



# Impulse

VEM SACHSENWERK

• VEM MOTORS

• VEM MOTORS THURM

• KEULAHÜTTE

Dear readers,

Looking back over my long career, I cannot remember ever having seen the German economy so dependent on external influences. VEM is also noticing the limited room for manoeuvre. But we fortunately began to take precautions at an early stage, and our managing directors are mentally prepared for an immediate future characterised by modesty, reliance on our own abilities and a step down from the dynamic growth of the past decade.

I can tell you today, that all the VEM companies are operating practically without losses and are strengthening their capital base with stabilised bottom-line results, despite the capacity underutilisation of 30 to 40 per cent.



This crisis, too, will be followed by upswing. Our task now is to be prepared.

Through the postponing of investments, consistent use of the instrument of short-time working, reduction of the numbers of temporary employees and timely implementation of a drastic programme of savings, we have built up comforting liquidity reserves, and will be continuing this process of stabilisation over the coming months.

We are maintaining our cash discount policy for all invoices, and our banks have expressed their further confidence in VEM, not least thanks to our prudent, forward-looking actions and our open information policy. We are thus justifiably optimistic that the crisis can now be weathered at our current level, i.e. without redundancies and loss of competence.

The crisis will be followed by an upswing. That must be the next subject of our preparations. Employees and management alike must learn from the problems of the past years. Please permit me to outline the most important tasks:

- Our bank liabilities must be reduced by clearing our still excessive stocks. I would consider liabilities of the order of two months group turnover to be acceptable - but no more than that.
- Borrowed funds will be capped at no more than one-third for all future investments, and the same must apply to business acquisitions and construction work.
- The period of reduced utilisation must be used for further training. I am here thinking of language skills, for example English, Russian and French.

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## Graduated plan for IEC motors

Energy efficiency (part 4): VEM offers a broad spectrum of classified energy-saving motors

On the basis of the new standard for efficiency classification (IEC 60034-30), an international understanding has been reached on widening of the relevant output range to 0.75 to 375 kW not only for 2- and 4-pole motors, but in future also for 6-pole versions.

The labelling follows in the footsteps of that already established for protection categories (IP = International Protection) and is to use the abbreviation IE, standing for International Efficiency:

IE1 Standard efficiency (former EFF2 class)

IE2 High efficiency (former EFF1 class)

IE3 Premium efficiency

This standardisation at the same time forms a basis for implementation of the EuP directive 2005/32/EC "Ecodesign requirements for energy-using products" in the field of drive technologies. The implementing Commission Regulation (EC) No. 640/2009 of 22<sup>nd</sup> July 2009 has set the course for the transition of the market to energy-saving motors.

The transition is to be accomplished in three phases:

Phase 1: Minimum efficiency IE2 from 16<sup>th</sup> June 2011

Phase 2: Tightening of requirements to IE3 (premium motors) from 1<sup>st</sup> January 2015 for the output range 7.5 to 375 kW; optional possibility: IE2 + variable speed drive

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Energy-saving motors enable operating costs to be reduced in many branches of industry.

Photo: Wolfgang Koglin

## 8<sup>th</sup> Technical Conference of the VEM Group

New challenges and trends in power generation and electric drive technologies

With a comprehensive and sophisticated lecture programme, the 8<sup>th</sup> VEM Technical Conference continues in the tradition of its successful predecessors between 2001 and 2008. Alongside contributions from university researchers, the participants can once again look forward to a whole series of exciting presentations from representatives of motor manufacturers and industrial applications. A total of 18 topics have been placed on the conference agenda.

One of the key issues for the Technical Conference - as already last year - will be energy efficiency. Against the background of the EuP directive on ecodesign requirements, and here particularly its implications in the field of drive technology, this subject has become more topical than ever. In July 2009, the European Commission published a regulation

implementing the EuP directive in the form of a graduated plan for the transition to energy-saving motors. This topic will no doubt be a source of ample debate in the coming weeks and months.

Questions regarding the use of renewable energies are another important theme. The lectures addressing power generation based on wind turbines and hydro-electric power stations are certain to trigger some interesting discussions.

The broad spectrum of subjects for the conference includes also drive technologies in energy and power supply applications, permanent-magnet motors and generators, the demands placed on modern motor lubricants and high-voltage insulation materials, and possibilities to avoid damage to electric machines.

