

# EPHY MESSAGE 06/14

## EDITORIAL

### EPHY-MESS – well worth listening to!

The world economy is struggling to recover. India experiences a sea change as the Ghandi clan's Congress Party is voted out of office after 30 years in power. The new Prime Minister, 63-year-old Narendra Modi, who stands for fresh approaches and renewal, was elected amid great hopes. This contrasts with the scene in Europe where efforts are made to return to first principles in the face of strengthening criticism of the EU, which now must opt for either Junker or Schulz as the new head of the EU executive. At the highest diplomatic levels, frantic attempts at damage limitation in the Ukraine crisis are still underway as Russia's annexation of the Crimea has deterred many investors. In response, early in June 2014, the European Central Bank once again dropped base rates, this time to only 0.15%, in a move to crank up flagging economic growth. Meanwhile, what is happening in Germany? We are simply carrying on as we always have done, trying to live up to our reputation as a driving force within the European economic union. Against this background, how do things stand currently for German SMEs?

The anticipated upturn after the Bundestag election in September 2013 has failed to materialize. The rates of new orders have remained moderate. Instead of major orders, the large scale corporations are concentrating on restructuring exercises. On the contrary, in the takeover battle for ailing French company Alstom, Siemens is bidding to acquire Alstom's energy segment in competition with General Electric. The risk here is that Joe Kaeser may want to more or less give away his train-making segment to the French company. From the perspective of SMEs, this would be fatal because this would affect more than 50,000 German jobs in supplier industries, most of which could be lost, given that Alstom would use its own French networks. And as a result Germany would lose its key skills in high-speed train manufacturing just as it did when aircraft manufacturer Dornier was broken up. What a sell out! And what would be next to go – expertise in ship building? German shipyards have also been in free fall for decades and the cost pressures are huge here as well! Yet Germany needs bread and work for its citizens if it is to avoid social unrest because, ultimately, we would be ill-advised if we could no longer provide enough innovative and highly productive jobs (in terms of Germany's '4th industrial revolution'). If this were the case, we would be submerged by a

## Update:

# EPHY-MESS temperature sensors for wind turbines

EPHY-MESS has been deploying temperature sensors in wind energy installations since as far back as 1986. In February 2009, EPHYMESSAGE reported on these "sensor specialties" for wind turbines. This edition reports on activities and new discoveries since then.

Since that time, EPHY-MESS has seen the development of three main areas of activity in the field of wind energy:

- Creation of networks, contacts, ideas
- Increased customer-specific focus
- Anti-corrosion measures for temperature sensors

As far as contractual agreements with our customers allow, this special edition of EPHYMESSAGE reports on the subjects listed above:

### Creation of networks, contacts, ideas

The name displayed on the wind turbine is not always the name of whoever works out the concepts, drives forward developments or makes decisions! This is why it is important to know "Who makes What for Whom?" It has been possible to discuss and coordinate some very ambitious projects in their early stages with

independent development companies. One interesting discovery was the fact that quite a number of Asian wind turbines had been developed by or with the aid of German companies, though they normally still went on to be built in Asia!

Today, EPHY-MESS works together with development companies and installation manufacturers, their sub-suppliers and (also independent) service companies. We count world market leading manufacturers of onshore and offshore installations with or without gears among our customers today. And of course we want to acquire more customers as well!

Networking also covers attendance at specialist conferences / technical symposiums / trade shows to gather information on future demands and to keep up to date in technical matters. Trade shows (e.g. the

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offshore show and EWEA events) are especially good opportunities to exchange ideas and also technical points in a relaxed atmosphere with international customers and prospects. Another positive aspect is the chance to take on board the alternative views of customers. And finally, direct communication with customers produces interesting ideas and questions which bear on product development.

Of course, EPHY-MESS also regards attendance as an exhibitor at the wind energy trade show in Hamburg as one of the musts in this industry.

EPHY-MESS uses the wind community platform on the internet ([community.husumwind.com](http://community.husumwind.com)) to put interested customers in touch with contact partners with the right technical skills and to draw attention to subjects linked with wind energy. A final component is technical articles for publication in magazines on activities and new or redeveloped products for the communications and information package from Wiesbaden-Delkenheim.

### Increased customer-specific focus

It is becoming increasingly recognized that standard sensors are not always the best solution. Application-specific designs for different types of sensors often achieve technically better results.

