

BENDER CIRCUIT

Newsletter for Employees and Friends



■ *Safe exploration
20,000 leagues
under the sea*

■ *Going back
to our roots –
Electrical safety
in modern mining*

■ *Shaping the future
together*

■ *Safety first
– especially in the
nuclear world*

Power in electrical safety



Dear employees, dear friends,

In this edition of "Circuits" I am delighted to be able to present the many fields of application now covered by BENDER's proven and innovative technology.

Did you know, for example, that we are now involved in deep-sea exploration and that the reliability of BENDER's equipment is very much appreciated in this field? Or that our technology is being used in Russia for the underwater mining of diamonds? Or that even such highly sensitive fields as the petrochemical or atomic energy generation industries are now relying on BENDER? All these applications are a powerful testament to the fact that the entire BENDER team (of which we are all a part) is performing brilliantly and finding solutions to all the challenges faced.

A good example of this comes in the form of our new portable insulation fault location systems. The three-phase voltage monitors that we have developed are another case in point. Naturally, we are also concerned with issues at an international level and of a theoretical nature. That is why we have made a conscious decision to put our expertise to good use when it comes to the development of national and international electrical safety standards (VDE, IEC) so that our solutions might help to achieve further advances. Read on if you want to find out more.

And finally in this edition, we will be addressing the issue of what our future at the BENDER Group is going to look like following the hand-over to the next generation and how we will be facing up to the challenges of globalisation. Our "shaping the future together" project is now well underway and before we know it, it will be time for the next generation of the BENDER family to start actively managing the business at the end of the year. Read on if you want all the latest news about this.

I very much hope that you enjoy reading this edition.

Best regards

Yours Sincerely,
D. Christian Bender

CONTENTS

Editorial	2
Shaping the future together	3
Full steam ahead: BENDER Group Members meeting, in Mallorca 2006	5
Exelon Nuclear Safety first – especially in the nuclear world	6
Safe exploration 20,000 leagues under the sea	7
Reliable testing systems for maximum quality	10
Going back to our roots – Electrical safety in modern mining	12
Electrical safety solutions in the petrochemical industry	14
EDS190P Portable insulation fault evaluators	16
Measuring and monitoring relays that set new standards	17
The third edition of "Protective Measures with Insulation Monitoring" by W. Hofheinz	18
Company Chronicle	19

IMPRINT

Published by:

Dipl.- Ing. W. BENDER GmbH & Co. KG.
Londorfer Straße 65 • D - 35305 Grünberg / Germany

Editorial Staff:

Marita Schwarz-Bierbach, Anne Katrin Römer

Realisation:

SIDDESIGNMENT • www.s-designment.net
Natascha Schäfer, Dipl. Komm.-Designerin (FH)

Copy:

Timothy Hörl, www.dreipass.net

Photos:

Private or BENDER archives, TFH Berlin, ELMOS, INEOS

Dipl.- Ing. W. BENDER GmbH & Co. KG.
Londorfer Straße 65 • D - 35305 Grünberg • Germany
P.O. Box 1161 • D - 35301 Grünberg • Germany
Fon: +49 (0) 64 01-807 0 • Fax: +49 (0) 64 01-807 259
E-Mail: info@bender-de.com • www.bender-group.com

Dipl.-Ing. Walther Bender establishes an engineering company in Gruenberg

1946



Dietrich Christian Bender becomes Owner of the company

1972



Christian Bender junior takes over esb as Owner

Sabine Bender-Suhr becomes Executive Vice President and takes charge of Administrations

2000



After leading his company for over 35 years, D. Christian Bender is now ready to hand over responsibility for managing the business to the next generation. When Mr. Bender steps down from active management at the end of 2007, he will closely monitor and be heavily involved in the handover to what will be the third generation of the Bender family to run the company. He has every confidence in the innovative management team, made up of his children Sabine Bender-Suhr, Anne Katrin Römer, Christian Bender and Dorothea Bender, who will continue to benefit from Mr Bender's advice and support.

Shaping the future together

>> The handover to the next generation provides you as employees with new opportunities and perspectives, but it also brings with it many questions. In response to the question of how and in what direction the new management team is going to develop the company, we held intensive discussions in order to come up with a corporate vision for the future:

BENDER – The power behind electrical systems. We make electrical power safe! Here we have set ourselves a very ambitious target, as we do not want to ever stand still even once we have achieved our goals; instead, we want to keep driving our company forwards. We want to continue to build on our core competency and further strengthen the name





Integration of the BENDER companies throughout the world into the BENDER Group



Handing over to the third generation

2005

2006

of BENDER as the market's leading provider of electrical safety products.

To enable us to put this vision into practice, we need to make everyone aware of our strengths and goals. We need to make it clear why BENDER is ahead of the rest when it comes to electrical safety products and what our company's unique selling point is. Our corporate mission (in other words, our company objective, or why it is important that we exist) has been developed whilst bearing these requirements in mind: We at BENDER create the new technologies for safe handling of electrical power; thus we ensure the protection of people and the safe operation of machines, plants and systems. We take social responsibility for our employees.

In order to provide you our employees with clear and authoritative guidance on how to perform your day to day duties, we have also drafted a set of guiding principles on which our daily work should be based. They are not designed to be filed away and forgotten about, but are intended to make our working life that little bit easier, to support us and to help us to achieve our overarching goal, i.e. the long-term success of the BENDER Group, based on these shared principles.

In the future, the management of our company and our workforce will be more consistently based on our corporate vision, our mission and our guiding principles. Tried-and-tested methods will be retained but, at the same time, further potential must be exhausted more fully and new capabilities developed. This also means that the new management team will lead its employees in a spirit of cooperation and that this style must be adopted by all the company's management staff. The implementation of this style of management is designed to give every single employee a voice and the opportunity to take on more responsibility within the company. This will mean that, in the future, communication will be performed on a more reciprocal basis than previously, which is why all managers have been trained in this particular style of communication and management.

