also defines dimensional tolerances that must exist for two fans to be considered geometrically similar. It does not cover the detailed procedures used by a manufacturer in selecting a particular fan or modifying a standard fan to achieve a specific rating. The information is, of course, confidential to each manufacturer and is based upon many years of experience and individual company research.

This publication, together with other documents contained in AMCA's 800 series, forms the basis for fan-related concepts and practices.

2. Scope

This publication applies to centrifugal and axial fans. State-of-the-art criteria is provided for establishing geometric and dynamic similarity between the model and the full size fan, including appurtenances and drives.

This document does not deal with structural details, mechanical properties, or components if they do not affect fan performance.

3. Definitions and Symbols

The following list covers definitions and symbols used in the testing and rating of fans. These are standard definitions as adopted by the fan industry. Certain definitions are similar to those used in general engineering practice and have been adapted for specific use in this publication.

3.1 Rating criteria

3.1.1 Fan. A device which utilizes a power driven rotating impeller for moving air or gas. A fan may have various appurtenances, provided by the fan manufacturer as part of the fan equipment, which are accessories that affect performance. It is necessary to establish what accessories are to be considered as part of the fan.

In many instances, a customer lists the system requirements and requests that the fan manufacturer supply additional accessories such as silencers or dampers. The pressure losses for accessories must be accounted for if the system is to operate properly. If the fan manufacturer supplies these items and they are directly connected to the fan, then appropriate accessory losses are added to the system requirements and a fan is selected for the sum of the overall pressure losses.

3.1.2 Fan inlet. The plane perpendicular to the airstream where it first meets the inlet cone or the inlet box furnished by the fan manufacturer. In this publication, the fan inlet is indicated by "Plane 1" (see Figure 1).

3.1.3 Fan outlet. The plane perpendicular to the airstream at the outlet opening of the fan or the outlet opening of the evasé or diffuser. In this publication, the fan outlet is indicated by "Plane 2" (see Figure 1).

3.1.4 Fan airflow rate. The volumetric airflow rate at fan air density at the fan inlet.

3.1.5 Total pressure. The air pressure that exists by virtue of the degree of compression and the rate of motion. It is the algebraic sum of the velocity pressure and the static pressure at a point.

3.1.6 Velocity pressure. The portion of the air pressure that exists by virtue of the rate of motion only. It is always positive.

3.1.7 Static pressure. The portion of the air pressure