These are mainly screw-in thermometers to monitor bearing temperature. Here, it is generally the mechanical specifications that need to be coordinated with the customer. Connection cables (insulation, shielding if necessary, number and length of conductors) are also very often the subject of discussion. Here are two examples of customer-specific solutions:

The customer had planned on having a bearing thermometer with two different installation depths. In practice, this would have meant two different types of sensor. By altering the construction and modifying the sensor housing, both installation lengths were covered by only one sensor. This enabled the customer to save one article number and cut down on the logistics expenditure, while unit costs also decreased due to larger production batch runs.

In order to measure brake disc temperature, a sensor was designed capable of withstanding working temperatures of up to +250 °C. The connection cable was up to 20 m long and would have twisted as the sensor was screwed in, but this was avoided by the ingenious design of the rotating sensor head.

A further field of interest is sensors located near permanent magnets, which are increasingly being used in generators. Here, due to the different installation sites, there are potentially special design and construction

features to be considered as well as coordination of sensor dimensions. If the sensor is to be used in a stator slot, does the design and construction need to be flat or can it possibly have a trapezoid design as a slot lock wedge? If installation is close to the magnetic field the question arises of the extent to which the construction needs to be fully shielded. In such a case, can a sensor housing made of metal be used at all? If not, EPHY-MESS has already designed sensors in special plastic housings.

Especially in the field of 'customer-specific sensor solutions', EPHY-MESS is well positioned. Thanks to the company's own mechanical manufacturing department (including NC-/CNC machines) even special constructions can be designed and manufactured relatively quickly.

To complement the classical applications such as external and internal gondola temperatures, and temperatures in the switchgear cabinet, in / on the



*Sensor with rotating sensor head*



generator, pitch and azimuth drives, on the gearbox, main bearing monitor and brake, the past 5 years have also seen the addition of temperature monitoring for central lubrication units, on busbars and power-dissipating cables.

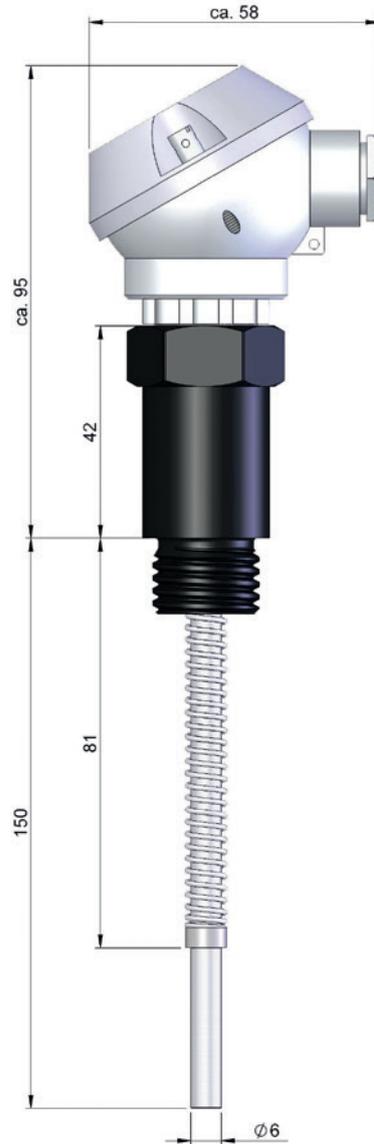
Here, different task scopes present particular aspects and features. In 'cold-climate' conditions - depending on which lubricant is used - the viscosity of the grease can change to a rather pasty state. To avoid this by switching on heating or prevent the risk of damage to the feed pumps, EPHY-MESS has designed a special bi-metal switch with a switching point slightly above 0 °C. Thanks to its design with a conventional M12 plug, this provides simple 'plug-and-play' functionality in the gondola and, thanks to its functional principle, a switch output without the need for any further control electronics.

The design of sensors for use on the busbars of wind turbines must be particularly resistant to high voltages. EPHY-MESS checks whether such special sensors also meet these requirements using its own high-voltage test rigs during the 100% output control. In order to meet continually growing kV requirements, EPHY-MESS is currently investing in a new test rig.

There have already been enquiries about sensors in ever more powerful wind turbines - for test operation at least - which monitor the temperature in cables laid in the ground to transmit the energy obtained. The particular focus here was on water-tight sensor designs.

