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**FORENSIC INVESTIGATION  
REVEALS CONCRETE SECRETS**

**COLLABORATION WITH  
ZUYD UNIVERSITY**

**SGSINTRON  
BULLETIN**

**SGS**

In these difficult economic times, companies which in the past invested in innovation are often in a better competitive position and are even showing growth despite the strong headwind. Over the past decade, the Netherlands only invested moderately in R&D – less than 2% of GDP. This is considerably less than countries such as Germany and the US which have devoted 3% or more of GDP in R&D. The differences are even greater in the construction industry. A typical example is nano concrete. This offers unprecedented opportunities to give (far too) inexpensive concrete (only 3 eurocents per kg!) exceptional performance and wider applications, and therefore added value. The US has been conducting a major strategic and practical programme in this area for several years, with several commercial applications as a result. With regard to nano concrete Europe has, as far as we know, only one significant activity: the Nanocem project, where scientific research is conducted on the nano structure and properties of hydrated cement. The Netherlands only plays an indirect role in this.

Austerity policies are currently still threatening the leading positions (in some areas) of our construction-related universities. There are still government (co-)funded programmes for some specific topics and we must continue to nurture these. However, this is too narrow a basis for maintaining our international position and thus our competitiveness. This type of research is often carried out by foreign students who, in many cases, return to their homeland at the end of their training. This means that the present shortage of qualified researchers and technicians will increase in coming years, a growing problem not only for Dutch construction companies, but also for attracting foreign investors. They will favour companies in countries/regions where there is a good supply of researchers and technicians, as well as high-quality universities and other educational institutions. With regards to the former aspect, the Netherlands already had an average score but it is now also losing its leading position with regards to the latter. Obviously, the parties involved, including SGS INTRON, are trying to guide these developments into a positive direction in various areas. One (regional) example of this is the collaboration between SGS INTRON and Zuyd University (see article in this bulletin). However, if we are to regain our leading position, even more efforts will be required. We must make this commitment – after all, it is our own future that is at stake.

**GERT VAN DER WEGEN**

## INVESTING IN THE FUTURE



**B**usinesses benefit from quality vocational training since it provides them with future qualified employees. This is not self-evident. Businesses have a responsibility and therefore an active role to play here. A good example from Limburg is the Chemelot Innovation and Learning Labs (CHILL) initiative, where chemistry studies (MBO/HBO/WO) are more practical, professional and innovative. There is scope for the development of top talent (tailor-made), and research facilities are made easily available for start-up companies/SMEs. This initiative will also contribute to achieving the ambitions of Brainport 2020.

SGS INTRON also benefits from a vocational training that matches its need for qualified employees. That is why we have a seat on the Advisory Board of Zuyd University, which has the task of better aligning the various courses at the university to the needs of businesses and further education. This includes both regular education and specific part-time training and courses.

One specific collaboration with Zuyd University and other parties concerns BIHTS: Building Integrated High-Tech Systems. It is a good example of synergy in training, expertise and innovation. You can find additional information of this public/private collaboration in the previous issue of the SGS INTRON bulletin. Guest lectures will be given to bring specific knowledge from a particular discipline to the attention of students.

# COLLABORATION WITH ZUYD UNIVERSITY

Zuyd  
Hogeschool **ZU  
YD**

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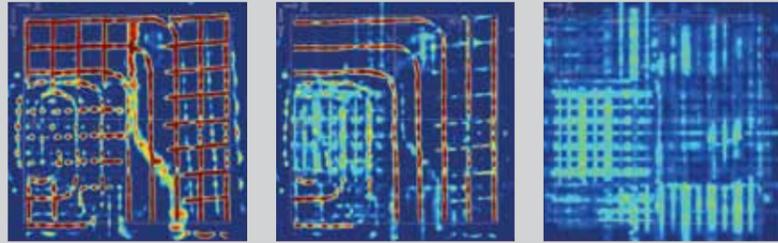
For instance, SGS INTRON will teach the subject of concrete technology in the materials science part of the Chemistry and Chemical Engineering course. It is a surprise for most students to discover that concrete technology contains so many chemical aspects and that so much more development is possible in this area. “Grey” concrete has become much more colourful to them, especially when the versatility of the material and its special applications are illustrated.

A guest lecture of over an hour can be regarded as a “teaser”. A better view of the world of concrete (technology) can only be obtained through an internship of several months at SGS INTRON. Each year our company takes on about 10 interns from different disciplines (chemistry, construction, engineering, etc.) and different levels (MBO, HBO and WO). An internship involves carrying out or participating in a specific (internship) project and gaining a detailed view of one of the activities of SGS INTRON (laboratory research, inspection, consultancy, quality assurance). These students learn how a company such as SGS INTRON is organised and operates. Special attention is also given to the development of skills, the interpretation of research results, the clear writing of reports and subsequently the oral presentation before a larger audience.

As shown, SGS INTRON is engaged in a multifaceted collaboration with Zuyd University. We place great store in this collaboration and it contributes to an even better alignment of education and market needs.



# RADAR INVESTIGATION OF CONCRETE STRUCTURES



In many cases, after a concrete structure is finished, it is advisable to check if the work has been performed as agreed. It may be necessary to check whether the correct amount of reinforcement has been used at the correct location and whether there are any voids present in the concrete. In older structures, it may be necessary to determine the concrete thickness, the amount of reinforcement or prestressing used and where it is located.

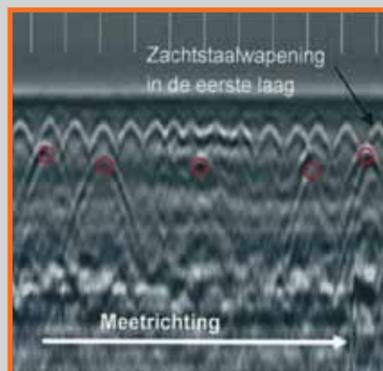
Carried out using radar, these analyses result in minimal damage to the structure. SGS INTRON has many years of experience in radar examination of built structures. The combination of radar experience and an extensive knowledge of construction methods, constructions and structural damage guarantees a good result.

SGS INTRON uses the latest radar equipment which provides the client with quick and easily understood images. In addition, we have radar antennae which display more details and allow for more complex situations to be assessed.

The radar is often used in combination with reinforcement detectors and other non-destructive measurement methods.

Radar can be used for the following purposes:

- Determining the presence of reinforcement
- Determining concrete covering
- Determining floor/wall thickness
- Detecting voids
- Detecting prestressing
- Preliminary investigation for drilling
- To replace destructive testing



# KNOWLEDGE IN TRANSITION

BY JACK DE LEEUW GENERAL MANAGER SBRCURNET

We talk about the crisis every day – how long it has been going on and how long it will continue. After previous crises, you normally got back on track once the economy picked up. But this time there seems to be more to it. There is an increasing realisation that things will never again be the way they were. We just do not know what will happen. We are in the middle of a transition. It is obvious this will have consequences for everyone.