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New production machinery for frame sizes from 280

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Preview of the 8<sup>th</sup> Technical Conference in Wernigerode

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Deutsche Welle film team at Sachsenwerk

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# New turning machine for end shields

VEM motors invests in further production machinery for frame sizes 280 to 450



Photo: VEM

The end shields for motors from frame size 280 upwards can in future be manufactured on a single machine at VEM motors in Wernigerode. In July, a new PITTLE PV1250 vertical turning machine was taken into operation. It possesses a separate milling spindle in the form of a swivel head and can be used for drive-end, non-drive-end and flanged end shields. The workspace and clamping chuck are already dimensioned to be able to handle parts for the future shaft height 450.

To date, the turning and various drilling operations were performed as separate work steps. The concentration on a single machine now releases the previous resources for other tasks and enhances overall production flexibility. As some of the previously necessary machining steps have been eliminated, intermediate transport and storage has become superfluous. That shortens throughput times and thus raises manufacturing capacity.

A crane lifted the new turning machine from the lorry, ready for transport into the production hall.

Continued from page 1: **Graduated plan for IEC motors**

Phase 3: Widening of the output range to 0.75 to 375 kW from 1<sup>st</sup> January 2017; optional possibility: IE2 + variable speed drive

The VEM Group will be gradually adapting its product range to these new regulations. As a first step, motors of the EFF2 and EFF1 classes are available with IE1 and IE2 classification with immediate effect. Alongside the previous 2- and 4-pole motors, this is also to apply to 6-pole versions and the full output range of IEC 60034-30. The foundation has thus been laid for energy-efficient solutions on the basis of optimised motors and drive systems. A focus is to be placed on the IE2 series, which is to be developed further as the future main series of the VEM modular system.

At the same time, IE2 motors can also be supplied for use in explosive atmospheres and for incorporation of the most varied mechanical modifications, for example brakes and forced ventilation.

## Energy-saving compact drives on the basis of efficiency class IE2

An energy-saving compact drive is achieved by combining an IE2 motor with a frequency converter. Enhanced efficiency is achieved not only at full load and the rated frequency of 50 Hz, but also in the partial-load range and at lower frequencies. Such drives require a higher initial investment, but soon pay back this additional outlay by way of their lower operating costs. This drive solution will benefit not only traditional fields of application, for example pump and fan drives in air-conditioning systems, but also new branches such as conveyor engineering and vacuum technology. Our drives are available with outputs up to 22 kW.

## Permanent-magnet synchronous motors

With the P21R series for outputs from 0.18 to 45 kW in 4-pole versions, or up to 30 kW in 6-pole versions, VEM has completed its modern range of energy-efficient drive solutions.

Permanent-magnet synchronous motors (PSM) achieve a higher output than an asynchronous motor of the same size. As the rotor follows the rotating field exactly, PSM is an ideal choice, for example, for transport conveyors with several drives running synchronously. This series is operated exclusively with frequency converter and can be characterised by the significantly enhanced efficiency compared to asynchronous motors. All types and modifications of the standard motor series can be supplied.

VEM is hereby also responding to the trend towards variable-speed drives as a means to raise efficiency. Maintenance-intensive DC machines are replaced by simple three-phase alternatives.

Another important field of application is to be found in small-scale power generation. In the case of renewable energies, in particular, permanent-magnet synchronous motors can be used successfully both for simple standalone applications and in corresponding inverter configurations for inputs into the public grid.



Wind turbines with lattice tower

Photo: SeeBA Energiesysteme GmbH

## PRODUCT RANGE OVERVIEW

IE1 (EFF2) Standard motors	IE1-K21R	2, 4 and 6 poles	IEC 80 to 355
Ex nA II T3	IE1-K..R... Ex nA	2, 4 and 6 poles	IEC 80 to 355
Ex tD A22 IP55 T125°C	IE1-K2.R...Ex II 3D	2, 4 and 6 poles	IEC 80 to 355
Ex tD A21 IP 65 T125°C	IE1-K1.R...Ex II 2D	2, 4 and 6 poles	IEC 112 to 315
Ex tD A21 IP 65 T125°C	IE1-K2.Q...Ex II 2D	2, 4 and 6 poles	IEC 112 to 355
Ex d(de) IIC T3-T6	K82R... Ex d(de) IIC	2, 4 and 6 poles	IEC 63 to 450
IE2 (EFF1) Standard motors	IE2-WE1R/W21R	2, 4 and 6 poles	IEC 80 to 355
Ex nA II T3	IE2-W.1R...Ex nA	2, 4 and 6 poles	IEC 132 to 355
Ex tD A22 IP55 T125°C	IE2-W.1R...Ex II 3D	2, 4 and 6 poles	IEC 80 to 355
Ex tD A21 IP65 T125°C	IE2-W.1R...Ex II 2D	2, 4 and 6 poles	IEC 132 to 315
Ex d(de) IIC T3-T6	K82R... Y2 Ex d(de) IIC	2, 4 and 6 poles	IEC 80 to 450

8-pole energy-saving motors with increased efficiency can be supplied without classification.

| FAIR |

## Positive summary of AICHEMA 2009

Chemical plant engineering has its sights set on the future. That was also the conclusion reached by VEM after AICHEMA 2009. The fair is considered the global industry forum, at which specialists meet to exchange the latest information on new and further developments for the chemical, petrochemical and gas industries, as well as their ancillary branches.