Of course, we must and we will hold on to the tried-and-tested methods which have been part of our company's ethos for over 60 years - and which still form the foundation on which our success is built. This is not about change merely for the sake of change - it is about motivation, efficiency and satisfaction; in short, it is about the success of the BENDER Group.

It is our most sincere wish that you will play an active part in this process of change, which we have called "working together to shape the future", and that you will assume responsibility for your own individual contribution to our joint success. And here we really do mean every single employee, no matter what their position.

Our common goal must be to prepare the BENDER Group for a successful future and to adapt it to the demands that are placed on flourishing modern enterprises nowadays. We want to make our employees happier in their work and to motivate them better, which will in turn make them more efficient and lead to more satisfied customers AND employees. In short, we want to work together to make the BENDER Group ready to face future challenges. ■

VISION

**BENDER – The power behind electrical systems.
We make electrical power safe!**

MISSION

We at BENDER create the new technologies for safe handling of electrical power; thus we ensure the protection of people and the safe operation of machines, plants and systems.

We take social responsibility for our employees.

& GUIDING PRINCIPLES

- > We aspire to be the best and want to inspire.
- > We are the technology leader, we set standards of excellence in technical innovation and quality.
- > Customers trust in our competence – we create added value for their applications and processes.
- > We provide customized solutions on short notice.
- > We concentrate on our core competency - Electrical Safety.
- > We actively participate in the development of standards.
- > We actively develop new markets.
- > We align our efforts to maximize the benefits to all BENDER Group members.
- > We manage economically and profitably to ensure a sustainable future.
- > We act with respect, honesty, integrity and openness.
- > We work together in shaping the future of the BENDER Group.
- > We assume responsibility for our actions.



Full steam ahead: BENDER Group Members meeting, in Mallorca 2006



In light of the new BENDER Group management team; new vision, mission, and guiding principles the BENDER Group management team identified a number of steps to communicate, train, and engage employees at all levels to ensure that the organization is well prepared for the future.

>> The first visible step of this process was an unprecedented meeting of all BENDER Group Member (BGM) company general managers and many key decision makers from Bender GmbH at a conference resort in Mallorca, Spain in October 2006.

While we can not share specifics about the meeting in this forum, it is important to know that it was a natural extension of the new management teams' motto "Shaping the future together". An acknowledgement that we need to work together to ensure a seamless transfer of responsibilities, to improve communications to be successful, and most importantly that we must work together to prepare all BENDER Group member organizations for continued growth and future challenges. In short, the "tried & true" has value and the experience of our people and member companies are key assets and success factors in our future.

Very early on in this process the BENDER Group management team identified that increased communication and management tools would be key ingredients to its future success. Therefore, the meeting was not just meant to familiarize general managers and senior management team members with the new team and its goals, but to embark on a path to identify and build a common future, i.e. to start the process aligning our efforts to maximize our resources to the benefit of all independent BENDER Group members. As such we discussed IT strategies and infra-

structure, revenue potentials, engineering opportunities and challenges, and common obstacles to our success.

Important parts of the whole process are the skills to communicate in a multicultural environment, i.e. to hear and understand each other. Along with continued sharing "what works," "what does not," and "where we want to go" in an open and honest manner with each other and the BENDER Group management team. Finally, to share thoughts and ideas of what needs to be done to maintain and achieve success in the future.

All of this basically describes the 3 day meeting in Mallorca; it was filled with communications training, sharing of management goals, successes and challenges of each group member and participant from their point of view, and a beginning to define common goals and areas of continued improvement. All this was hard work and not always easy; though the setting, the warm October sun, mixed with good food and good times, guided by a good team of moderators made it an enjoyable process.

We all learnt a lot, we came back with a better understanding of the road ahead and an appreciation of what it means to operate in a cultural diverse team and to be a globally operating company. We learnt that there are no easy answers, but a lot of hard work ahead of us. However, we walked away with a better understanding of each other and the challenges we commonly face. We knew this was only Step 1; many others have been taken since, while much more needs to be done to ensure that the BENDER Group is and continues to be the "power behind electrical systems".

Mallorca was only the beginning, we left knowing that the road ahead is exciting and might be bumpy sometimes, but in our more than 60 year history it has often been like that! We left Mallorca knowing that by leading together we will succeed together. We left in the certainty that together we can be as successful in the future as we have been even more in the past! We left saying, "Full Steam Ahead: Let's unleash the Power of Our Vision! ■

Berthold Langer



Exelon Nuclear



Safety first – especially in the nuclear world



Exelon Generation is considered a world-class operator of nuclear power generation, a leader in wholesale power marketing, and an innovator in the fossil, hydro, wind and solar development areas.

>> Exelon Nuclear operates the largest nuclear fleet in the USA, the third largest fleet in the world.

Exelon's ten stations – with 17 reactors – represent approximately 20 percent of the U.S. nuclear industry's power capacity. More than 18,000 megawatts of capacity. But size is not as important as performance. Exelon's engineers are constantly working on the improvement of their electrical systems to ensure reliability and uptime. BENDER Group and Exelon engineers designed new

insulation monitoring concepts and ground fault locating systems for the Dresden (located in rural Grundy County in Northern Illinois, 3 x 794 megawatts), Limerick (located in Limerick Township, Montgomery County, PA, 2 x 1,143 megawatts) and Peachbottom (located on the west bank of the Conowingo Pond in York, 2 x 1,093 megawatts) plants.