And that also applies to knowledge institutes. SBR is 54 years old and CUR(NET) 61. They have always fulfilled a function in a sector where a few things changed but much still remained the same. Since 5 March 2013, SBR and CURNET have merged to become SBRCURnet. The merger already meant a big change for everyone concerned, and in these times there seem to be even more risks involved. The glass is half empty from this point of view. The other way of looking at it is that a merger is the perfect time to change things around. And to retain what was good in the past, of course. We have both always been working with and for the disci-

plines we regarded as our network for years. We built a good name for ourselves and plucked the fruits of appreciation for traditional products such as SBR reference details and CUR recommendations. Like everyone of us, we called ourselves the research organisation; not exactly very distinctive. With the merger, we join together the B&U and civil engineering sectors, but we do not want to limit ourselves to the simple arithmetic. We are looking for the real connection: how can we solve questions of sustainability, how does climate change affect all levels, and what solutions can we come up with? How can we cooperate cleverly and start Bimming more efficiently? How can we improve developments in sectors technically and process-wise while looking closely at administration and organisation and taking in political discussions. There is so much we can learn from each other and so much that is new to incorporate when we consider the bigger picture.

If you look at it this way, the link with SGS INTRON can be seen as an extra thread (aside from what we already do together in the areas of materials, guidelines and other traditional subjects). What will be the role of quality



assurance in the future? Just a little teaser: would you organise the world of certification as it is now if you could start over and, second question: do you know more than 50 people in the construction industry who can explain how the quality assurance world works? The answer to both questions is always the same: no! Shall we be bold and have a debate about this? Only with other people who think the glass is half full. And only by looking at what is good for the end users of our built environment. And not by saying it is the government that should do things differently. No, we will address it in our own sector. SBRCURnet would like to have this conversation: to promote major improvements and changes, to develop and implement them. Maybe we used to do this from time to time, but the need for it is increasing. It is logical if you are in transition.

## SGS INTRON LAB TO GO DIGITAL FOR DOCUMENTS AND FUNCTIONALITIES

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To better service its customers, the SGS INTRON Laboratory is currently developing a digital platform where customers can consult all the information relevant to them, for instance, commissioning forms, analysis reports, analysis history and calculation of inspection frequencies. The personal and substantive support by the dedicated account manager/project manager will remain one of the key pillars of SGS INTRON laboratory's services. The account managers will therefore talk to their own customers and together they can align the environment for the customer's organisation to be consistent with that of the customer. A start will be made with customers who use the lab for BRL 2506 services. The first customers will have access to their own environment at the end of May.



# RUBBER GRANULATE ON GRASS TURF: FIELD STUDY

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**S**GS INTRON recently conducted a verification of previous model calculations on the leaching of zinc from grass turf by means of a field study of existing grass turf. It concerns potential environmental risks when using rubber granulate - recycled rubber from car tyres - as infill on synthetic turf. The verification study on 6- to 10-year-old synthetic turf confirms the model calculations from previous laboratory tests. The materials from the foundation of the synthetic turf can be reused without environmental risks. Exactly at the right time: because many synthetic grass mats are about to require renovation as they reach the end of their 15-year technical life span. The study meets the social need for more transparency about the safety of this material. Apart from producers and research institutes, including SGS INTRON, the following were also involved in research in the previous laboratory research: sports organisations KNVB and NOC\*NSF, VWS, ISA Sport, the ministries of Infrastructure and Environment (VROM) and Public Health Well-being and Sports (VWS), the National Institute for Public Health (RIVM), the Association of Sports and Municipalities (VSG) and contractors. Key conclusions: both for the health of athletes and for the environment (leaching to subsoil) the rubber infill does not entail significant risks. The field study was conducted by SGS INTRON by order of RecyBEM B.V. and the Vereniging VACO.



## STUDY ON ZINC LEACHING

It is important for sports clubs at the eve of the renovation of their synthetic turf to know that rubber granulate is harmless. But also, to what extent the zinc from the granulate, dissolved in rainwater, penetrates in the bottom layer of the field. "More zinc in the subsoil than allowed by the Soil Quality Decree would mean that the entire construction has to be replaced, which makes the renovation quite

a bit more expensive", explains adviser Huub Creuwels of SGS INTRON. "That could be a reason not to choose rubber infill again." That is why SGS INTRON did not only investigate how much zinc leaches and to what extent this increases as the rubber granulate gets older, but also when and to what extent the zinc ends up in and is absorbed by the different layers underneath the field.

## MINI SYNTHETIC TURF FIELDS

For good technical characteristics and adequate drainage the substrate of the artificial grass field is essential. In general, it consists of several layers: a centimetre top layer made of lava or lava with rubber infill and a forty-centimetre sand layer. Standard column tests in the SGS INTRON laboratory have demonstrated that, in laboratory conditions, the zinc leaching of rubber granulate no longer increases after 1 year. The extension study, to study the long-term prediction of zinc leaching on the substrate based on the model calculation, was not really standard. "In so-called 'mini-lysimeter tests' we imitated the practical situation at laboratory scale", explains Huub Creuwels. "Mini synthetic turf fields in trays with different substrates, which we subjected to accelerated ageing by (alternately) applying UV light, ozone, temperature differences and rain."

## LONG SUBSTRATE LIFE

It appears from these model calculations on the basis of this mini-lysimeter study that even if you applied rubber granulate on an artificial grass field without substrate - which is actually never the case in practice - zinc leaching into the soil under the artificial grass field would only occur after forty years, which is higher than the reference value for soil from the Soil



Quality Decree. Due to adsorption of zinc at the lava substrate (as a sport technical and drainage layer) underneath the synthetic turf field (without infilled rubber granulate) and at the sand package in the substrate, it will, according to the model calculations, take more than 100 years for leaching to occur. After ten years, as appears from the mini-lysimeter tests, the amount of zinc in the sand package (0.6-8.6 mg/kg) is largely lower than the reference value for soil (59 mg/kg) from the Soil Quality Regulation. The leaching of lava meets the leaching requirements for construction materials from this Regulation. This allows for both materials to be reused in all kinds of applications. If the synthetic turf needs to be replaced after fifteen years, the substrate can remain in place without any risks to the environment for dozens of years.

