The Scope for Energy Saving in Japan from Motor Driven Systems

The Japan Electrical Manufacturers' Association
—Secretariat Kei Konishi—
Takahiro Takeda

Industrial Electric Motor Systems Workshop
15.-16. May 2006
Paris, France

Outline

- Introduction
- Progress in development of high efficiency motors in Japan
- JIS C 4212 “Low-voltage three-phase squirrel-cage high-efficiency induction motors”
- Japan’s energy saving measures

Introduction

- The turmoil caused by the first and second oil crises of the 1970s had a great impact on Japan's subsequent energy policies.

- In Japan, when the industry has tackled the miniaturization of equipment, development of energy-saving technologies, etc., energy saving has been promoted.

Progress in development of high efficiency motors in Japan

- Oil crisis in 1973
- JEM-TR 137 “Selection and Application of Motors for Energy-Saving” in 1982 by JEMA
  “Efficiency criteria of the TEFC motors for energy-saving ”
- The Kyoto conference on the prevention of global warming in December 1997
- “Energy Conservation low” established in 1979, revised in 1999 & 2003
- JIS C 4212 “Low-voltage three-phase squirrel-cage high-efficiency induction motors” in July 2000

JIS C 4212 “Low-voltage three-phase squirrel-cage high-efficiency induction motors”

Scope

Number of poles:2, 4, 6

Rated output :0.2 kW to 160 kW

Rated voltage :200 V, 220 V, 400 V, 440 V

Frequency :50 Hz, 60 Hz,
supporting both 50/60Hz

Protection: :IP4X (TEFC), IP2X (ODP)

JIS C 4212 “Low-voltage three-phase squirrel-cage high-efficiency induction motors”

Efficiency testing method（brake method or dynamometer method）

a. No load test

Measurement: voltage, current, input power

Results: mechanical loss, the iron (core) loss

b. Load test

Measurement: Input power, current, slip, torque, stator winding resistance

Results: Total loss, primary and secondary resistance loss

c. Smoothing out stray load loss

Results: Smoothed stray load loss calculated from measured stray load loss

d. Calculation of efficiency

Result: Along IEEE standard 112, efficiency calculated from primary and secondary resistance loss (correction value), mechanical loss, the iron (core) loss and smoothed stray load loss

JIS C 4212 “Low-voltage three-phase squirrel-cage high-efficiency induction motors”