Over the course of the five days, VEM was able to welcome many more visitors to its stand than at the previous fair in 2006. Energy-saving motors attracted particular attention. With a new generation of explosion-protected drives, VEM had plenty on offer to address the currently omnipresent topic of energy efficiency.

The interest shown by the fair visitors was renewed proof of our reputation as a partner to chemical and engineering companies throughout Europe, and indeed worldwide. The quality of the contacts and meetings dispelled all feelings of crisis. And so VEM can look back with satisfaction to AICHEMA 2009, and to the confirmation that we are on the right track with our commitment.



Photo: Wolfgang Koglin

Energy-saving motors of the second generation (efficiency class IE2) were a focus of attention for visitors at AICHEMA.

Continued from page 1: **Editorial**

- Better and above all confident use of our SAP systems.
- Better mastering of the theoretical background to our compact drives in the competence centres.
- Closer employee interactions between the sales and production departments.

I expect our employees to show even more initiative than to date and to seek future-oriented further qualifications. Lifelong learning must be more than just an empty word. Every single one of us must know that the global battle for markets has only just begun, and that only the best will survive. Unfortunately, we must here still mend some of the results of our over-reformed West German school system. Short-time working will continue for a while yet, so let us make optimum use of our time.

It is equally important to share the free time with our families. Especially in times of crisis, the support and motivation arising from family relationships is indispensable. The family bonds which you experienced in the years before unification made you strong. Remember those times. Are the Maldives really important? Cycle to the Baltic Sea with your wife/husband and children. When you return, nothing will be able to get you down. And after the elections, there are a number of truths which will come to the surface.

I hope you will take my words as positive inspiration. Let's get ready for the economic revival in 2011/12. I am already looking forward to celebrating new successes with you. But in the meantime, I am content to wish you and your families a pleasant holiday.

Yours, Freiherr von Rothkirch

# Future drive technology

8<sup>th</sup> Technical Conference on current topics and trends in electric machines



Under the heading "Future drive technology", the 8<sup>th</sup> Technical Conference in Wernigerode will again be presenting a broad spectrum of lectures. Some of the contributions had already been submitted before our editorial close, enabling us to give you the following sneak preview:

## Energy-saving potential in electric drive technologies – Status and trends

**Prof. Dr.-Ing. Wilfried Hofmann, TU Dresden**

Prof. Wilfried Hofmann from the Dresden University of Technology will be outlining the potential for energy savings in electric drive applications. The relevant factors include new materials for use in electric machines and converters, speed variability and the overall optimisation of industrial processes through the use of electric drives. Based on the current power consumption figures for Germany, a number of examples serve to illustrate the potential and its limitations.

## Innovative linear direct drive for transport conveyors

**Prof. Dr.-Ing. Bernd Ponick, Leibniz University of Hanover**

Linear direct drives have been realised for a variety of applications in recent years. Compared to conventional drive solutions, they are characterised by their high precision and dynamic response. One drawback is that generally high normal forces arise, and furthermore only limited motions are available in many cases. It is also not possible to use the whole active part for drive power generation, but always only that part in which the rotor and stator overlap.

The contribution by Prof. Bernd Ponick looks at the initial designing, coarse dimensioning and optimisation of a linear motor with which to drive transport conveyors. Particular attention is paid to the force ripple, which arises, on the one hand, from the chosen combination of pole number and stator slots, but at the same time from the end effects inevitable with a linear motor. Various countermeasures are discussed and compared with regard to the extent of their effectiveness.

## Damage to electric machines

**Dr. Frank Hillmann, HDI-Gerling Industrie Versicherung AG**

The lecture given by Dr. Frank Hillmann from the insurance company HDI-Gerling Industrie Versicherung AG addresses possibilities to avoid damage from the points of view of manufacturers, operators and service companies. By way of selected examples of damage to electric machines and drive systems, he identifies the factors which are important in damage prevention. Rotating machines are placed in the foreground, but transformers and damage to wind turbines are nevertheless included in the discussion.