## COMPARISON OF RAIN AND DRAINAGE WATER

SGS INTRON has verified the results of the model calculation to the substrate in practice. First of all, for a number of years the drainage water was collected underneath some fields (under the sand package) and the zinc content in this drainage water was compared with collected rainwater. The drainage water of all fields appears to have a lower zinc content than rainwater: a confirmation of the conclusions from the laboratory

tests (no high emission of zinc from the artificial grass with lava and sand package).

## FIELD SAMPLES

In the recent extension study, four synthetic turf fields were selected with an age between six and ten years. Samples were taken from the infill rubber from every synthetic turf field and from the individual layers of the subbase. "We wanted to know more about the actual zinc absorption of the subbase materials and the possibility of reuse", explains Huub Creuwels. "After taking samples from the infill rubber, we removed part of the grass mat in a number of places to sample the subbase. The lava layer was sampled at 1 depth due to its minor thickness. The total sand layer was sampled at 4 depths (layer thickness of 10 cm each time). This had to be done accurately because if rubber infill accidentally ended up in the samples, the measured zinc concentration could accidentally be increased."

## ABSORBING BUFFER

Despite the accurate approach the zinc concentrations in the lava samples seem to be quite different. Possibly because when one or more of the fields were built, rubber granulate may have been mixed with the lava to improve the technical sports properties (cushioning). This should be taken into account when renovating

because such a construction may clearly increase the zinc content of the substrate. Nevertheless the zinc concentrations in the sand layers of all studied fields are still largely below the reference value of 59 mg/kg. The lava and the upper sand layer absorb the largest part of the zinc. Overall, the total foundation ensures a firm buffer. Huub Creuwels: "The study confirms our previous conclusions from the model calculations: at the end of the synthetic turf field's life span, after fifteen years, no renovation of the foundation is required from an environmental-perspective. And if the substrate is removed, both sand and lava (with maximum ten percent rubber infill) can be reused without restrictions."

## RENOVATION PROTOCOL AND RECYCLING-BRL

In part based on the above study, a renovation protocol for synthetic turf fields was prepared by the Sports and Culture Branch Association (BSCN), which provides guidelines for field managers. Huub Creuwels: "In addition to that, we are also preparing an assessment guideline, by order of one of the processing companies, on the basis of which synthetic turf fields, including the foundation, can be fully recycled. This will complete the cycle in an environmental respect."

# GALLERY FLATS

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In May 2011, a cantilevered concrete gallery slab at the Antillenflat in Leeuwarden broke off. Its fall caused some of the slabs below to collapse as well. In response to this accident the Platform Structural Safety created a protocol for the investigation and assessment of the structural safety of the cantilevered concrete slabs of gallery flats. On behalf of SGS INTRON, Martin de Jonker was one of the three rapporteurs contributing to the formulation of this protocol, now published as CUR publication 248: Investigation and assessment of the structural safety of the cantilevered slabs of gallery flats.

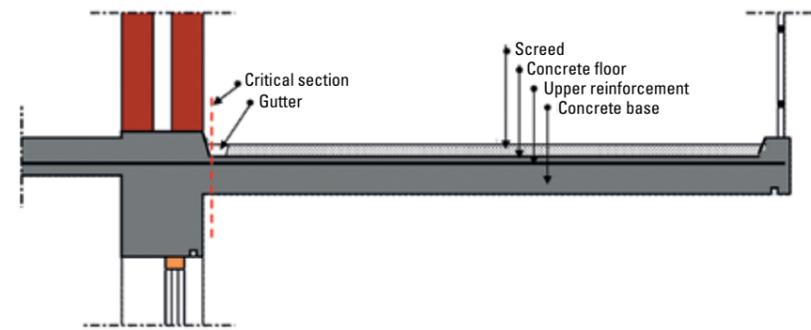


Figure 1. Diagrammatic representation of cantilevered concrete floors

The protocol aims to provide a uniform procedure for owners/managers, engineers and local authorities for assessing the structural safety of this type of floor (Fig. 1). In order to avoid unnecessary expense, it was decided to take a risk-based approach and guidelines were adopted for a justified number of slabs to be tested.

The purpose is to determine whether the floors meet the requirements set out in the House Act for existing buildings; further provisions are included in Building Decree 2012 and NEN 8700.

The protocol is based on three specific risks with regard to the structural safety of cantilevered floors, which were derived from similar apartment buildings in Leeuwarden:

- Pitting corrosion of the reinforcement, as a result of chlorides in the concrete; this corrosion does not

only reduce the bearing capacity, but also results in brittle breaking behaviour of the steel;

- A lower position of the reinforcement than what was intended in the design; a smaller lever arm results in a lower failure moment (larger chance of collapse).
- A higher load (own weight and static load) on the slabs, than what was assumed in the design; therefore the safety margin between the actual bending moment and the maximum moment at failure is reduced.

In principle, the protocol is written to evaluate the structural safety and to compare the results with the minimum requirements corresponding to a residual life of 1 year. In addition to that, it also provides sufficient information to say something about the structural safety for a longer time horizon.

In practice, a residual life span of 30 years is often used in this respect for existing buildings (this corresponds to the renovation level according to NEN 8700).

The study which is described to evaluate the structural safety is summarised in a step-by-step plan (see figure 2). The study starts by collecting the data and a visual inspection, combined with non-destructive study methods.

Information about the structural design, the construction and maintenance are an important starting point. The same applies for results of previously conducted inspections, concrete repairs and/or other maintenance in the usage phase. To this end the archive of the owner of the apartment building and/or the archive of the municipality must be examined. The more data that can be obtained from the archives, the more efficient the study can be planned and conducted. When information is lacking, it will have to be found during the study in the construction.

The non-destructive study methods include in this respect:

- Survey of the construction and the engineering finishing to determine the own weight, static load and construction dimensions;
- Electromagnetic measurements and radar to determine the reinforcement configuration and position of the reinforcement in the construction and to estimate the reinforcement diameter.

If sufficient information is available, a first mathematical test of the bearing capacity will follow. If not enough data are available about the reinforcement (diameter and material properties), prior to this first test, additional destructive study will be required.



Overview after the fall of the gallery slab on the 5<sup>th</sup> floor.