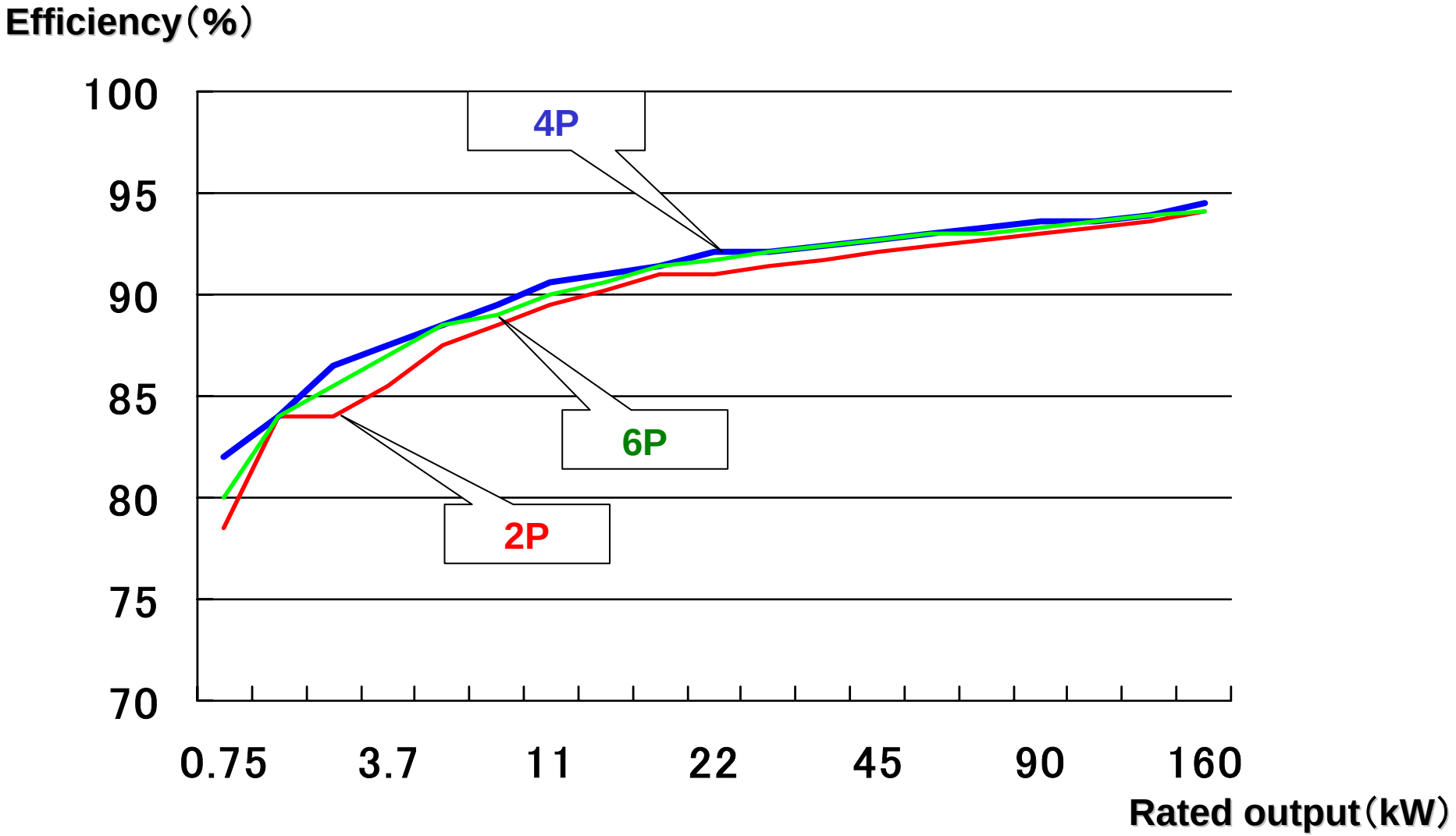
Efficiency values

Basis: Efficiency values of EPACT in USA (60Hz)