The additional layer of safety provided by the BENDER Group monitoring devices is one more step towards safe power generation.

Safety first is the motto, especially in the nuclear world. ■

Torsten Gruhn





The Polarstern off the Neumayer station in the Antarctic in February 2007



Safe exploration 20,000 leagues under the sea

The ocean depths are practically the only part of our planet that we have left to explore. Exploring them subjects equipment and technology to the toughest of requirements. When looking for electrical safety solutions for use in a deep-sea exploration context, design engineers from TU Berlin (Technical University) and TFH Berlin (University of Applied Sciences) turned to BENDER.





„These projects are concerned with the acquisition and evaluation of geophysical and oceanographic data on the sea bed.”



The Pertinacia in action in 2005 off Catania, Sicily



>> Initial results have already borne fruit in the pharmaceutical and biomedical industries as well as in the fields of geophysics, oceanography and biology. For example, micro-organisms have been transformed into highly effective antibiotics and biotechnical procedures for purifying waste water have also been developed. However, this voyage of discovery has only just begun and looks set to intensify in the future.

The untapped potential for using the ocean depths more systematically for research and industrial purposes is about to be exploited by the GEOSTAR (GEophysical and Oceanographic STation for Abyssal Research) series of projects (1, 2 and 3), which are being sponsored by the EU and organized at an international level. These projects are concerned with the acquisition and evaluation of geophysical and oceanographic data on the sea bed.

3 tonnes 4 km down

The three-part project involves the following system components: 1. A mobile docker (MODUS – MOBILE Docker for Underwater Sciences), 2. A benthic station (BS) and 3. A communication system. The BS is the actual measuring instrument and has numerous sensors for recording different types of data. The communication system transmits the data recorded by the BS to the ship and a satellite. The MD is a remote operated vehicle (ROV) for carrying heavy loads, which the BS lowers from the ship onto the sea bed and subsequently recovers. It has a load-bearing capacity of 3 tonnes.

A deep-sea cable for control and communication

TFH Berlin worked together with TU Berlin to develop “MODUS”. Complex calculations and simulations were undertaken to investigate the complicated effects of hydroelastic phenomena on MODUS and the deep-sea cable in order to optimize the drive and control units in terms of MODUS energy requirements. MODUS is controlled by means of a



„When we used the equipment subsequently at a depth of 3800 m (September 2000) and then again in 2005, water got into the cable termination but the BENDER system still worked perfectly. Once the repair work had been carried out, we were simply able to carry on“



multi-function cable (umbilical), which is also used to transmit BS data to the vessel (up to 4 video channels at once). TU Berlin and TFH Berlin were also responsible for developing the telemetry for communication via the umbilical.

Power for the depths

Having to supply power via a cable with a potential length of up to 4 km inevitably involves a huge loss of voltage. The loss of voltage is compensated by increasing the ship's electrical system voltage from 400 V to 3000 V, which can then be converted into 230 V/24 V by the MODUS transformer.

The problem that is most feared by anyone working in the field of deep-sea exploration is a physical phenomenon known as "slack cable". Swells and currents generate high forces of resistance and

inertia, which in extreme cases can lead to zero cable tension. As a result, the movements of the vessel (ship) and the underwater system become dislocated. In turn, this causes jerky tightening of the cable, which subjects the entire system to dangerously high peak forces that can damage or even destroy the equipment. In phases such as this it is a question of providing the system with downtime protection.

Timely shutdown

BENDER offers the necessary protection technology to ensure that the research vessel remains fully fit for service for a period of several months. The condition of the system's insulation can be monitored using the IRDH265 ISOMETER, which is installed inside the vessel's transformer cabinet, and the AGH520S coupling device for AC 3000 V. In the event of an insulation fault (caused for example by the ingress of leaking water), the sensitive drives and sensors are protected by timely shutdown of the power supply.

Star protection

The BENDER protection technology has proven itself on the first voyage to the Adriatic. The ISOMETER signalled an insulation fault at a depth of 1000 m and when the 2nd threshold value was reached, the power supply was shut down. This prevented MODUS and BS from sustaining any major damage. "When we used the equipment subsequently at a depth of 3800 m (September 2000) and then again in 2005, water got into the cable termination but the BENDER system still worked perfectly. Once the repair work had been carried out, we were simply able to carry on", says Prof. Dr.-Ing. Hans W. Gerber, Project Manager at TFH Berlin. Since then, MODUS has been successfully used as part of numerous other research projects, including in the Antarctic, and is now known as "the star of the deep sea abyss" (quote taken from EU project report). ■

Dipl.-Ing. A. Jähnigen



The Ionian Sea 2005 - Searching for deep-sea corals



BENDER electrical safety system



Reliable testing systems ...



... for maximum quality

ELMOS Semiconductor AG, a company based in Dortmund, is a market leader in the field of silicon-based system solutions for the automotive industry. It is a supplier to practically all the European car manufacturers and has over 1000 employees spread across various sites in Germany, France, the USA and the Netherlands.

>> ELMOS manufactures special high-threshold circuits for use in automotive applications. The fact that voltage regulators, analogue-to-digital converters, microprocessor cores and many other options such as E-PROM or Flash memories can all be integrated facilitates the provision of tailored solutions in line with customer-specific application profiles.

ELMOS has its own wafer production facility, which handles all the production processes from initial cleaning of the bare wafers right through to the final etching stage, which activates the electrical connecting points. Production is highly automated and takes place in clean rooms of the highest standard; computer-aided process control



„ELMOS uses residual current monitoring systems from BENDER, because they provide comprehensive and continuous monitoring of the entire power supply system.“

ensures extremely rapid throughput times. All quality-related parameters are monitored continuously and stored in databases.