If the first test is not sufficient, measures must be taken to bring the structural safety up to standard. In that case there are errors in the design and/or construction. If the requirements are met, destructive study methods will be used to further look into the risks of pitting corrosion. The destructive study methods include in this respect:

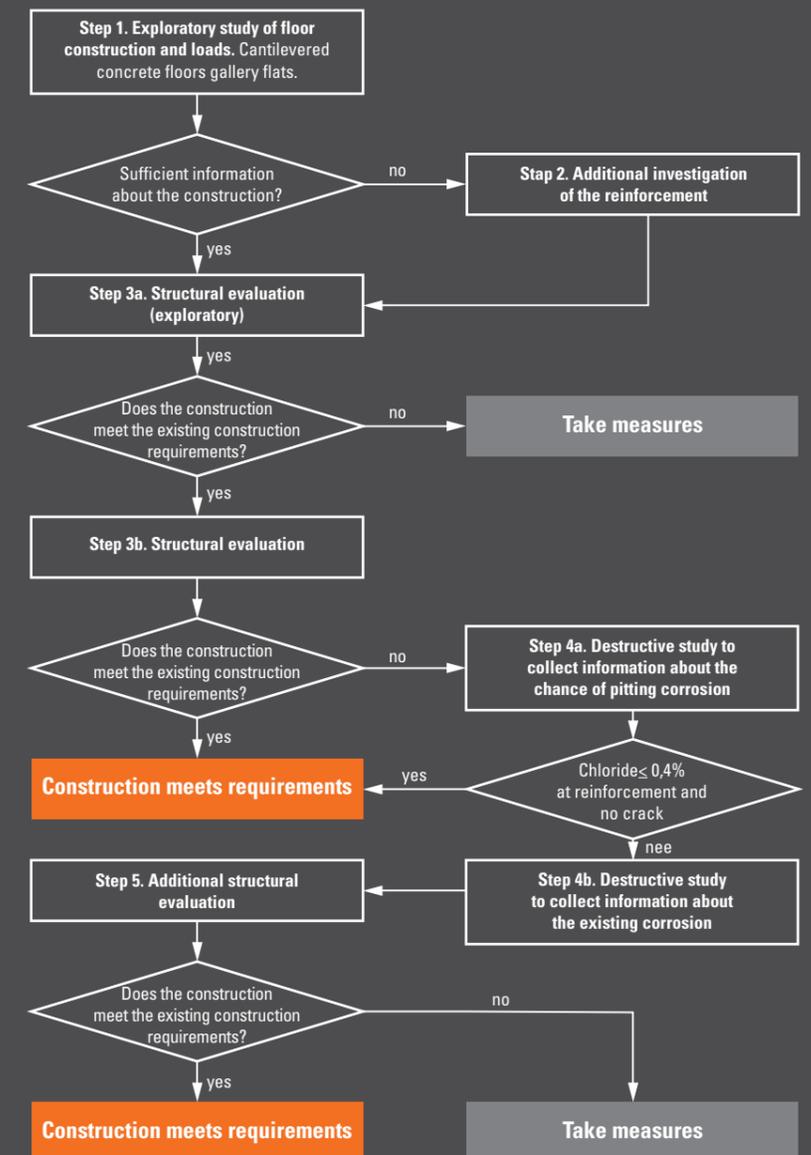
- Clearing away the concrete from the reinforcement to measure the diameter of the reinforcement which was used;
- Removing a part of a reinforcement bar to determine the stress-strain diagram by means of a tension test;
- Drilling the concrete cores to verify the covering, investigate the presence of any bending cracks and/or to determine the chloride profile by means of tests performed on samples of the concrete covering;
- Potential measurements to detect the corrosion activity in the reinforcement at the place of the restraint; in places where the chance of corrosion is highest bars are laid bare to determine whether corrosion is taking place and, if so, to what extent.

With the collected additional data a final mathematical test will be conducted.

When the current structural requirements are not met with this standard mathematical test, measures are required in the short term. The scope and nature of these measures depend on the study results. When the requirements are met, we will be able to conclude, based on the current insights, that the cantilevered concrete floors are sufficiently safe.

The Platform Structural Safety wishes to collect the experience gained with the protocol. If necessary, the protocol may be adjusted after some time based on these experiences. Users of the protocol are invited to report their experiences on [www.platformconstructieveveiligheid.nl](http://www.platformconstructieveveiligheid.nl). The protocol can also be downloaded from this site.

## STEP-BY-STEP PLAN



# FORENSIC INVESTIGATION REVEALS CONCRETE SECRETS

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Photo f.l.t.r. Bert Creemers (Laboratory Account Manager) Stefan Benders (Lab Technician) and Maarten Swinkels (Advisor)

The SGS INTRON Laboratory is well-equipped for this investigation. Our equipment ranges from a simple optical microscope to an advanced electron microscope. However, the most important tool to examine concrete is a resin which is fluorescent under UV light, with which concrete samples are impregnated.

## GREEN RESIN REVEALS SECRETS

Under vacuum a concrete drilling core can be impregnated with resin which is fluorescent under UV light. The resin fills cracks and gaps in the concrete. After curing we saw the core in two halves and look at the sawn surfaces under UV light. Due to the UV light, cracks and other defects light up in green, the resin makes them extremely visible. By means of this resin, continuous cracks and/or larger defects can easily be detected. The image of the impregnated concrete core below, for example, shows that the concrete covering positioned before the reinforcement absorbed a lot of the fluorescent resin. This also means that the reinforcement can easily be penetrated by water, oxygen and chlorides, which negatively affects its life span.

Thanks to advanced study methods and techniques, concrete cannot keep many secrets from the SGS INTRON staff. In the article below we give you a fascinating look behind the scenes in the SGS INTRON Laboratory, where we analyse drilling cores and thin sections. This is done by means of microscopes and fluorescent resin. Concrete shows its most colourful side.

## AT THE TRAINED EYE OF THE INSPECTOR

If a customer calls on SGS INTRON to study concrete damage, one of our advisers/inspectors goes on-site to look at the damage. His eyes are the inspector's most important tools. With his knowledge and experience and based on the observations and information provided by the customer, he will determine what the possible causes of the damage can be.

Then we try to discover, through specific tests on-site and sample analyses

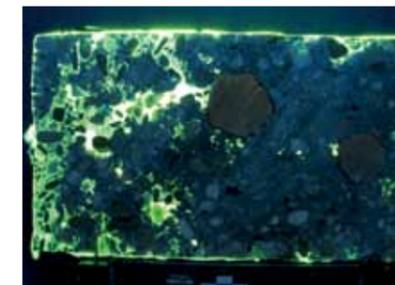
(drilling cores) at the SGS INTRON Laboratory what the right hypothesis is, and confirm it.

## SGS LABORATORY: INVESTIGATION DEEP INTO THE CONCRETE CORE

The questions an adviser may ask the laboratory can be quite varied. For example: how much has the concrete been affected by fire or by ASR (alkali-silica reaction)? How high-quality is the top layer? Do the cracks penetrate to the reinforcements? What is the concrete's water/cement factor?

