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NEMA MG 10-2013

Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cag Polyphase Induction Motors

National Electrical Manufacturers Association

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and Use of Fixed Frequency
Medium AC Squirrel-Cage Polyphase Induction Motors

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Foreword

The Motor and Generator Section of NEMA published the first edition of MG 10 with the statement to periodically review the guide for the purpose of keeping it up to date with advancing technology. This edition, MG 10-2013 is the result of this commitment to include typical characteristics of IEC Design H and N induction motors and information on the NEMA energy efficient and Premium efficiency motor standards.

The goal of this guide is to assist the reader in the choice of equipment for his application.
The practice of periodically reviewing and updating the guide will be continued. Comments on the guide from readers are welcomed and should be addressed to:

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Scope

This energy management guide provides practical information concerning the proper selection and application of medium AC polyphase squirrel-cage induction motors including installation, operation, and maintenance in fixed frequency applications

Section 1
INTRODUCTION

The shortage and large cost increases of vital national energy resources has demonstrated the need to conserve such resources. In 1992 the Energy Policy Act mandated minimum levels of nominal efficiency which some classes of motors were required to meet after October 27, 1997. As a result of the market demand for standardization in the identification of motors having efficiency that exceeded the levels set by the Energy Policy Act, NEMA introduced the new Premium efficiency motor standard in June of 2001.

In 2007 the U.S. Congress passed the Energy Independence and Security Act increasing the level of the efficiency standards on existing covered electric motors and added efficiency standards for additional types of electric motors manufactured on or after December 19, 2010. In February of 2011 NEMA revised Premium Efficiency Motor tables for medium motors by adding efficiency values for 8 pole Premium efficiency motors.

It is important that motor users and specifiers understand the selection, application, and maintenance of electric motors in order to improve the management of electrical energy consumption. Energy Management as related to electric motors is the consideration of the factors that contribute to reducing the energy consumption of a total electric motor-driven system.

Among the factors to be considered are the motor design and application.

An electric motor is an energy converter, converting electrical energy to mechanical energy. For this reason, an electric motor should be considered as always being connected to a driven machine or apparatus, with specific operating characteristics, which dictate the starting and running load characteristics of the motor. Consequently, the selection of the motor most suitable for a particular application is based on many factors, including the requirements of the driven equipment (e.g., starting and acceleration, speed, load, duty cycle), service conditions, motor efficiency, motor power factor, and initial motor cost. These application factors often conflict with one another. The driven system efficiency is the combination of the efficiencies of all of the components in the system. In addition to the motor, these components include the driven equipment (such as fans, pumps, and compressors) power transmission components (such as belts, pulleys, gears and clutches). Other components which are not a part of the driven system will affect the overall system efficiency; some of these are refrigerator and air conditioning evaporator and condenser coils, piping associated with pumps, ducts and baffles associated with fans and blowers, and motor controllers (ac variable speed drives and power factor controller).

Good energy management is the successful application of the motor controller, motor, and the driven components that results in the least consumption of energy. Since all motors do not have the same efficiency, careful consideration must be given to their selection and application.

1.1 REFERENCED STANDARDS

Canadian Standards Association
178 Rexdale Boulevard
Toronto, Ontario, Canada M9W 1R3

CSA 390-10 *Energy Efficiency Test Methods for Three-Phase Induction Motors*

Institute of Electrical and Electronics Engineers (IEEE)[1]

[1] Also available from ANSI.