ELMOS places particular emphasis on quality assurance. The wafer probing process is automated and takes place under clean room conditions using state-of-the-art mixed signal test systems and high-performance multi-side handling systems. The latter support functional checks within a temperature range of -40°C to $+150^{\circ}\text{C}$ and are capable of simulating ageing.

ELMOS recently opened a new building with 4 function levels. Because the test and production equipment housed by the new building involves highly automated process chains, a high-availability and virtually fault-free power supply has to be ensured so that the sequence is never interrupted. The Facility Management department was already using RCMA470LY and RCMS470 residual current monitors from BENDER to monitor its existing facilities and it was in light of this

experience that the company again opted for BENDER's residual current monitoring system. Ritter Starkstromtechnik provided a professional installation service in respect of the equipment for the new building.

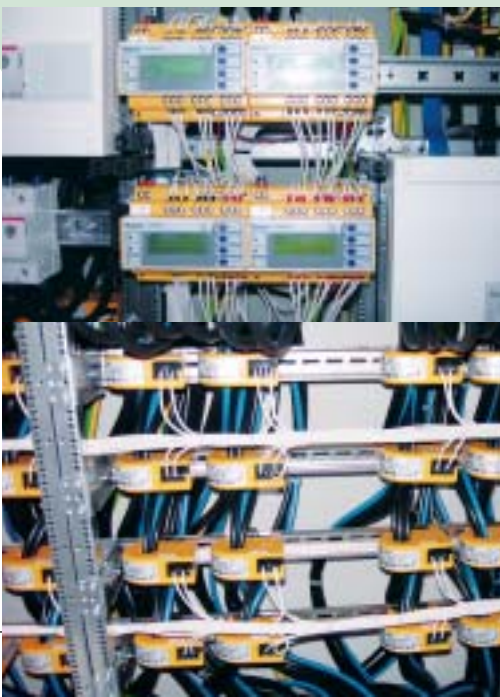
The new building's power supply, designed as a TN-S system, has to be continuously monitored for insulation problems in accordance with legal requirements and the BGV A3 regulations. The residual current monitoring systems (RCMS460) are perfect for meeting these requirements. Not only do they facilitate continuous multi-channel pulsating-current and AC/DC sensitive residual current monitoring, but the fact that they are used in conjunction with a protocol converter (FTC470XET) means that they can also display measured values on computers at Facility Management level over TCP/IP.

The equipment used consists of RCMS460-D-2 systems and an FTC470XET protocol converter. The protocol converter has its own dedi-

cated web server and is capable of evaluating the measured values and parameterizing the RCMS. To enable the entire system to be visualized, the BMS data are transferred using the TCP/IP protocol. This enables technicians to locate the source of any insulation faults immediately and at a glance. It also means that maintenance can be scheduled to meet human resources and optimize cost, whilst ensuring compliance with the accident prevention regulations and guidelines applicable in the location of use.

ELMOS uses residual current monitoring systems from BENDER, because they provide comprehensive and continuous monitoring of the entire power supply system. Since high availability is today an absolute must for any highly automated plant and because maintenance costs have to be optimized due to increased competition, plant operators can no longer go without a continuous plant monitoring system. BENDER can provide them with a state-of-the-art solution for mastering this monitoring task. ■

R. Gudelius

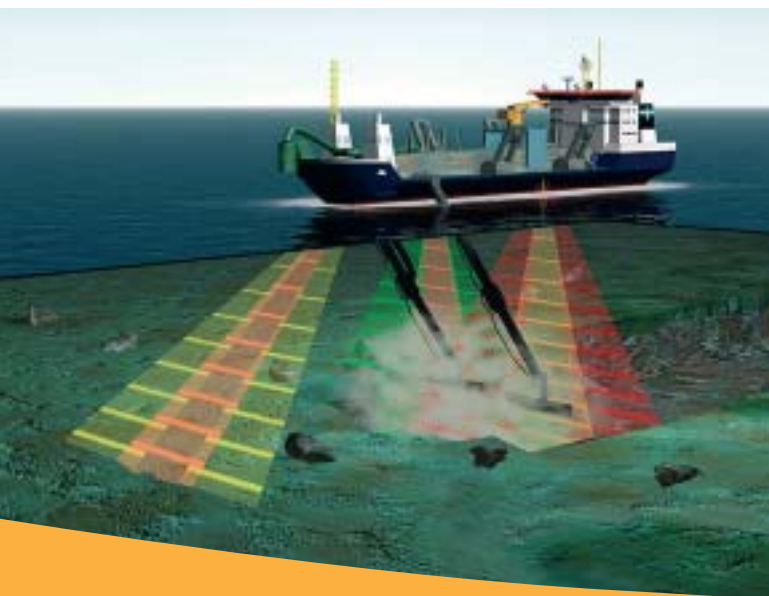




Going back to our roots

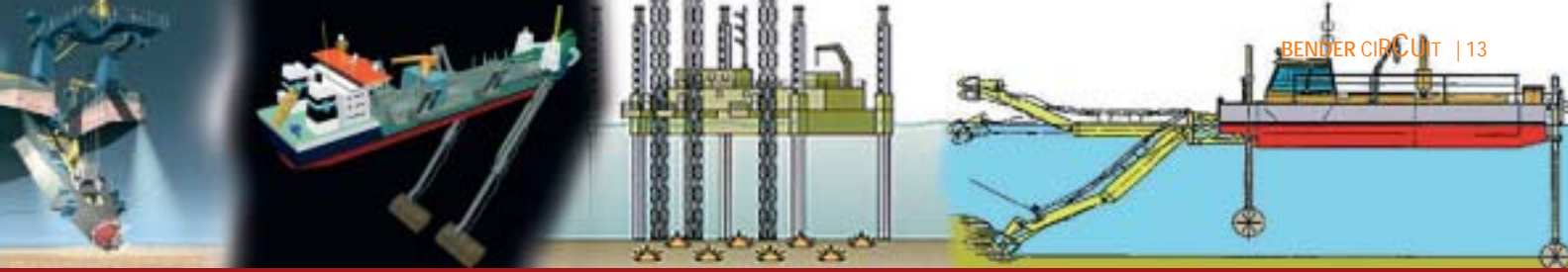
Electrical safety in modern mining

In addition to more familiar settings, advances are also being made in Russia as regards to the standardisation of work and production sequences with the twofold aim of optimizing and simplifying processes whilst simultaneously increasing personal safety.



