Issue 9
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# GeoWatch

A Newsletter from GeoSys

## GeoSys provides Geophysical Measuring Solutions

## In this GeoWatch:



### From the Editor's Desk

Dear Reader

It's been an exiting few months here at GeoSys. The completion of the Seismic System for the Ignalina Nuclear Power Plant, like any other large scale project allows us to reflect on the progress made and the work done. It's always satisfying to look back upon the completion of a project with the knowledge that a very special and beneficial objective has been achieved. The system for Ignalina is one of the largest and perhaps the most sophisticated system of its kind ever built. It will greatly enhance the safety of the nuclear power station and provide valuable data on the structural characteristics of such buildings, as well as the seismic conditions in the region. I like to thank everyone inside and outside the company for their contribution in accomplishing this project.

In the meantime we've had a number of other projects and developments to keep us occupied. The result of many of these developments can be seen in this issue. Due to its popularity and in response to a number of suggestions from users, we set out to extend the capabilities of the GSR-18 recorder. These advances have allowed us to develop an instrument encompassing a vast range of features and capabilities. At the same time we have been able to enhance the qualities inherent in all our products; reliability, functionality and quality.

However we have not confined ourselves only to the GSR-18. As well as other new items announced in this issue, we have been closely collaborating with our partners to develop other exciting products. These will be introduced in the next few months and we look forward to informing you about their benefits to the field of Geophysics.

You may have noticed the many comings and goings around us in this issue. We have recently visited Guralp Systems and had a very fruitful meeting at Bergen University. Since the earliest days of its inception, GeoSys has been a hive of activity and at times, our facilities have felt like the hub of a busy airport. We are committed to providing the very best products in the field, and will continue to work closely with colleagues across the world to maintain our standards.

Christoph Kündig
Managing Director

## New SSA-320S 'Smart Sensors'

Unlike conventional sensors which send analogue data to a recorder for conversion into digital data, the 'Smart Sensors' have 18 Bit A/D converter built in, which digitise sensor readings right within the sensor housing.

This approach offers many advantages over traditional sensors. Digitising the information within the sensor allows the highest resolution A/D conversion to be achieved, so the distance from the recorder doesn't impose a penalty. The new 'Smart Sensors' also add a checksum to the data, allowing error detection, making the data much safer than pure analogue data, which can be corrupted due to interference. However, we have not mentioned one of the most important advantages of A/D conversion at the sensor; because the data is already in digital form, PC based recording systems can be used allowing much more flexibility and convenience in storage, sorting, analysis and transmission of data. This has a significant effect on the development of instrumentation in the new millennium.

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GeoSys AG would like to take this opportunity to announce that our annual summer holiday this year is between the 20th of July and the 2nd of August 98.

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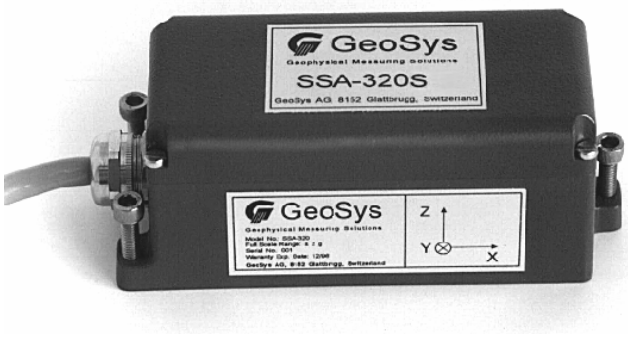
The data from the Smart Sensors is available through an RS-485 line in the standard Smart Sensor format; 16 Bytes with a 38400 Baud rate. The Smart Sensor also includes an internal sensor test routine, which may be initiated by the recording system.

Like all other sensors in the SSA series, the patented Terra Technology force balanced accelerometers maintain exceptional linearity, have low hysteresis errors and have an unparalleled low cross axial sensitivity. The SSA-320S was selected as the sensor for the recently completed Ignalina Nuclear Power Plant Project (see page 4).

The new range of sensors are packaged in the same housing which has proven itself in the past and has helped the SSA series to build a solid reputation for durability under the most difficult operating conditions. All SSA series sensors are made using the most advanced manufacturing techniques for improved reliability and enhanced performance. The introduction of 'Smart' technology to the sensor will only enhance the already strong appeal of the SSA series of sensors for a wide range of applications including seismic monitoring, structural response monitoring, industrial applications and borehole mounted systems.

The main features of the new SSA-320S are:

- 18 Bit A/D conversion within the sensor
- RS-485, 38400 Baud Data Link
- Open system for direct PC recording
- No distortion in long cable links
- High linearity, low hysteresis and low cross axis sensitivity
- Built in sensor test circuit




## GeoSys Visits Bergen University

For many years, the Institute of Solid Earth Physics at Bergen University has been at the forefront of development in the field of seismic study. As a company committed to strong research and development GeoSys has formed close links with Bergen University, which has resulted in a number of collaborations.