## Challenges to be met by modern lubricants in electric drive engineering

**Dieter Schuster, Klüber Lubrication München KG**

The increasingly variable operating conditions for electric motors represent an ever greater challenge for bearing lubricants. The prime issue is not only to achieve the longest possible relubrication intervals, but also to satisfy demands concerning quiet running, wear resistance and corrosion protection. At the same time, speed control by way of frequen-

cy converters enables electric motors to be operated across a wide speed range and under the most varied loads.

The tribo-system is only able to meet such diverse requirements through ultimate flexibility and efficiency. The theoretically recalculated lubrication interval and the grease lifetime play an important role in ensuring optimum operating reliability during service intervals. Dieter Schuster from Klüber Lubrication München KG explains how the demands are reconciled with the fundamental properties of modern antifriction bearing lubricants for electric motors, and illustrates the decisive contribution of special lubricants.

## Off-line partial discharge measurements on the insulation of high-voltage machines

**Dr. Jürgen Stahl, VEM Sachsenwerk GmbH**

The insulation of high-voltage machines is subject to partial discharges over its whole lifetime. The measurement of such discharges is the subject of the lecture prepared by Dr. Jürgen Stahl.

Modern PC-assisted measurements and analyses supply numerous partial discharge parameters and patterns. Furthermore, partial discharge values already display fluctuations during measurement, and the results are also influenced by the design of the winding and insulation system. The interpretation of partial discharges on machine insulations thus requires comprehensive and systematic measurements under comparable test conditions. This forms the basis for collective evaluations and trend observations.

## Dimensioning of drives for mobile driven machines

**Prof. Dr.-Ing. Norbert Michalke, Dipl.-Ing. Uwe Schuffenhauer, University of Applied Sciences (HTW), Dresden**

The replacement of a threshing drum motor with an electric direct drive is the example taken by Prof. Norbert Michalke and Dipl.-Ing. Uwe Schuffenhauer from the University of Applied Sciences (HTW) in Dresden to examine the dimensioning of drives for driven machines. The task is achieved with a synchronous external-rotor motor with permanent magnet.

The lecture points out the possibilities and limitations of a cooling with phase reversal to store the losses from peak loads. The use of FEM programs and own service programs for calculations of warming and operating behaviour are similarly discussed.

## Cooling of permanent-magnet machines with external rotor for wind turbines

**Prof. Dr.-Ing. Thomas Burkhardt, HTW Dresden**

The lecture given by Prof. Thomas Burkhardt from the University of Applied Sciences (HTW) in Dresden deals with the cooling of external-rotor machines designed specifically for low-power wind turbines. He explains the basis of the thermal calculations and describes the flow model for optimisation of the cooling system. The discussion addresses furthermore the determination of final temperature by way of a heat source network, verification of the results with prototype measurements, and detailed examinations with FEM and CFD analyses using ANSYS.

| 8<sup>th</sup> TECHNICAL CONFERENCE |

## Overview of lectures

**Prof. Dr.-Ing. Wilfried Hofmann, Dresden University of Technology**  
*Energy-saving potential in electric drive technologies – Status and trends*

**Prof. Dr.-Ing. Bernd Ponick, Leibniz University of Hanover**  
*Innovative linear direct drive for transport conveyors*

**Dr.-Ing. Edwin Kiel, Lenze AG**  
*The future of drive technology – More copper or more software?*

**Philippe Thiéry, Moteurs Leroy Somer (F)**  
*Working title: Permanent-magnet motors*

**Prof. Dr.-Ing. habil. Dr. h. c. Andreas Binder, Darmstadt University of Technology**  
*Highly utilised permanent-magnet synchronous machine for industrial applications*

**Dipl.-Ing. Reinhard Hagen, ATB Technologies GmbH (A)**  
*Energy-efficient drive solutions for industrial applications*

**Dr.-Ing. Christian Lehrmann, Physikalisch-Technische Bundesanstalt, PTB Braunschweig**  
*Technologies to protect induction machines against unacceptable warming as a result of overload*

**Dr.-Ing. Frank Hillmann, HDI-Gerling Industrie Versicherung AG**  
*Damage to electric machines – Possibilities to avoid damage*

**Dieter Schuster, Klüber Lubrication München KG**  
*Challenges to be met by modern lubricants in electric drive engineering*

**Dr.-Ing. Jürgen Stahl, VEM Sachsenwerk GmbH**  
*Off-line partial discharge measurements on the insulation of high-voltage machines*

**Dipl.-Ing. Frank Steuer, VEM motors GmbH**  
*Energy-efficient drive solutions for the steel industry*

**Prof. Dr.-Ing. Norbert Michalke, Dipl.-Ing. Uwe Schuffenhauer, University of Applied Sciences (HTW), Dresden**  
*Dimensioning of drives for mobile driven machines*

