

Coiltech 2011 Nord Alpe Adria – 28/29 September 2011

SESSION 1

The revolution of the electrical motors

UNIVERSITA' DELL'AQUILA

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The new frontiers in the efficiency of the electric motors

Abstract

It is common that in industrial activities most of electric energy consumption is due to electric motors. A preliminary study carried out by European Community shows that electric motors are put on the European market in large quantities, and their energetic consumption in the use phase stands for the most important environmental feature among all life cycles phases, with an energy consumption in a year of 1067 TWh in 2005, like to 427 Mt carbon emissions. Without control measures energy consumption is doomed to increase up to reach 1252 TWh in 2020. In July 2009 European Commission published a new agreement (Nr. 640/2009) concerning the specifications for an environmentally compatible design of electric motors. The new rules, based on international standards, means a great step towards a global harmonization among the different rules on efficiency, and it can be applied to three-phase induction motors, 2, 4 and 6 poles, with power in a range between 0.75 kW - 375 kW, continuous duty S1. Two efficiency level have been introduced: IE2 (High efficiency) and IE3 (Premium efficiency, totally new for Europe, equal to the American "Nema Premium"). The new agreement of European Commission has to promote the penetration into the market of technologies that reduce the environmental impact of electrical devices during their life cycle, with an energetic and electricity consumption saving estimated in 135 TWh respectively, within 2020, compared to a setting where no measures would be taken. The new motors classification and the coming dates open new settings for electric motors Manufacturers, which will have to adapt their production cycle and invest on development strategies for innovative and high efficient motors.

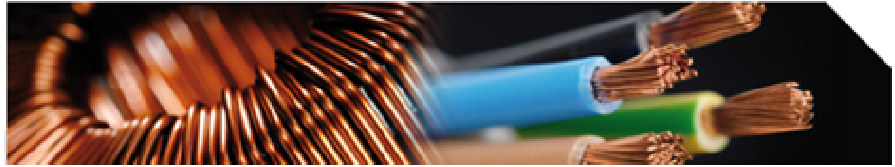
In this study several solutions will be proposed for the improvement of induction motor efficiency. Moreover, some prototypes of IE2 and IE3 motors will be presented in order to demonstrate the achievement of the least efficiency levels set by European Community, through the use of innovative technological solutions and an optimized motor design, keeping construction restrictions typically adopted for these motors classes.

Curricula Prof. Marco Villani

Nato a Lecce l'11 novembre 1960. Nel 1985 ha conseguito la laurea in Ingegneria Elettrotecnica presso la Facolta' di Ingegneria dell'Universita' dell'Aquila. Nel 1987 ha vinto la borsa di studio di perfezionamento all'estero "Ferdinando Filauri" che gli ha consentito di effettuare uno stage presso la Technische Universitaet - Sektion Elektrotechnik di Dresda.

Ha coordinato numerosi progetti di ricerca, in collaborazione con Enti ed Industrie sia nazionali che europee. Ha partecipato a numerosi programmi finanziati dalla Comunita' Europea (progetti SAVE II), dal Ministero dell'Universita' e della Ricerca Scientifica (progetti PRIN, COFIN) e dal CNR. Referente, nell'ambito dei programmi Erasmus, degli accordi bilaterali con le Universita' di Amiens e di Kaunas.

La sua attivita' di ricerca riguarda prevalentemente la modellistica e la progettazione di motori elettrici per impieghi nel settore industriale, aeronautico e nel settore "automotive" ed e' documentata da circa 90 pubblicazioni in conferenze e riviste nazionali ed internazionali. Attualmente e' docente del corso di Costruzioni Elettromeccaniche presso Facolta' di Ingegneria dell'Universita' dell'Aquila.



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EUROGROUP

Ing. Gianluca Pagani

The efficiency as an integration of the synergies of the different components of the electrical motors.

Abstract

Reaching the goal of high efficiency on rotating electrical machines, according what requested by European Norms, is the result of the optimization of several parts working on them. It will be summarized losses genesis and what are the main strategies for reducing them, which are not only confined to the active parts. Efficiency is also a different way to consider the machine design and its use.

Curricula Ing. GianLuca Pagani

Dr. Ing. Gianluca Pagani has based his whole working experience on electrical machines world, starting from designing and developing permanent magnet machines as technical director in motor companies, special electrical machines (linear, induction, high speed,/torque, high efficiency, variable reluctance, medium voltage).

Now he is with Euro Group S.p.A. and leads Euro Efficiency Team, which is a recently formed pool of experts in electrical machines specialized on high efficiency topics. Dr. Pagani is also a Member of IEEE and a registered engineer on Milan Order of Engineers.

CEMP Srl

Ing. Marco Garbuio

From the theory to the reality: as an electrical motors manufacturer is challenging the opportunity of the revolution in the efficiency

Abstract

How the manufacturer could know the way to get high efficiency

- 1) To know the rules in Europe and in the rest of the worlds (IEC norms and extraeuropean norms for references values)
- 2) To know the way to measure the efficiency of the motor (IEC norm 60034-2-1)

Why and how CEMP decided to answer to the challenge of high efficiency :

- 1) Little presentation of the company
- 2) Main modification on CEMP IE2 product design
- 3) Efficiency on flameproof motors

Curricula Ing. Marco Garbuio

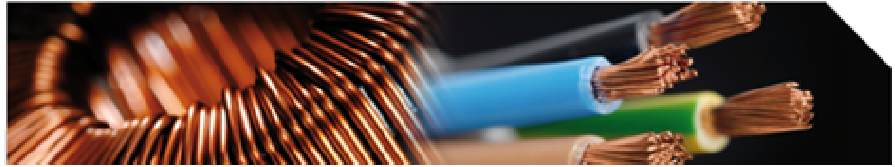
Degree in Electrical Engineering - Politecnico di Milano, 2002

CEMP srl (from 2006):

Responsible for testing room, designer and R & D manager Leroy Somer spa (2003-2006) :
technical support to the sales

OTHER ACTIVITIES

Member of CEI, Technical Committee 2 (rotating machinery).



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KIENLE+SPIESS

Dr. Michael Braun

IE3 and IE4 a great challenge for the electrical motor manufacturers

Abstract

Recent legislation in the USA, Europe and China has been defined with the objective of setting new standards for the production of energy efficient motors. Some of the standards have already become effective; others will come into effect within a few years.

It is already apparent that the standards will be difficult to meet with current asynchronous motor designs. This paper discusses various possible solutions in providing compliance with the new standards.

Traditional induction motors require more volume to generate the same output, however, this is a limited solution and is not possible for many applications. In contrast, permanent magnet (PM)synchronous motors comply with the specified efficiencies without volume increase and provide a better solution.

New applications are often realized with inverters. In these cases, PM synchronous motors are a good solution as well. The guidelines for the development of such a series are explained.

PM synchronous motors with embedded magnet blocks are best suited to meet all requirements and they offer great flexibility for range of applications.

The newly designed series covers diameters between 120 and 300mm. It can be extended to cover smaller or larger diameters as well. The results are illustrated using the example of a 5,5HP (170mm diameter) motor.

Curricula Dr. Michael Braun