Efficiency values were decided considering

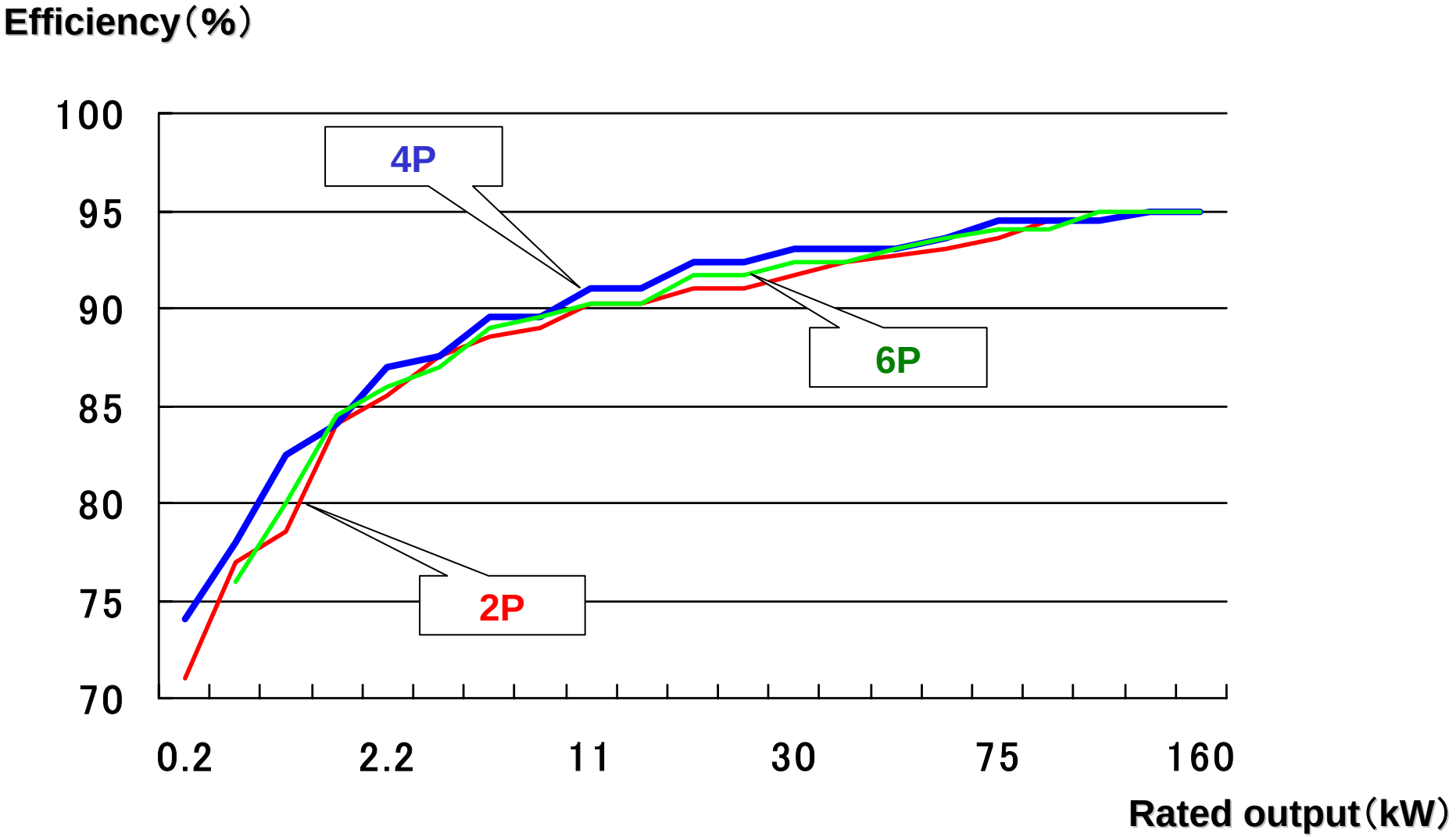
the condition of 50 & 60Hz in Japan