## A CONCRETE SLAB THINNER THAN A HUMAN HAIR

If we want to look at concrete in even more detail, we can cut a thin section. We then impregnate the piece of concrete again with fluorescent resin under UV light and polish it to a thickness of about 0.020 mm. In comparison: a human hair is four times as thick, about 80 µm. Because the concrete slab is so thin, it becomes transparent. Then we examine this piece of concrete under a microscope with normal, polarised and UV light. Thin sections are an excellent resource in the assessment of fire damage and for confirming ASR. In addition, a thin section provides information about many other things, such as the cause of cracks, the water/cement factor, sulphate corrosion, ettringite formation, the quality of the micro structure, leaching, the type of cement, applied aggregates, etc. The thin

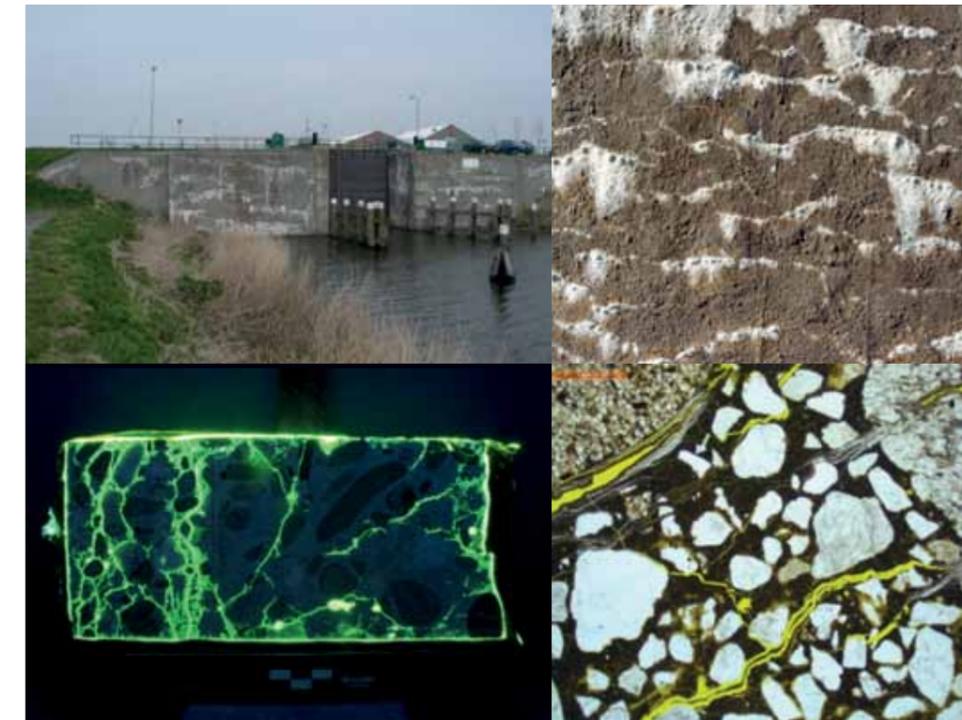


section below has a dimension of 35 mm x 45 mm and a thickness of 0.020 mm. This piece of concrete is stuck between two glass slides.

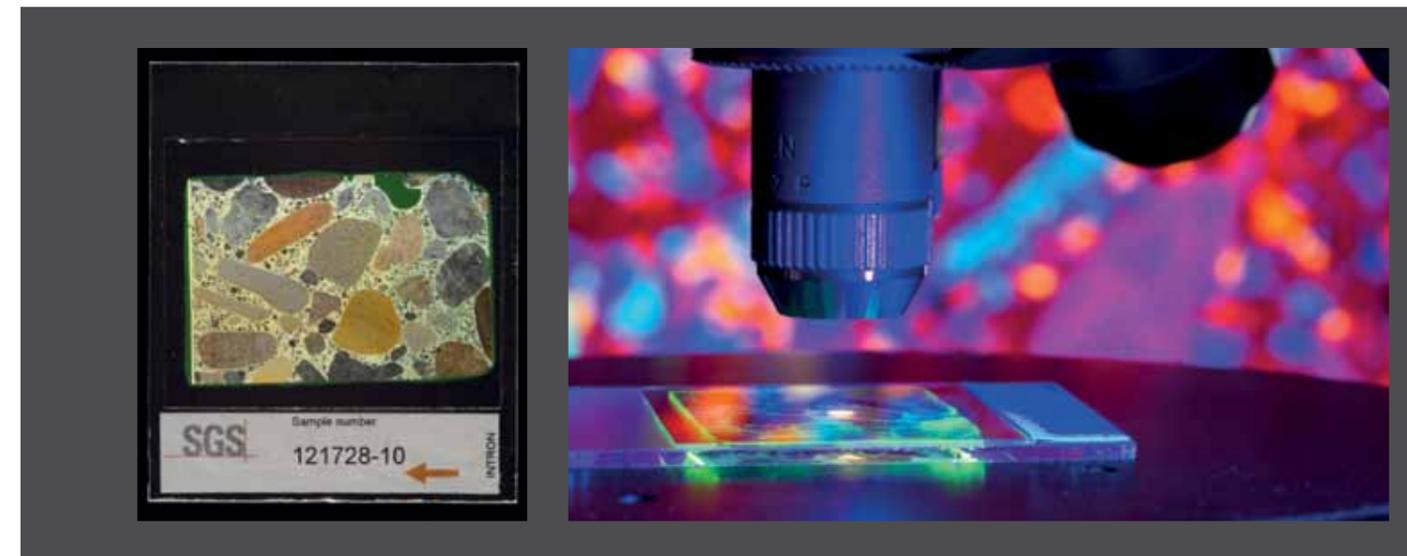
## IMAGES THAT SPEAK VOLUMES

The advantage of the techniques shown here is that they can quickly and easily be understood by customers. One image often speaks

louder than a written report. The SGS INTRON laboratory knows lots of methods to reveal the 'secrets' of concrete - and many other materials - which tell our advisers what caused the damage and how it can best be handled. Below you will find a practical example, in which the aforementioned techniques are used to reveal the cause of the damage.



From left to right and from top to bottom: 1. A lock whose condition must be determined. 2. During the inspection it turns out that white bloom and cracks are visible in the concrete. 3. A concrete core of the same lock treated with resin: the cracks are not only present at the surface, but in the entire core. 4. The thin section shows that the cracks are filled with gel. ASR is the cause of the damage.



# BRL 2506: MORE TRANSPARENCY ABOUT RECYCLING AGGREGATES

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On 1 July 2013 national guideline BRL 2506 was added to the Soil Quality Regulation. From then on certification of recycling aggregates takes place on the basis of this new BRL. It took a couple of years to prepare the guideline, and SGS INTRON was closely involved in the process. "In a work group with branch organisations Branchevereniging Mobbiele Recycling and BRBS Recycling, we formulated demands and rules which ensure a better alignment with European standards and more transparency", says Erik Hoven, from SGS INTRON Certification.

