

Newsletter



INNOVATIVE SENSOR TECHNOLOGY

Letter from the CEO



Now, as the summer comes to an end, we are delighted to send you our second Newsletter in 2015. We hope you have all enjoyed the hot summer days and your vacation.

Since the last newsletter it has been an eventful time at IST AG. For example one of our employees held a lecture about Nepal, which was hit by fatal earthquakes this spring. IST AG, its employees and the citizens of the surrounding area raised a substantial amount to an aid organization supporting Nepal. In mid-August we had the Swiss parachute championship on our doorstep and at the end of last month our first Webinar about Areospace took place. Hopefully those of you who attended enjoyed it. We are already looking forward to the next free webinar, which we will announce.

Furthermore we took part in and visited a lot of exhibitions this year and we still have a few more in 2015. One of them is the Biotechnica fair from October 6th to 8th in Hannover. It will be our first larger exhibition focusing on biosensors and we will be exhibiting together with our subsidiary Jobst Technologies GmbH. Gerhard Jobst, CEO of Jobst Technologies, will give two presentations at the fair – find further information on the next pages. We would be happy to welcome you at our booth A60, Hall 9.

It has been seven months since the acquisition of Jobst Technologies now, and we would like to give you an insight in Jobst's technology as well as our joint cooperation. We are pleased to elaborate on our biosensors and their application spectrum and also bring an interesting interview with Mr. Gerhard Jobst on the following pages.

A handwritten signature in blue ink, appearing to read 'Mirko Lehmann'. The signature is fluid and stylized, with a large loop at the end.

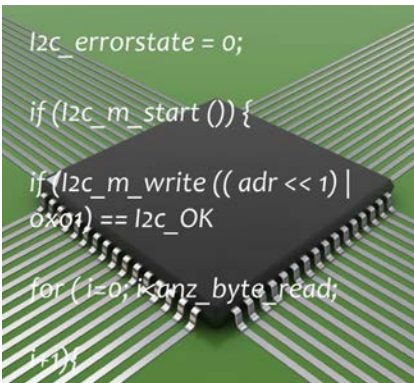
Yours,
Dr. Mirko Lehmann, CEO Innovative Sensor Technology IST AG

Company News



Support for Earthquake Victims in Nepal

At the end of Mai, IST AG invited its employees and the residents of the Toggenburg area in order to introduce them to Langtang, a region in Nepal which was hit by earthquakes at the end of April. One of our employees gave a presentation about his experience in this area of Nepal and cooked the national dish "Dal Bhat" for the visitors. At the end of the day, CHF 3'000 were collected for the LiScha Himalaya charity and will be distributed locally, especially for the rebuilding of schools in the affected region.



Application Development - Proper Solutions for Individual Applications

Do you have a challenging application?

Our highly qualified technical teams can offer you consulting, development, and production assistance for your project. Our application development department can act as an interface between your application and our sensor components. This is especially valuable in working with our more complex flow, humidity, and conductivity sensors.

We employ our simplified embedded frontend solutions (electronic and software based), modules, and software algorithms, to support a fast design-in-process and provide ideal sensor operation conditions in development of your application.

For more information, go to www.ist-ag.com



Swiss Championship in Parachuting

From August 14th to 16th the Swiss Championship in Parachuting took place in Ebnat-Kappel, right next to the headquarters of IST AG. The skydivers proved their skills in different disciplines. The runway of the airplanes that transported the competitors to the sky and the landing area of the parachuters were located directly next to the IST AG building.



Biochemical



INNOVATIVE SENSOR TECHNOLOGY

Focus on Biosensors

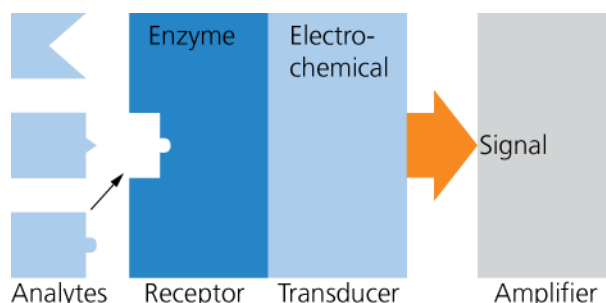
Biosensors – a new Sensor Type from IST AG

What are Biosensors?