>> Both provide a route to sustainable cost optimisation. As part of a joint project with the town of Mirny, the Russian diamond company Alrosa AG commissioned the development of the country's first insulation monitoring and line monitoring system for 0.4 kV industrial power supplies.

The Russian company K-Elektrotechnik develops and sells industrial monitoring and energy logging systems along with monitoring solutions for industrial installations. These systems are designed to optimize work sequences and control processes as well as to increase accuracy where data acquisition and personal safety are concerned. In 2005, BENDER took part in a project to develop Russia's first system for insulation monitoring and power supply status control on 0.4 kV industrial power supplies. Once the K-Elektrotechnik engineers had completed a period of intensive training and support under the leadership of our export sales manager Dipl.-Ing. Ismail Ahmadov, the system was installed within the power supply of a floating dredge designed for mining diamonds. The system was compliant with the new guidelines issued by the PUE (the equivalent of Germany's VDE) and the requirements set



out in the general safety regulations for mining. The latter both prescribe the setting up of the mains as an IT system and state that measures to ensure personal protection must be in place in the event of insulation faults on the installation and loads.

Proven safety engineering

Russia's first monitoring system for industrial power supplies was installed with BENDER hardware components. An IRDH575 type A-ISOMETER® is responsible for the insulation monitoring of the entire supply system. It supports the setting of two user-definable response values. Status messages and alarms are transmitted via the BMS bus and an RS 485 interface. An EDS insulation fault location system was also used to facilitate the rapid localisation and removal of insulation faults.

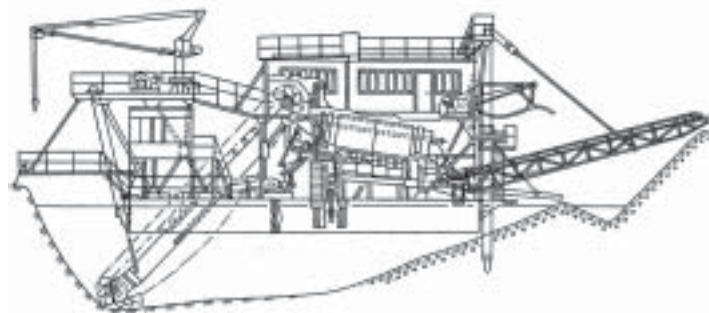
Know-how from Grünberg

In parallel with the EDS-based technology, compliance with the Russian standard for emergency shutdown (within 200 ms) was mandatory. Once again, K-Elektrotechnik turned to BENDER's engineers for help in solving this problem. The two companies worked together to develop a system featuring RCMS460/490 type devices. Once residual currents have been detected, the RCMS system safely disconnects the faulty outgoing circuit from the main distribution board. The RCMS also supports two userdefinable response values and on request can transmit measurement data to a central control station via BMS bus.

Digital possibilities...

Digital evaluation of the measurement results by the built-in microprocessor and the numerous other setting options facilitate reliable residual current measurement even in applications with complex requirements such as:

- > Those featuring loads with high electrical power ratings and connected via soft starters or variable frequency converters. Residual current measurement and insulation fault monitoring can be implemented for these loads with ease.
- > Expansive power supply systems with correspondingly high system capacitance. The high "background currents" requested the use of devices designed for TN systems in IT systems.
- > Presence of loads which cause major faults on the system.



...in action

Measurement data are transmitted to the machine operator's PC via a hardware interface. The operator's automated workstation features Siemens WinCC software which can run with a variety of data acquisition functions (e.g. functioning as a local control panel or an industrial PC). A standard solution was implemented and expanded with the addition of innovative data acquisition functions such as data logging, message archiving and data transmission to a central database used to control the floating dredge. The Russian Federal Service for Environmental, Technological, and Nuclear Oversight approved the devices for use in Russian mining operations.

Safety provides security

The use of an insulation and residual current monitoring system increases floating dredge performance through reliable working, reduces down time and money spent on repairs and maintenance and generally improves occupational safety. The resounding success of the system has led Alrosa AG to install a similar system in the "Mir" diamond pipe which is currently under construction at the Mirny integrated mining and processing complex. So, 60 years after making our debut in the German mining industry, BENDER safety solutions are now taking centre stage in Russia... ■

Dipl.-Ing. I. Ahmadov



„... the costs of maintaining a cracker plant have been considerably reduced, the availability and safety of both the plant and personnel increased significantly and the conditions for compliance with the accident prevention regulations ...“



The petrochemical industry has a significant role to play in our everyday needs. It provides the raw materials for products such as plastics, paints, medicines, man-made fibres (for clothing and other applications) and toiletries and is the link between the petroleum and chemical industries. Every year, Cologne based petrochemicals company INEOS manufactures 4 million tons of chemical raw materials for subsequent processing in the chemical industry.