## GPS ON CRUSHERS

More transparency is important to increase confidence in the product - i.e. aggregates from construction and demolition waste. To this end a GPS system is installed on every crusher, fixed or mobile. That system does not only provide information about the location of the crusher, but also mentions whether the crusher is operating, what is being crushed and what the volume is. All this information is published on a website, to make sure that certification organisations like SGS INTRON, have an insight into the crushing process of the aggregates (delivered under certificate) at all times. "Instead of paper notifications we can now base ourselves on the actual GPS messages, with the option to conduct very specific inspections on-site."

## ENVIRONMENTAL STUDY PER PRODUCT GROUP

Another major change caused by the new BRL is the product group regulation. "According to the old BRL you needed to conduct separate environmental measurements for every product", explains Erik Hoven. "Now, similar products are joined in product groups and BRL prescribes the environmental analyses per product group. This makes it cheaper and easier for companies to have several products certified. Because the most commonly used products, mixed aggregates, concrete aggregates, masonry aggregates and their hydraulic version are all contained in one product group." No asbestos, no more mandatory prior sifting.



Furthermore the acceptance of asphalt is stricter in the new BRL, in line with the CROW regulation. It also states that employees who accept debris - just like SGS INTRON auditors - must have attended the SC-580 training to make sure they can recognise asbestos and exclude it from acceptance. Finally, prior sifting of debris is no longer required because the study indicated that it does not significantly contribute to the quality of the granulates.

## FLEXIBLE TRANSITION

By performing evaluations based on the new BRL even before 1 July, SGS INTRON makes sure that the transition to the new regulation takes place smoothly for its own certificate holders. "We will be able to issue the new certificates as of 1 July", expects Erik Hoven. "During inspections we look at the entire process of debris acceptance until the delivery. The frequency of the visits will depend on the production volume and the number of products. In the future, crushers handling large volumes of debris can expect more inspections than smaller companies."



# CE-MARKING: WHAT CHANGES ON 1 JULY?

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CE marking is the ultimate tool of the European Union to remove trade obstacles for many products in the European area. If CE marking is required for a certain product, it may not be marketed without this mark in the EU. The other way around, a product meeting CE requirements may not be rejected on the European market.



The rules for CE marking are set out in separate laws per product category. For building products this is the Construction Products Directive or, abbreviated, CPD. This directive will change on 1 July. The CPD will be replaced by a regulation, the Construction Products Regulation, or CPR. By implementing the CPR several rules on CE marking will also change. There will be no more member states to which exceptions apply, like is the case now. From 1 July the CE marking will be compulsory in the entire EU, including

the UK, Denmark, Sweden and Ireland. The most important administrative change is the obligation that a declaration of performance will be issued by the manufacturer for every product subject to CE regulations, a so-called Declaration of Performance (DoP). This declaration is required both for new products and for products already bearing the CE marking. The declaration must be made available for every delivery to a customer, either on paper or in digital format. Another major change is that, according to the CPR, not only the

manufacturer is responsible for the product's compliance with the rules. Importers (from products outside the EU) and distributors must also be able to justify the compliance of their products with the CE regulations. This is how the entire chain of every relevant product is covered. To date products without CE marking, mainly produced outside Europe, could still be marketed. The makers of these products are often unfamiliar with the European rules. By involving importers in the CE marking procedure, this problem should be reduced. In the long term the content of the CE marking will also change. The performances which have so far been set out in the CE marking refer to health and safety. According to the CPR the sustainability of the construction products will also be included in the CE marking. European methods will also be introduced to determine the environmental performance, like leaching and emissions of hazardous substances. In practice it will take a couple of years before these content-related changes will have been implemented, because the corresponding procedures still have to be developed and added to the relevant product standards. By holding seminars, for example, SGS INTRON is investing in informing the market about the upcoming changes. Since November we have organised seven such seminars, which were largely attended.

At the same time all certification organisations and laboratories must update their own qualifications in order to continue to perform their certification and lab activities under the CPR to inspect products subject to CE marking. SGS INTRON is doing what is needed to get these novel qualifications. To do so we are also seeking to cooperate with our SGS UK subsidiary. This cooperation confirms once again the international European character of the CE marking.

# FANN VISCOMETER 35

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SGS INTRON recently bought a Fann Viscometer 35, a couette coaxial rotational viscometer, which accurately measures the viscosity of fluids and slurries. Viscosity is the resistance of a fluid or slurry during deformation (for example, stirring). If we compare water to toothpaste, this can be expressed in terms of thin, low viscosity and thick, high viscosity, while the extent of deformation (e.g. stirring) is kept equal. In other words, the less viscous, the easier a fluid 'flows' (this is usually also called fluidity). Viscosity is nothing more than the shear stress ratio (the amount of torque exercised on a fluid divided by a contact surface) and shear rate (difference of, in case of a stirrer, the speed on the outside and inside of the fluid in a defined set-up). The study of fluidity is sometimes called rheology.

Rotational viscometers, like the Fann Viscometer 35, use the idea that the amount of torque, required to move an object in a fluid, depends on the viscosity of that fluid. A rotational viscometer measures the amount of torque required to rotate a small cylinder in a fluid depending on a rotation speed of that fluid, which can be set. By using the resulting data SGS INTRON can measure and predict the flow behaviour of fluids and slurries. Knowledge about the flow behaviour of a material is very valuable for, for example, anticipating the pump rate or several other production processes (for example, filling moulds). Fluids with a constant viscosity (shear stress divide by shear rate is constant) are also called Newtonian fluids. Fluids with no constant viscosity (for example, the viscosity increases or decreases when the shear rate increases) are also called Non-Newtonian fluids and these can display fluid behaviour like shear thickening (viscosity increases) or shear thinning (viscosity decreases).



With the Fann Viscometer 35 SGS INTRON can accurately survey the viscosity of viscous fluids and slurries over a wide measuring range. With these data SGS INTRON can then determine the flow behaviour and, in consultation with the customer, give advice to improve it. Measurements are in accordance with API Recommended Practice 10B and viscosity levels up to 2500000 cP (centipoise) can be determined.

# CE MARKING ALSO FOR STEEL AND ALUMINIUM CONSTRUCTION PRODUCTS

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About 608 harmonised standards are currently governed by the new Construction Product Regulation, the CPR, including the EN 1090-1:2009 + A1:2011 "Execution of steel structures and aluminium structures" – Part 1: Requirements for conformity assessment of structural components. This standard describes the requirements for the CE Marking of steel components.