**Dr.-Ing. Hans Linnenbrink, Bayer MaterialScience AG; Dipl.-Ing. Herges, RAG; Herr Wagner, Evonik; Dipl.-Ing. Bracke, ThyssenKrupp-Steel AG**  
*VIK working group "Drive technology" Drive technology in energy and power supply applications*

**Dipl.-Ing. Jörg Krebs, Krebs & Aulich GmbH**  
*High-efficiency permanent-magnet generators for renewable energy generation in hydropower plants*

**Dr.-Ing. Henri Arnold, VEM Sachsenwerk GmbH**  
*Double-fed asynchronous generators for wind turbines – Trends for the future*

**Prof. Dr.-Ing. Thomas Burkhardt, Dipl.-Ing. Martin Eckart, Sören Miersch M.Sc. University of Applied Sciences (HTW), Dresden**  
*On the cooling of permanent-magnet machines with external rotor for low-power wind turbines*

**Andreas Siemens, Mocotech GmbH**  
*Soft starters for start current limitation and torque reduction on MV motors for the output range 250–5000 kW and rated voltages 3.3–11 kV*

**Dipl.-Phys. Dirk Seehase, VEM motors GmbH**  
*The use of energy efficiency classes for explosion-protected motors and other special drives*

Further information: [www.vem-group.com](http://www.vem-group.com)

# Naming ceremony

## VEM motors demonstrate absolute reliability

The new club liner of the AIDA fleet was sent on its way under the name "AIDAluna" at a ceremony in Palma de Mallorca. Just like two of its sister ships, this 252 metre long and 32.2 metre wide liner was fully equipped with low-voltage motors from VEM at the Meyer Shipyards in Papenburg. VEM supplied some 400 motors, for example for fans and pump drives. The AIDAluna, the sixth club liner launched by AIDA Cruises and the third of a fully revised series, offers a total of 1,025 passenger cabins. The air-conditioning alone accounted for around 200 VEM motors. All the low-voltage motors on board had already demonstrated their reliability on the two-week maiden voyage from Hamburg to Majorca. The cruise liner will be spending its first summer season in the Baltic Sea. The seventh liner with the characteristic lips on its bows, the AIDAblu, is scheduled for launch in 2010.

An impressive party and firework display accompanied the official naming of the AIDAluna in Palma de Mallorca.



Photo: Kunstfeuerwerke Schallschmidt, Döbern

# VEM to be shown in Deutsche Welle documentary

## Filming and interviews at VEM Sachsenwerk



Photos: Karin Wagner

Film team in the production halls and interviews with VEM employees. Technologist Peter Sperling tells DW-TV World how he experienced the political changes of 1989, and how the current situation compares to that of the GDR years.

The television station Deutsche Welle-World is preparing a detailed documentary for worldwide broadcasting under the title "20 Years after the Berlin Wall - Made in East Germany". In this connection, the film will be presenting various enterprises in the Eastern states of Germany, among them also VEM Sachsenwerk. The example of our Dresden location is to illustrate the difficult starting point after unification and the subsequent successful transition to market economy conditions.

In an interview, Sachsenwerk managing director Gerhard Freymuth, explained why VEM is today so strong, and where the future challenges lie.

## | NEWS |

# 14.5 MW motors for power station in Datteln

The railway power station in Datteln to date comprises three blocks with a total capacity of 303 MW. In addition to electricity for the railway, the coal-fired power station also supplies district heating for the town of Datteln. The old installations, however, are now to be replaced with a new complex on the other side of the Dortmund-Ems Canal. The new power station block Datteln 4, which is planned to go into operation in 2011, will also be coal-fired.

VEM is supporting this major project with three water-cooled squirrel-cage motors with an output rating of 14.5 MW and a weight of 33.5 tonnes. The motors are to be used to drive the water pumps required to start up and shut down the power station.



Photo: Karin Wagner

Drive for power station water pumps

# Drives from Dresden for Warsaw tram

The latest generation of the "Warsaw" tram incorporates traction motors from Sachsenwerk. A corresponding agreement was signed with the leading Polish rail vehicle manufacturer PESA Bydgoszcz on 15<sup>th</sup> July 2009. The contract provides for deliveries of 752 motors of type DKCBZ 0211 4FA with an output of 105 kW each. The delivery period stretches from 2010 to 2013. The decisive point which clinched the deal for VEM was the high quality and reliability of the tram motors manufactured for PESA in the past. They are proving themselves on board modern low-floor trams in the cities Elblag, Lodz, Warsaw and Bydgoszcz.

## | IMPRINT |

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