Electrical safety solutions in the petrochemical industry

>> The company's headquarters in Cologne, Germany, occupies a site covering 176 hectares and employs a workforce of approximately 2000. Refineries supply plants known as "crackers" with raw material – petroleum ether or naphtha – which is then used to produce new substances for the chemical industry. Crackers, which are based on similar principles to refineries, are primarily used to break down long chains of hydrocarbons into smaller ones and then isolate them.

It is not only the technical structure of a cracker that is extremely complex, but also the power supply system. As a basic principle, the numerous different individual units, control motors, measuring equipment, N/O contacts, pumps, heaters, cooling





Complete control in complex systems

Insulation monitor IRDH575, fault location system EDS470 and measuring current transformers with a variety of dimensions are used as EDS systems (an average of 50 - 80 CT's per system). Assigning transformers enables INEOS to not only to detect and signal insulation faults, when they occur, but also locate them and pin-point the load. If several loads happen to be connected to a faulty outgoing circuit, the portable EDS3060 system is used to detect the precise location by means of measurement using portable current clamps.

units, and so on, are supplied with voltages of DC 24 V , AC 230 V and AC 500 V. Processing highly explosive materials necessarily involves particularly high requirements in terms of safety at the plant.

When it comes to gaining trust, actions speak louder than words

During the commissioning of an ethane cracker in 2002, an earth fault occurred. After BENDER was asked to locate the cause and once it had been discovered by using the EDS3065 portable insulation fault location system, a decision was made to monitor the entire plant for insulation faults on a permanent basis.

Since then, EDS insulation fault location systems have been used in ethane crackers to continuously monitor not only the electrical systems, but also the drives, lighting, sockets, control voltages, measuring voltages and measuring transducers. Earth fault messages are sent to monitors in a supervisor room or to a master control station, where they are then visualized.

The large number of smaller systems is also monitored using BENDER technology. Loads are operated by means of converters on many of these systems. Long cables also increase the system's capacitance to PE. Here, the IRDH275/IRDH375 systems are sufficient for monitoring purposes, as they are equipped with state-of-the-art measuring technology, such as the *AMP^{PLUS}* technique.

By using permanent insulation monitoring, the costs of maintaining a cracker plant have been considerably reduced, the availability and safety of both the plant and personnel increased significantly and the conditions for compliance with the accident prevention regulations and guidelines applicable in the location of use have been met – all of which are typical advantages of BENDER safety solutions. ■

U. Richter
Dipl.-Ing. E. D. Göbel

Based on the EDS460/490 and EDS461/491 stationary insulation fault evaluators, a new portable version has now been developed.

EDS190P ...



... portable insulation fault evaluators

The EDS190P is based on the two previous portable evaluators (EDS165 and EDS165-3) but manages to combine the functions of both in a single device. There are new functions to facilitate insulation fault location and mobile residual current measurement.

IΔs mode: insulation fault location for IT systems

Insulation faults can be located in IT systems using appropriate current clamps or measuring current transformers. The EDS190P has been designed for use in conjunction with either a permanently installed insulation fault location system such as the EDS460 or a portable version such as the EDS3065. The IRDH or PGH insulation fault test devices that are integrated in these systems generate the relevant test current pulses. Once current clamps have been placed around all active conductors of the individual outgoing circuits, the test pulses can be evaluated by the EDS190P for the purpose of locating insulation faults. Exceeding of user-defined limit values are signalled by means of a visual and audible alarm. The response sensitivity is 0.2 - 1 mA for control circuits and 2 - 10 mA for main circuits.

IΔn mode: Residual current measurement for TN-S and TT systems

In conjunction with appropriate current clamps or measuring current transformers, the device can be used to locate residual currents in TN-S or TT systems (as well as for IT AC systems under certain supply conditions) Residual currents can be caused by insulation faults or multiple N-PE connections. If a residual current leaks out via the PE or some other route, the differential current in the current clamps connected to the EDS190P will be measured. Thus, once current clamps have been placed around all the active conductors, any residual current that may be present can be located. If the configured limit value is exceeded, the portable test device will emit an audible and visual warning signal. The measuring range is 2 mA to 20 A and the response range is 5 mA to 10 A.

It is also possible to measure the harmonic oscillations by performing a harmonics analysis. The frequency range is 50 Hz to 2000 Hz. The measuring range covers the 2nd to the 10th harmonic component.

Application:

Like its predecessors EDS165 and EDS165-3, the portable EDS190P can be used to locate insulation faults in IT systems. It can also be used in conjunction with a permanently installed insulation fault location system in cases where certain sections of the supply system or load feeders are not monitored by the existing equipment. In situations where it is not desirable or feasible to have a permanent installation, the EDS190P can be used in conjunction with a portable insulation fault location system such as the EDS3060 in order to locate any insulation faults. ■

Dipl.-Ing. H. Becker
Dipl.-Ing. K.-H. Kaul



Technical improvements

- > Ergonomic, user-friendly enclosure
- > Mechanical protection by rubber jacket
- > All functions incorporated into a single device
- > Backlit 3-line LC display
- > Language selection: English/French/German
- > Battery capacity increased to approx. 150 hours from the original 10 hours
- > Rechargeable NiMH batteries (via socket)
- > Data logger with time stamp for 100 data records
- > Display of evaluating current for insulation fault location within the range 0.3...50 mA
- > Adjustable response value range from 0.3 to 10 mA instead of one fixed value
- > Mains frequency adjusted automatically within the range 45 - 450Hz.
Need to be set via the insulation fault location menu
- > Expanded 2 mA...20 A residual current measuring range
- > Expanded 42 Hz...2 kHz frequency range for residual current measurement
- > Harmonics analysis for residual current measurement up to the 9th harmonic component
- > The frequency converter mode option makes it easier to locate insulation faults in systems with controlled drives

Measuring and monitoring relays that set new standards

Availability and operational safety are extremely important issues as far as electrical installations are concerned, as they are the key to avoiding costly system downtimes, faults or risks to life and limb.