The EN 1090-1 took effect on 01/09/2012. Because a large part of the steel market is not yet prepared for this step, the EU decided to extend the co-existence with a period of 2 years. In this period the steel market still has the time to demonstrate that the products meet the requirements of CE Marking. If after 01/07/2014 no CE declaration has been achieved, the steel product may not be sold on the European market.

The EN 1090-1 regularly refers to the EN 1090-2<sup>1</sup> standard. The EN 1090-2<sup>1</sup> contains technical requirements for steel constructions like dimension tolerances, welding and staff. In addition, the EN 1090-2 mentions 4 manufacturing classes: EXC 1 through EXC 4. Steel companies that want to be certified first have to make a choice of the manufacturing class their product must meet. The higher the selected manufacturing class, the stricter the requirements for staff, dimension tolerances and welding.



The most important change for the steel market is the welding section, requiring processes, methods and staff to be written down. For instance, a welding coordinator must be appointed and the welding method description, welding method and welder qualifications must be compliant.

Furthermore, the operations of the company must be documented in a quality manual. To make sure that the quality can be assured in every process during the manufacturing. During the audit by the certified organisation, the quality manual will be assessed. In addition, the auditor visits the workplace to assess whether the quality manual is implemented

in the company. If the requirements are met, the steel company may issue a CE – Declaration of Performance and apply a CE – label.

SGS INTRON offers the entire package for customers. SGS INTRON Consultancy advises about the rules and necessary qualifications to meet the legislation. SGS INTRON prepared a 10-step plan for the manufacturers of steel and aluminium products. This can be requested by mailing or calling SGS INTRON, contact Jo van Montfort or Peter Crucq.

<sup>1</sup> EN 1090-2 + A1: "Execution of steel structures and aluminium structures" – Part 2: Technical requirements for steel structures

## CE MARKING OF YOUR CONSTRUCTION PRODUCTS ARE YOU READY?

According to Construction Product Directive 89/106/EEC producers are required to affix CE marking to each of their products governed by a harmonised European standard or a European Technical Assessment. This Directive will be replaced by Construction Product Regulation 305/2011/EU on 1 July 2013. This causes several obligations for CE marking to change compared to the current construction product directive. Are you ready?

### WHY SGS?

SGS is world leader in the field of inspection, verification, analysis and certification. SGS is known as the global benchmark for quality and integrity. SGS maintains a global network of about 1,500 branches and laboratories with more than 75,000 employees. With local knowledge and worldwide presence we can assist you in complying with the Construction Product Regulation as a producer, importer or distributor of construction materials.

IF YOU WANT TO KNOW HOW SGS CAN HELP YOU, PLEASE CONTACT **PETER CRUCQ** (E-MAIL [PETER.CRUCQ@SGS.COM](mailto:PETER.CRUCQ@SGS.COM)) OR VISIT [WWW.SGS.COM/INTRON](http://WWW.SGS.COM/INTRON)

WHEN YOU NEED TO BE SURE

**SGS**

# CEMENT-BENTONITE WALLS IN A SPECIAL APPLICATION

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Between Delft and Schiedam, consortium A4all is currently building a sunken motorway section. For the sunken section the consortium selected a construction with cement-bentonite (CB) walls. Volker Staal en Funderingen (VSF) is a member of the consortium and responsible for the construction of these walls. Vibration-free sheet piles are hung in a trench filled with cement-bentonite slurry. The length of the function excavation is restricted to what is required for the earth-retaining. The CB walls continue deeper the sealing clay layer. Therefore, after an open tunnel is created which effectively keeps the groundwater out on all sides. A smart solution which makes an expensive concrete floor with tension piles unnecessary. With minimal pumping the entire section remains dry. But what about the durability of this construction? And can the retaining walls also be used as the foundation for the overpasses and eco-fly-overs to be erected? This calls for a special investigation, conducted by SGS INTRON.



## STUDY OF THE MECHANICAL PROPERTIES

"CB walls are usually used to make sure that groundwater cannot flow into or out of a certain area", explains senior consultant Michel Boutz of SGS INTRON. "Not much research has been conducted on specific mechanical properties of this material. To date, mainly the compressive strength has been investigated. In order to answer the question whether CB walls are suitable as a foundation for the bridge decks, we have to investigate other mechanical properties like creep and adhesion to the retaining walls. To this end we developed a test programme in consultation with VSF. We conducted tests on three different CB mixtures, to which zero to fifteen percent of sand was added. After all, it is possible that, when excavating the wall, sand from the slot wall ends up in the mixture. We wanted to know what the effect of this would be. The sand appears to affect all properties: it increases the strength and adhesion and reduces the creep."

## WRAPPING TO PREVENT DRYING

When applying it as a foundation for bridge roads the adhesion between the retaining wall and the cement-bentonite is important. In order to determine the adhesion SGS INTRON performed tension tests on retaining wall strips poured into cement-bentonite cubes. In addition, the compressive strength of the CB walls is investigated, with and without soil pressure, and the creep. "If a bridge deck rests on the retaining wall, a vertical load is generated underneath the retaining wall - at about 20 meters depth - on the cement-bentonite", explains Michel Boutz. "The sagging due to the creep of the CB which occurs should not be too large. To investigate this we have loaded large cement-bentonite cylinders with a strength corresponding to the load of a retaining wall supporting a bridge road. No simple tests, because cement-bentonite quickly dries out when exposed to the air, resulting in cracks and loss of strength. Therefore, every cylinder had to be packed in three layers of foil."

## DURABLE SOLUTION

The risk of drying and subsequent cracking has been adequately covered in the construction project. Besides the high groundwater level a waterway and extra clay dam ensure that the CB walls cannot significantly dry out. Wet and in contact with the steel of the sheet piles they provide optimal protection against corrosion, concludes SGS INTRON in the durability study. "When looking at the life span we considered the risk of corrosion and whether the consortium, due to the protection by CB walls, would be allowed to calculate with lower cor-

rosion rates than normal. In that case, thinner sheet piles could be used. On the basis of our risk analysis we advised the contractor not to do this. With the currently selected construction and retaining wall slabs a life span of one hundred years can certainly be achieved."

On the basis of the study of SGS INTRON, among others, VSF decided to use concrete slurry walls for the foundation of the bridge decks, because they are more rigid and have more bearing capacity.

# SGS INTRODUCES

ON 1 FEBRUARY 2013 LUUT DE JONG JOINED SGS INTRON CERTIFICATION AS SOIL AND GROUND AUDITOR. Luut got his degree Higher Laboratory Training at the Noordelijke Hogeschool Leeuwarden, followed by a 1-year study of Environmental Technique in Enschede. In his job career so far he has been Environmental Technique project leader at a medium-sized road and waterways company in Friesland. The past 11 years Luut has worked as Head of Environment for a medium-sized contractor in Friesland. SGS INTRON recently crossed his path. The company offers him a unique opportunity for personal growth. With his current work experience in the field Luut definitely expects to be an asset to the organisation. With special thanks to his colleague auditors at SGS INTRON who are showing him the tricks of the auditing trade.