A biosensor is a device capable of detecting a certain substance or analyte with high specificity. Examples of such analytes are glucose, lactate, glutamine and glutamate. Most biosensors measure the concentration of an analyte in an aqueous solution, usually producing an electrical signal, which is proportional to the analyte's concentration in its measuring range.

An enzymatic biosensor comprises an enzyme, which recognizes and reacts with the target analyte generating a chemical signal, a transducer, which produces a physical signal out of that chemical one, and an electronic amplifier, which conditions and amplifies the signal.

Biosensors allow the analysis in complex biological media. The detection of a large number of compounds is of great relevance not only for scientific research but also for process control in the chemical and food industry. It is also indispensable in the health care field for the diagnosis and treatment of diseases and monitoring of illnesses. The pharmaceutical and biotechnology industries greatly desire frequent to continuous analysis of biological media.



General structure of a biosensor. Sensors by IST AG use enzymes to detect glucose, lactate, glutamine and glutamate. The transducer principle is electrochemical, producing a current as output signal (amperometric).

Such analyses are conducted with the aid of analytical instruments like HPLC systems, which, although robust and reliable, are expensive and have a limited suitability for online operation. For this reason, the acquisition of Jobst Technologies GmbH positions IST AG as a key provider of high-performance and reliable online biosensors.

Enzymatic Biosensors for Metabolic Parameters

Back in the early 1960's Clark and Lyons introduced the first glucose sensor using an enzyme (glucose oxidase, GOx) as receptor, this enzyme being specific for glucose. Enzymes enable the highly specific measurement of their corresponding analyte even in complex mixtures like fermentation broth and blood; it is like finding a needle in a haystack.

Analytes such as glucose, lactate, glutamine and glutamate play an important role in the metabolism of living organisms. Glucose and glutamine support the cell function and growth; lactate is produced by cells and allows judging the efficiency of the cells metabolism; and glutamate is an amino acid consumed by cells. Each of these analytes requires a specific set of enzymes for its detection.

The continuous (on-line) monitoring of the concentration of such parameters enables among numerous others

- the generation, optimization and control of feeding strategies in cell cultures
- the minimization of patients' risks during surgery and intensive care
- on-site analysis of food processes

Presentations at the Biotechnica by Gerhard Jobst:

- Miniaturized analytical systems for bio/medical monitoring (Tuesday, 6th October / 3:30 - 4:00 pm / Hall 9 Booth C55)
- Biosensors for reliable monitoring (Wednesday, 7th October / 3:45 - 4:05 pm / Hall 9 Booth F51)

Focus on Biosensors

Versatile Sensors

Jobst Technologies GmbH has decades of experience in enzymatic biosensors. Enzymes are immobilized in a stack of four permeable polymeric membranes on top of platinum micro-electrodes, which pick up an electrical current originating from the enzymatic reaction. The superior membrane technology by Jobst Technologies allows for easy tuning of performance parameters like sensitivity, measurement range and response time. Moreover, this technology is compatible with sterilization by irradiation (gamma, beta). All this makes our biosensors suitable for a large variety of applications.

Thanks to the small size of the electrodes, a single chip can hold several electrodes. The array sensor LV5 from Jobst Technologies features up to 6 sensitive electrodes where glucose, lactate, glutamine and glutamate can be detected simultaneously. Very small liquid samples can be analyzed as they flow through its 1- μ L flow cell, thus being suitable for offline analysis as well as for online operation.