>> As a result, early warning systems are becoming increasingly significant. The new VMD420 three-phase voltage relays from BENDER leave virtually nothing to be desired in terms of measuring technology and customer requirements. Thanks to the following monitoring and product features, they cannot fail to impress:

Key monitoring parameters:

- > Undervoltage/overvoltage in 3AC and 3NAC systems up to 500 V
- > Frequency: 10 to 500 Hz
- > Asymmetry: 3 to 30%
- > Phase loss
- > Phase sequence

Key product features:

- > Compact design (2 module enclosure)
- > With or without auxiliary voltage
- > Measuring functions can be deactivated
- > Variable start-up delay, response delay and delay on release
- > Two independent programmable alarm relays (changeover contacts)
- > Continuous self-monitoring
- > Password protection
- > RoHS-compliant

Measurement – Signalling – Correction

The monitored parameters are measured as true r.m.s. values. There is no risk of erroneous measurements due to voltage distortion. The automatic preset function facilitates commissioning by providing optimum response value settings. All monitoring functions boast a wide setting range. There are two independent programmable alarm relays for signalling purposes.

Safety at a glance

Measured values are clearly indicated on the LC display, which uses clear and transparent symbols to communicate all measured and alarm values. There is no need for any external indicator. The measured value memory,

which is used to store and display operating values, is another new feature. Device versions featuring a 0/4 to 20 mA or 0 to 400 μ A analogue interface or an analog voltage of 0 to 10 V. This significantly reduces the amount of time required to locate and resolve faults, thereby cutting costs associated with repair and maintenance. ■

Dipl.-Ing. H. Muhm



The third edition of ...

”Protective Measures with Insulation Monitoring”

by Wolfgang Hofheinz

This book is not a direct translation of the original German VDE Publication Series 114, “Schutztechnik mit Isolationsüberwachung”. Rather, it has been updated to reflect the very latest status of international IEC Standards.

>> With only a few of exceptions, the DIN/VDE standards from the original book have been updated and the corresponding IEC standards were incorporated. This resulted in a revised translation of Series 114, now available in English.

As you will be well aware, standards underlay constant changes, which is why my next project – the second edition of VDE Series 114 – will be published later in the year. This will ensure that all references to German standards are also up-to-date. In both books – the new English and the forthcoming German editions – I have omitted the chapter on the application of IT systems in medical locations, as I intend to include it in the next edition of the VDE Publication Series 117, “Elektrische Sicherheit in medizinischen genutzten Bereichen”. And of course, an international edition “Electrical Safety in Medical Locations” to follow.

“Protective Measures” features a chapter that is bound to be very helpful as it contains a list of the references between IEC standards and their corresponding German and European standards, where applicable. The most interesting standards-update concerns the completely restructured IEC 60364-4-41 “Protection against electric shock” see in Chapter 4 as well as the new second edition of IEC 61557-8 – both very



Wolfgang Hofheinz
Executive Vice President of the BENDER Group

important standards as far as electrical safety is concerned.

If you would like to hand-out copies of “Protective Measures with Insulation Monitoring” to your customers, for example, please feel free to contact our PR department.

A sneak preview of the next (German) SR114: it will contain a completely new chapter on the “Design and Function of Protective Measures in Unearthed IT Systems”, which combines all four parts published over the last three years in the “etz”, a magazine for the electro-technical expert. Just like in “Protective Measures”, a full chapter will be dedicated to the elaboration of the new German DIN VDE 0100-410, which is the mirror standard to IEC 60364-4-41. ■

Dipl.-Ing. W. Hofheinz



! INFO

Joyous Information for BENDER Customers

The new IEC 60364-4-41, Protection against electric shock, contains references to RCMs and EDS Systems.

For the first time, RCMs are mentioned in Note 2 of Clause 411.1. It states: “Residual current monitors (RCMs) are not protective devices but they may be used to monitor residual currents in electrical installations. RCMs produce an audible or audible and visual signal when a preselected value of residual current is released.”

Likewise, in Clause 411.6.3 monitoring and protective devices are listed: apart from RCDs, RCMs, IMDs and overcurrent protective devices, for the first time, insulation fault location systems are mentioned – relating to EDS in the BENDER program.

However seemingly inconspicuous words or sentences, they are very important and may have a tremendous impact on BENDER devices.

Company Chronicle

4. International markets

Once the major change in production from relay-based to electronic technology was finally completed at the beginning of the 1980s, and the BENDER brand had become a household name across large swathes of Europe, it was time for the company to seek out new challenges.



Just eight years after the new production and development complex which ushered in the era of D. Christian Bender had been opened, an ultramodern development centre was also built with the aim of meeting the increasingly complex requirements that were being made of our measuring technology products.

Responding to challenges

1980 also saw the foundation of the SCB (Sportclub Bender) as a response to the increasing demands which were being made of our employees. The Sportclub Bender offered (and still does offer) sporting employees with opportunities to manage the stress that came with their jobs. This venture was so successful that one year later a tennis court was built on the company premises, fully funded by our sporty employees.



In 1983, D. Christian Bender and Wolfgang Hofheinz decided to get a foothold in the American market with a company specifically set up for that purpose: BENDER Incorporated was founded in Haverford, Pennsylvania. To start with, this company successfully developed and manufactured insulation monitoring devices for American hospitals. But despite this success BENDER did not rest on its laurels; rather, it expanded its sales range to include special industrial solutions tailored to the US market.

Getting out there and winning customers

By establishing itself on the American market and consistently participating in international specialist trade fairs, the BENDER brand rapidly gained a foothold on the global market.