During the past two years, collaboration with Bergen University has increased even further. A number of instruments are now optimised for use with SEISLOG and SEISLAN and bespoke versions of both these packages have been developed for GeoSys projects.

With this in mind, GeoSys and Bergen University had much to talk about on a recent visit by GeoSys to Bergen University. The aims of the visit were to coordinate and strengthen our relationship with the Institute. The delegation from GeoSys met with Prof. Dr. Jens Haskov and other members of the teams involved in the research and development.

During the visit the delegation from GeoSys was given a demonstration of the new SEISNET version running under UNIX. The SEISNET system has been developed as an automatic data collection and event detection system for geophysical networks, serving as a link between the field stations and the processing centre. In the current version, stations of type SEISLOG and IRIS/GSN, which are connected to the data centre through Internet or modem, are supported. Bergen University has successfully applied SEISNET in a number of projects.

This trip proved to be very successful and the team from GeoSys had a number of meetings during the two day visit. The results of these meetings are a stronger link between the two organisations and an exchange of ideas useful to both parties.

## Technical Corner

**Edited by: Lukas Gätzi**

## New GSR-18 Developments

The introduction of GSR-18 has seen a significant expansion of the capabilities and performance of Strong Motion Recorders. Compact dimensions, high quality and a high dynamic range have given this recorder an excellent reputation in the market. Due to its popularity, GeoSys has undertaken a program of upgrades designed to further increase this instrument capability and flexibly.

Within the past few month a number of these developments have been incorporated into the recorder. For instance the addition of online RSA calculation makes the GSR-18 a unique instrument in the world. This feature allows the recorder to provide, in parallel with the time series of data for each axis, 10 spectral RSA values, which allow immediate information of earthquake data centres. Furthermore, the peaks in velocity and displacement are given online in parallel to the time series.

By incorporating the latest PC and memory device evolution, the GSR-18 now fully supports ATA compatible drives.



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Data files are stored on the removable drives in the DOS 5 format, with root directory and File Allocation Table data. In order to incorporate the GSR-18 in networks more easily, a ASCII based 'script' communication feature is supported, allowing easy access to GSR-18s from any W95/NT or UNIX system including SEISNET.

Another very important feature is support for the ZMODEM file transfer protocol. To incorporate this feature as effectively as possible, GeoSys worked closely with its inventor Chuck Forsberg. This sets yet another new standard in the strong motion sector by being the first recorder to include CRC (Cyclic Redundancy Checksum). This is a much more reliable and robust protocol than the widely used XMODEM standard.

An interface with FAMOS has also been added. Standing for Fast Analysis and Monitoring Of Signals, FAMOS has been specifically tailored to meet the needs of measurement and control engineers. The software allows easy processing of wave forms of any length and can display real and complex curves in 2-D and 3-D with any scaling and generates measurement sequences in everyday mathematical notions without specialised programming experience. By giving GSR-18 an easy interface with FAMOS, GeoSys has combined a very high performance instrument, with the capability for very high levels of signal analysis.

## The GeoMan Interview

**Who are you?**
Markus Annen

**How long have you been with GS?**
I started at GeoSys in January 1997

**What do you do at GeoSys?**
Seriously: Originally my task was to develop firmware programs for our recorder boards. These days I am involved in both hardware and software development
Not too seriously: I am the coffee machine, the Hoover, the soldering machine, the trouble-shooter, the secretary, the answering machine.

**What do you like about GS?**
For me it is very important that I can work independently with a lot of freedom so that I can focus the problems with higher efficiency. I do not like to work in that way that I have to fulfil many rules and that my creativity is blocked. On the other hand it is very important to have a capable team around. In GeoSys I have both.

**What are you doing right now?**
I am working on the new KKSL (Lucerne Cultural and Conference Centre) project. For this project I have to write a firmware program which packs four independent digitised strain gauge channels together.

The master board collects the data packets from three packer boards and puts the 12 channels as well as two other channels with wind speed and wind direction into a 1 second packet. This packet is sent to the SEISLOG software which analyses and stores the data.

**What's your pet hate?**
Seriously: I can not stand false people who shout against you if you can not hear them, but praise you when you talk with them.
Not too seriously: An empty beer can, RNET type 2 where it has to be a RNET type 1.

## GeoSys visits Guralp Systems

A delegation from GeoSys, including Johannes Grob and Christoph Kündig visited Guralp Systems in early march this year.