Efficiency values of IP 2X motors



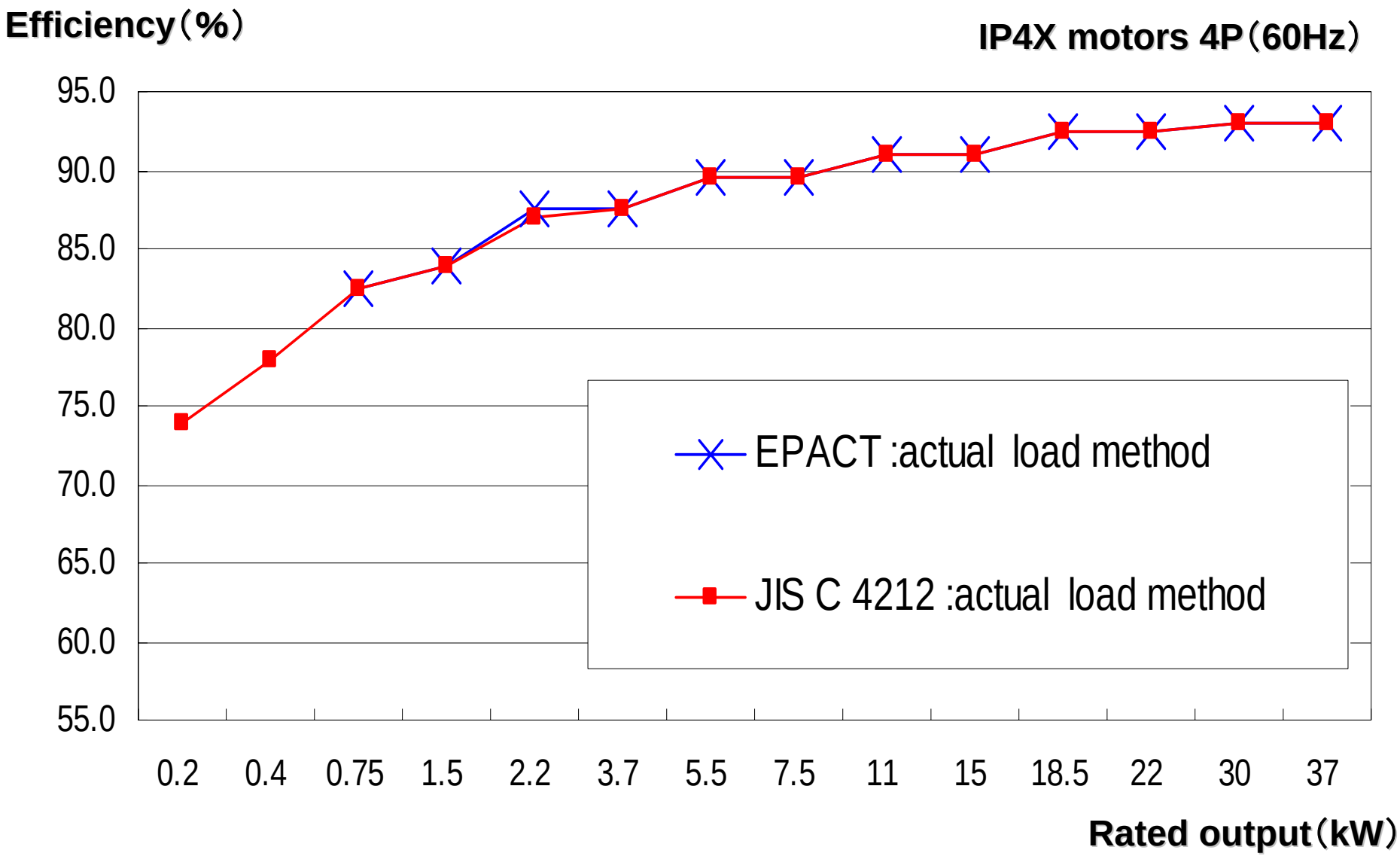
High-efficiency induction motors-3phase-2P, 4P, 6P(60Hz)