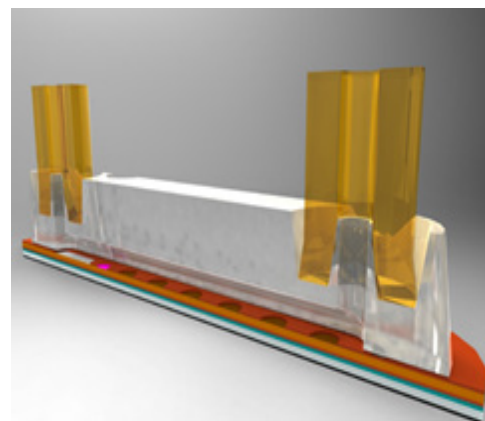
Last but not least, each sensor is factory calibrated and marked in an automated process providing full traceability making it ideal for ready-to-use and single-use applications.

Biomedical Application – A new Landmark Product: EIRUS

Optimal treatment of critically ill patients requires the continuous surveillance of their blood values. Recently, a world-leading provider of medical systems for hospitals, Maquet Critical Care, has been setting a new standard by introducing the EIRUS platform specifically developed to provide continuous monitoring of both glucose and lactate in critically ill patients. In addition to optimizing patient care quality, it reduces nurses workload compared to frequent intermittent blood analysis. This system relies on micro-dialysis technology that feeds a flow-through sensor developed and manufactured in Freiburg (Germany) by Jobst Technologies GmbH.

During several days of continuous operation, EIRUS reports glucose and lactate blood levels every minute and raises alerts whenever the values fall outside the preset ranges. This enables the rapid assessment of the patient's glycemic condition, which in turn ensures for prompt and swift glucose management with insulin. Tighter glycemic control benefits not only diabetic patients but has been shown to improve outcome also in non-diabetic critical care patients who frequently display a condition called 'stress diabetes'.

Elevated lactate levels (hyperlactatemia) are an indicator of increased morbidity and mortality. Monitoring of lactate enables an early and continuous risk assessment, diagnosis and therapy minimizing patients' risks.



Cross section of a flow-through LV5 biosensor featuring a flow-through cell for measuring of glucose, lactate, glutamine and glutamate



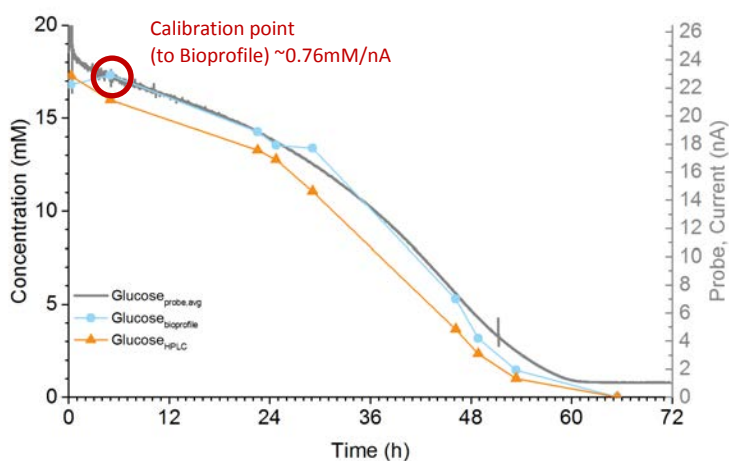
EIRUS system by Maquet for continuous monitoring of glucose and lactate in intensive care patients. Copyright: Maquet Critical Care

Focus on Biosensors

Biosensors – Their Application in Biotechnology

Nowadays cell cultures aid in the development of new drug and medication. Animal cells are engineered to express proteins and antibodies used in the treatment of several illness and conditions. In order to maximize yield and product quality, conditions of cell cultures must meet optimal values. Monitoring of nutrients, like glucose, plays a vital role in the feeding strategy of a cell culture. One type of glucose sensors used in biotechnology requires a fluidic-dilution stage that has to be outside the culture vessel. Such systems show problems like large latency due to the transit time through the dilution stage; more footprint since an external analyzer is required; contamination risk because it is necessary to invasively take samples inside the bioreactor and dealing with the dead volume in the tubes. Other sensors cannot survive prolonged shelf storage after sterilization by irradiation. The technology developed by IST AG and Jobst Technologies allows for continuous glucose monitoring either inside the culturing vessel or by means of a probing system.