Formed in 1985, Guralp Systems has designed, built and developed some excellent seismometers, and enjoys a reputation as one of the main world-wide suppliers of seismic sensors. As our visit showed, the company has experienced rapid expansion, due to its highly innovative culture and technically advanced products. Investment in research and development has allowed the company to build a substantial body of expertise. Guralp CMG-40T and T-1 seismometers have been used on several GeoSys projects, including INPP (see News In Brief) and with recently shipped IDS-24 recorders to Russia.

An example of the cutting edge, state of the art projects under development at Guralp was the Mars Seismometer. Developed for NASA's Lunar and Planetary Institute, this is a prototype seismometer for use on the surface of Mars. Its most impressive feature is the new locking mechanism for isolating the delicate pivots and holding the mass. This allows seismometer to be safely lunched and 'dropped' onto the Mars surface.

## IDS-24 Recorders for Kazakhstan

In the final week of April, Dr. Oleg Razinskov from GeoSys' Russian representatives, Scientific Production Vulcan Inc., visited GeoSys to train with and take delivery of nine IDS-24 recorders. These recorders are destined for use in Kazakhstan and include built in SSA-24SLN accelerometer, GPS receivers and external Guralp CMG-40T-1 Seismometers.

GeoSys places much emphasis on the ability of its representatives to provide support to local customers. During his visit Dr. Razinskov was able to absorb a great deal of information about a whole range of GeoSys products. Staff at GeoSys were very impressed by Dr. Razinskov's qualities and are thankful the valuable input and the opportunity for the exchange of ideas.



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## News in Brief

**Edited by: Johannes Grob**

### Seismic Alarm and Monitoring System is shipped to Lithuania

Many regular readers will be aware that GeoSys, together with its joint venture partner EWE (Electrowatt Engineering Ltd.) won a competitive contract to design and implement a Seismic Alarm System (SAS) and Seismic Monitoring System (SMS) for the Ignalina State Nuclear Power Plant (INPP) in Lithuania. After receiving shipping release documents, the remaining equipment was shipped to Lithuania on the 28th of April 1998. GeoSys together with EWE is now in the process of preparing to supervise the installation and commissioning of the system.

The INPP plant consists of two reactors with a nominal capacity of 1500 MW per reactor. Although the reactors are of advanced design some parts of the equipment and structures of INPP do not fully comply with present seismic strength standards. Normally these parts would have to be structurally strengthened, however, this was considered to be unfeasible and other options where considered. The conclusion was to implement a system to shut down the reactor, via the Fast Acting Scram System (FASS), before the arrival of an earthquake at the INPP site. This would significantly reduce the risk of radioactive contamination being released.

The system will be described in detail in the report, Characteristics of the Ignalina Seismic Alarm and Seismic Monitoring System, which will be presented in the forthcoming ECEE conference.

This project represents one of the largest and most advanced seismic systems ever implemented and we at GeoSys are proud to have been able to work with EWE and the staff at INPP to complete a successful project.

### ISO 9001 Accreditation for GeoSys

GeoSys is proud to announce that it now has ISO 9001 Accreditation. A competent to high technical and organisational standards has been one of our fundamental philosophies.

Thus we saw ISO 9001 Accreditation as a natural extension of our commitment to our customers to not only to provide technically advanced, high quality products, but also to organise service and implement a quality organisation.

Everyone here at GeoSys recognises the importance of an effective quality system as a foundation for high performance. This is why we have been able to comply with ISO 9001 requirements with such speed. The task of maintaining and developing our QA system will be the responsibility of Johannes Grob, Amin Abdollahzadeh and Mr. Walter Kündig who will be carrying out regular audits of our procedures.

### Visitors from GeoSys India and TERRA Technology

Mr. Louis Ho, from GeoSys' strategic alliance partner TERRA Technology Corp. has recently returned to the USA after taking part in the final stages of the work on GSR-18 here in Switzerland. Mr. Ho is the overall leader of software development at TERRA. As a member of the joint task force for the development of the GSR-18 he contributed on key parts of the development such as the interface between the recorder DSP and the Microcontroller as well as the interface between the GSR-18 and the PC.

As part of the commitment GeoSys places on Quality Management issues, Mr. J.K. Kulkarni of GeoSys India completed an intensive training course at GeoSys Switzerland. The primary aim of this course was to further improve co-ordination in the fields of software design and QA control of software development. This together with other initiatives will insure the continuation and improvement of the close and efficient relationship in the software development.

### GeoSys UK is born

After our successful venture in India with GeoSys India, it's now the turn of the UK to get its own GeoSys operation. Our presence in the UK will allow us to develop close contacts with some of the excellent companies based there as well as allowing GeoSys to take advantage of the competitive opportunities offered by its presence in the European Market.

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