One of the high points in the company's history was the 80th birthday of its founder Walther Bender in 1984. The birthday boy was in excellent health and was delighted to take part in the topping-out ceremony for the Grünberg annex, seeing it as an extra-special birthday present! Extending the company premises by over 1000 m² enabled 40 jobs to be created in the short term, and over 100 in the long term. This met with a very positive response, particularly from the public and the authorities.

C-Print was founded in 1985, with the takeover of a company specializing in the manufacture of printed circuit boards. With this move, BENDER teamed up with a reliable supplier of high-quality printed circuit boards, whose excellent production quality and short delivery time guaranteed a secure market share and chimed with the superior quality customers had come to expect from BENDER products.

In 1986 BENDER celebrated its 40th anniversary with a huge number of well-wishers, including figures from the worlds of politics and economics. The festivities were a great success and those who were involved look back fondly on them even today.



An open day gave visitors from in and around Grünberg the chance to take a look behind the scenes and find out about the many locations around the world where BENDER equipment is used.

Safeguarding our future through investment

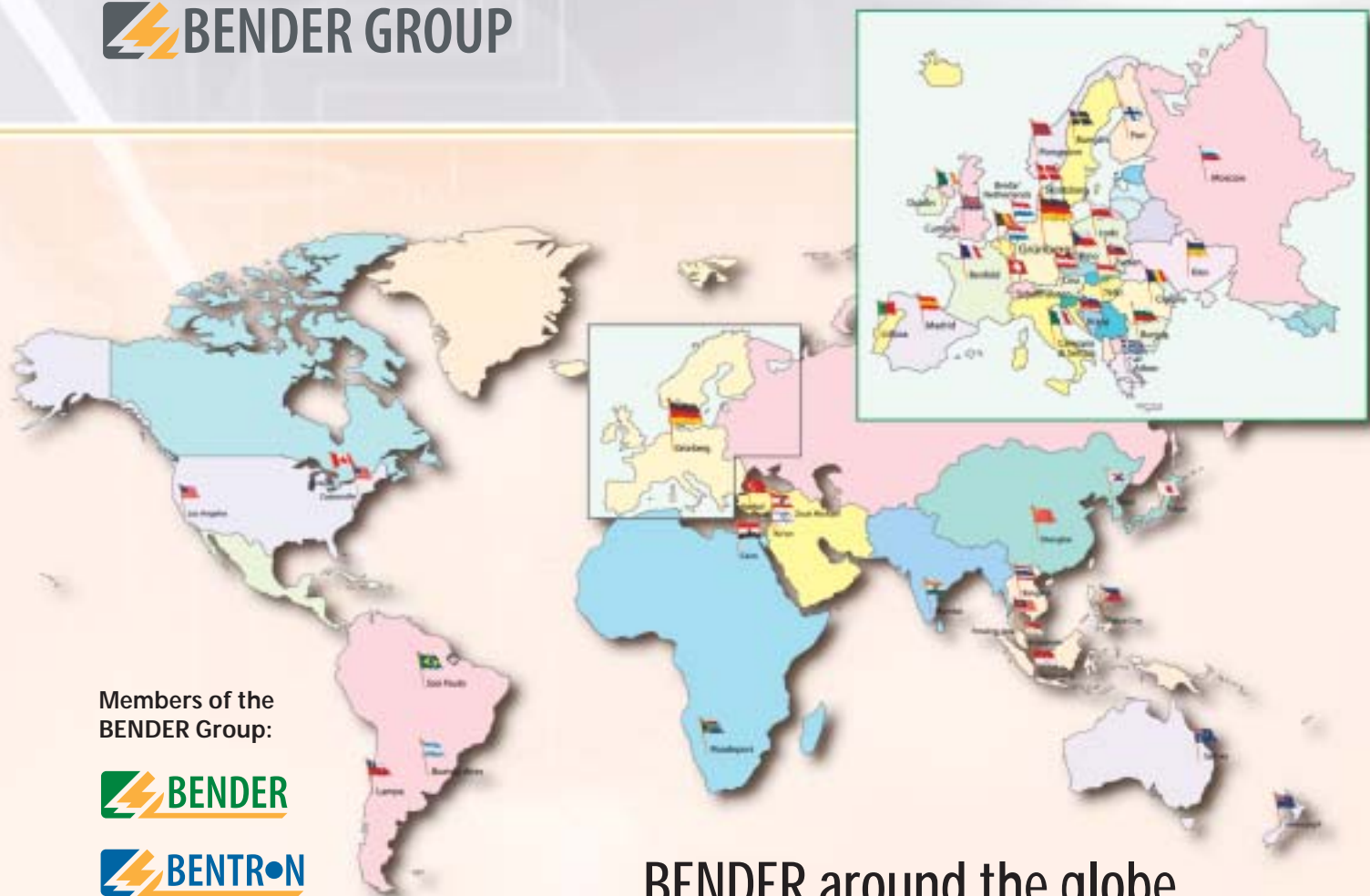
An important element as regards the company's, and the region's, future continues to be the training of new employees, particularly in the industrial electronics trade and the commercial field. Excellent career prospects and early involvement in the company's decision-making process mean that young people are given great professional opportunities with us. Our commitment to this is well known on a national level and was honoured in 1984 by the German President.



Once BENDER had established itself on the North American market in the 1980s, its next target was to become the global market leader in insulation monitoring technology.

To be continued ...





Members of the
BENDER Group:



BENDER around the globe



Dipl.-Ing. W. Bender GmbH & Co. KG
Londorfer Str. 65
D-35305 Grünberg

Fon: +49(0)64 01-807 0
Fax: +49(0)64 01-807 259

E-Mail: info@bender-de.com
www.bender-group.com