A Chinese-hamster-ovary (CHO) cell line was used for a batch¹ culture in a conventional glass bioreactor. The glucose concentration was continuously monitored for several days. For the control measurements a Nova Bioprofile Analyzer and a HPLC system were used. Due to their robustness, sensors can be gamma irradiated and stored before utilization. Sensors are precalibrated; however a single calibration at start provides increased accuracy throughout the entire cultivation lasting days. During this time, a measurement point is acquired every second without requiring any manual work as the used reference systems do.



Comparison of glucose values during batch culture

Acknowledgment

Special thanks to Dr. Caspar Demuth, Dr. Iris Poggendorf, Fabienne Seiler and Irène Stutz from the Zurich University of Applied Sciences (Institute for Biotechnology, Wädenswil, Switzerland) for carrying out the cultivation and providing us with the data.

¹ In a batch culture, the nutrient medium has starting glucose concentration and no further nutrient feeding is performed.

Insight

An interview with Gerhard Jobst, the CEO of Jobst Technologies, regarding the recent acquisition of Jobst Technologies GmbH by IST AG and the integration process during the last months.



Gerhard Jobst, CEO of
Jobst Technologies GmbH

It has been already seven months since Jobst Technologies has become part of IST AG. What is the general mindset among the employees at Jobst Technologies and how have they assimilated becoming part of the IST AG family?

It is great being a part of that beautiful and charming family! And the insight that this integration brings with it, is an ongoing process that encompasses way more sectors than originally anticipated.

Like you said, an integration process usually requires a great deal of changes and adjustments for both parties. How has the general experience been for Jobst Technologies?

Neither do we see a need for significant changes to our way of working nor do we expect such requirements from the Headquarter in Ebnat-Kappel. Certainly there are numerous fields where accommodation is imperative. E.g., at Jobst we had just started setting up marketing and now also profit a lot from the professionalism of the IST AG sales force. Vice versa quality requirements implementation for medical device manufacturing in Ebnat-Kappel will profit from Jobst Technologies operational quality management system.

What kind of changes have been made inside your company during this integration?

Actually, not too many. Dominating so far are certainly the marketing issues.

From these changes, which one do you think would represent the greatest advantage for Jobst Technologies in the future and why?

Certainly the marketing, since there we had the most significant shortcomings in the planned business development of Jobst Technologies: Targeting not only the existing big customers, but also broadening our footprint into the SMB segment maintaining focus on delivering value throughout the chain. The added production facility, providing customers with ultimate security in supply, is also a significant advantage.

What aspect of this integration process have you enjoyed the most?

The obviation of the need for upscaling manufacturing in Freiburg and of course the celebrations in beautiful Ebnat-Kappel.

Now for IST AG, how can they benefit from this acquisition?

An instantaneous broadening of the competence and products portfolio into the "bio" field and considerable visibility by a true landmark product: "Eirus" – the first glucose/lactate monitor for the ICU. In the mid-term our expertise in microfluidics and assembly will contribute significantly to application development.

What can we expect for both companies in the near future?

The evolution and development of more landmark products for Biotech and Medicine.

Events



Biotechnica - October 6th - 8th, 2015
Deutsche Messe - Hall 9 - Booth A60
Hannover - Germany
www.biotechnica.de



Advance Engineering UK - November 4th - 5th, 2015
NEC, Birmingham - Hall 5 - Booth C63
Birmingham - UK
www.advancedengineeringuk.com



Space Tech Expo Europe - November 17th - 19th 2015
Messe Bremen - Hall 5 - Booth F21
Bremen - Germany
www.spacetecheurope.eu

Preview on next issue

Company News
Focus
Insight
Events



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