EPHY-MESS is currently investigating potential concepts for the intelligent temperature sensors of the future which allow installations to continue operating even in the event of sensor failure.

The idea here is that in the event of a failure the active sensor switches automatically to a redundant second sensor and sends a fault signal to the plant operator or the on-duty control center. The plan is to install the necessary electronics and the two temperature sensors in a (conventional) sensor housing.



Company's own mechanical manufacturing department allows for special constructions

## CONTINUANCE EDITORIAL

*flood of cheaper goods from our Asian competitors - who compete not just on price but on quality and expertise as well. This would be the end of the road for the legendary slogan 'Made in Germany', leaving the once admired world export champion to content itself with the so-called service business .... !*

*Summary: We cannot afford to part so recklessly with our core skills. And it may well prove necessary to protect or maintain leading edge German technology through political means as well.*

*Thanks to the Department of Trade and Industry, we in the SME sector may be able to continue boosting export business through sponsored trips by industrialists to markets abroad. In this way, EPHY MESS*

*has been successful in recent years in cultivating markets such as India, China, Russia, Turkey, Japan and Korea.*

Sincerely yours

Andreas Becker

Offshore installations are seen as the main area of use, particularly as screw-in thermometers for bearing monitoring. The advantages would be hazard-free continued operation of the installation even in the event of servicing not being immediately available (e.g. in bad weather at sea) or, alternatively, service planning with a better schedule. This also includes active reporting on a fault to the monitoring points and reduced installation downtimes.

The technical requirements and underlying conditions are currently under investigation. However, at present, no decisions have yet been reached on either the possibility of manufacture or timeframes.

In the course of discussions on the potential for storing wind energy the subject arises again and again of converting wind power into gas. In this context, either the power is split by electrolysis units into hydrogen and oxygen or power is generated again from the two components in a reverse process in fuel cells. What both principles have in common is the need for temperature sensors to ensure the operating parameters.

EPHY-MESS engaged intensively with this subject area and found itself faced with very special requirements for sensors after discussions with relevant research institutes, universities and industrial enterprises. As an innovative solution compared with the commonly used thermoelements, EPHY-MESS designed miniaturized temperature sensors on an NTC-basis, which allow an output signal with significantly better resolution. For various applications on PEM cells with a self-defined upper application temperature of +250°C, three different sensor models were designed which we are happy to describe in greater detail for interested customers.

## Anti-corrosion measures for temperature sensors

Attendance on a course of lectures sponsored by the state of Hessen entitled 'From Bionics to Technology' enabled an interesting subject to be transferred into one of our own projects.

EPHY-MESS has continued developing a novel, innovative foundation coating based on nanotechnology and today can supply a coating system as an optional anti-corrosion measure for temperature sensors.

The situation to date had been that installation manu-



Testing corrosion resistance with salt spray

facturers often asked for anti-corrosion measures but either failed to specify exactly what or specified it in a manner that was impractical. An example of this is thick-film coatings on steel constructions, e.g. towers. While these coatings definitely work well, they 'isolate' the temperature sensors in their housings, causing wrong measurements, which makes them unusable in sensor applications.

The discoveries and test results obtained have been discussed in detail and given a positive rating by a research institute renowned in the wind energy field. In the course of this process, ideas and suggestions for testing additional product characteristics specific to wind energy were taken up and investigated by EPHY-MESS.

According to the institute, it is not aware of any supplier working in the field of anti-corrosion measures for temperature sensors other than EPHY-MESS to date, although the experts recognized a strong need for action on this subject. Given that manufacturers often publicize a useful working life for wind turbines of 20 to 25 years, anti-corrosion measures deserve special attention. The additional cost of the optional nano coating was rated as acceptable by contacts consulted so far, but the main positive aspect is its relatively flexible usability on different forms of sensors.

If interested, we should be happy to supply further details where necessary. However, the coating of components of other manufacturers is still not available as a service.

### Summary:

EPHY-MESS continues to see growth potential for the wind energy industry and will also continue to collaborate with users in discussing and designing special solutions and potential ideas for future temperature sensors.

As in the past, rising production numbers are supported by specific investments in tooling for manufacturing. A range of international distribution representatives advise locally, so that nothing stands in the way of sourcing original EPHY-MESS sensors in non-European countries, Asia for example included.

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