Efficiency values of IP4X motors



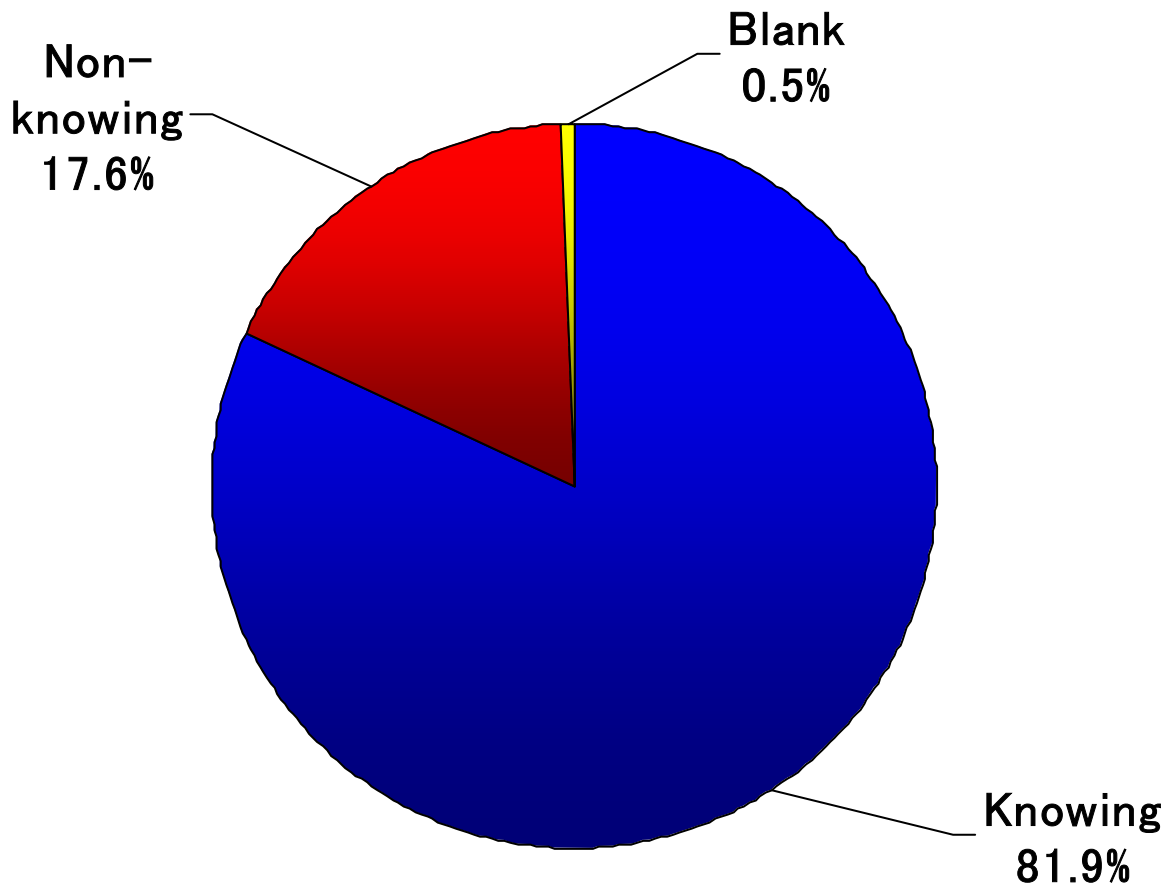
High-efficiency induction motors-3phase-2P, 4P, 6P(60Hz)

Comparison of Efficiency values : EPACT, JIS C 4212

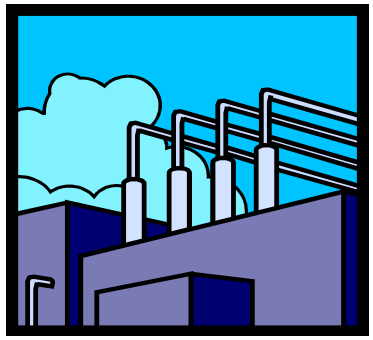


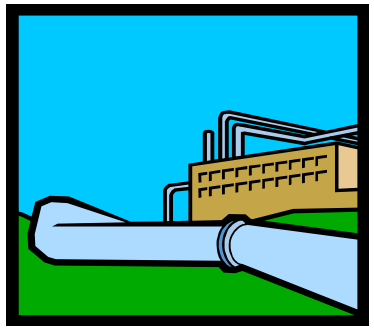
The rate of popularization of high-efficiency motors in Japan

Users' Survey by JEMA(2004) Reply :188 company



Energy saving of Motor plus inverter





Selection

Selection

Selection

High-Efficiency Motor

+

Motor

Inverter

Energy saving of Motor plus inverter

- The user has chosen the combination of a motor and an inverter from the side of cost effectiveness.
- Japanese industrialists preferably introduce an energy saving measure to apply power electronics to motor drive systems rather than high efficiency motors. This is due to the continuous and stringent requirements for energy saving in Japan.

Japan's energy saving measures

Higher efficiency motors

High efficiency induction motors

（JIS C 4212:2000）

Permanent magnet Synchronous motors

（JEM 1487:2005）

Higher efficiency for driving systems

Saving energy by inverter drive variable speed

（JEM-TR 148: 1986 Application guides for inverter-drive (general purpose inverters))

Summarizing

- **Progress in development of high efficiency motors in Japan**
- **JIS C 4212 “Low-voltage three-phase squirrel-cage high-efficiency induction motors”**
- **Japan’s energy saving measures**

Information supplement

The Japan Electrical Manufactures' Association

TEL : +81-3-3556-5884

E-mail : kei_konishi@jema-net.or.jp

URL : http://www.jema-net.or.jp

Thank you

For

Polite listening