# SGS INTRON IN BUILDING PROJECTS ABROAD

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Other countries are calling, that is where we have to get our growth. That is the target SGS INTRON has set for itself. We have worked on it for about three years. But how is it going? The answer is short and simple: good!

The turnover we get from abroad is growing. A selection of currently ongoing projects. The Izmit bay bridge in Turkey is being built and our advisers regularly visit the building site. Or they fly out for (emergency) consultations with the customer.

The design phase for the 3rd Bosphorus Bridge, also in Turkey, has just been finalised. Together with a Swiss designer SGS INTRON worked on finding a solution for a number of concrete problems.

The third Bosphorus Bridge will be built north of Istanbul, just underneath the Black Sea. One of the largest projects within SGS INTRON at the moment is the Waaslandhaven project. SGS conducts all external quality controls on the large gates of this new sealock in Belgium. The gates are produced in Shanghai, China. On-site inspections were a demand from the client, as a part of SGS this is no longer a problem for SGS INTRON. SGS INTRON's role in this project is project management. This involves regular visits.

Last but not least a nice project close to home: Femern Sund Baelte between Germany and Denmark. This project is still in an early phase: the pre-qualification. SGS INTRON was asked by two consortia to form part of the consortium. Finally, we have had to choose one of them. Of course this was, in our eyes, the strongest one, a German combination.

These projects are ensuring a nice turnover generated abroad and are only a part of our international turnover. Conclusion: SGS INTRON's international ambition is right on track.

## BUSINESS UNIT MANAGER ADVICE AND CERTIFICATION RON LEPPERS:

### “IMPORTANT DECISIONS COME FROM THE GUT”

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#### SHORTLY AFTER YOU GRADUATED AS A BUILDING PHYSICIST YOU STARTED WORKING FOR INTRON. A COINCIDENCE?

“No, I knew INTRON from a report about frost damage in brickwork which I came across during my graduation research. Construction materials are my specialisation: (transport of) heat and moisture in construction materials. That background is a perfect match for INTRON. Partly due to this report I identified more with INTRON than with TNO, where many of my fellow students wanted to go. I applied for a job at INTRON immediately, though the position in question was not really my thing. A few months later, I had just been offered a permanent contract, a new position opened up. I was invited for an interview. I followed my gut and immediately went for INTRON. Without the security that I was going to get the job. Seventeen years later I can still say: it was the right decision.”

#### DO YOU OFTEN TAKE DECISIONS BASED ON GUT FEELING?

“I am a quite rational person, but for important decisions I do listen to my gut feeling. SGS INTRON suits me very well. In addition to a high knowledge level, in a wide area, the enthusiasm in the company is unique: people want to make things happen. We do not do tricks, but always try to find the best solution. In doing so, we deliver what others cannot come up with. We know what the customer will need tomorrow.”

#### WHAT ROLE WOULD YOU LIKE TO PLAY?

“If someone comes up with something at SGS INTRON, I am often one of the first ones to find it an interesting idea, adopt it and further develop it. I am a so-called ‘early adopter’. Right from the start I made my focus wide. I have done projects for the construction, environment, laboratory and certification departments. It often involved guiding innovations into routine operations. That is what I like and what I am good at. I know how to distinguish main issues from side issues. And because I also know my weaknesses, I have handled many projects together with colleagues - people with additional knowledge.”

#### IS YOUR EXPERTISE A PERFECT MATCH FOR MORE SUSTAINABLE CONSTRUCTION?

“Yes, that’s right. I know a lot about heat and moisture transport through materials and how materials affect the energy consumption of buildings. I have applied that knowledge in projects now and then, but also, for example, in the construction of my own house.”



IN THE SPOTLIGHT

products in a system often do not work together well. That experience was the drive for me to adopt and further develop the idea of a colleague for a new energy research and test centre. Now that the Sustainability Test Centre is up and running, I have to let it go. No matter how much I like it there.”

#### BECAUSE AS A SECTOR MANAGER YOU HAVE MORE THAN ENOUGH TO DO WITH MANAGEMENT TASKS?

“Certainly since I started managing two sectors: Advice and Certification. Before I became Sector Manager Advice in 2008 I was the chairman of the works council. I loved and found it important to talk with the management about strategy and policy. The partner model, where employees and management look for solutions together, works really well at SGS INTRON.”

#### WHAT DO YOU MAINLY USE YOUR ENERGY FOR AS SECTOR MANAGER?

What I find really important is personal attention for employees and customers. To make sure that employees continue to get the attention they deserve, I delegated part of my management tasks within

the Advice sector. As far as attention for customers is concerned, I think we can be more proactive. Surprise the customer every now and then by calling him on the phone, by actively thinking with him. Studies in recent years have indicated that customers praise our expertise time and again. But sometimes we communicate and deliver too late. As far as I am concerned ‘a promise is a promise’ can become our mission again.”

#### WHY DO YOU INVEST MOST OF YOUR WORKING HOURS IN THE CERTIFICATION SECTOR NOW?

Because I want to devote extra attention to the employees and the process. The suspension on a number of systems, which was related to the Certification in 2012, had a big impact. It also means a lot of work: a sizeable plan of approach was written which requires a lot of time and

dedication. But we are heading in the right direction. The new organisation structure is a clear improvement and we have also made great leaps forward in terms of process content. My responsibility lies in improving the process efficiency and ensuring adequate staffing and peace.”

#### WHICH SHOULD RESULT IN A BETTER, FUTURE-PROOF ORGANISATION?

“That I am sure of. I get my joy as a manager from the visible progress we are making, the atmosphere and the deep belief that we are going

to succeed. Our certificate holders choose us because of our professional know-how. The trinity we are, Advice, Certification and Laboratory, is also our strength and must remain our strength. That is also what SGS wants. We are lucky to have been taken over by a company with lots of similarities with INTRON. The cooperation within SGS will only increase in the future. If we succeed in combining our expertise with pro-activity and speed of delivery, we will be unique as an organisation and definitely future-proof.”

## SGS INTRON INVESTS IN THE MEASUREMENT OF THE HEAT CONDUCTION COEFFICIENT OF CONSTRUCTION MATERIALS

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The development of sustainable and, hence, energy-efficient products and processes in the building trade is a hot topic. Not so strange, because at least 35% of our energy consumption, and therefore CO<sub>2</sub> emission, can be ascribed to the energy consumption of our built environment and another 15% to the manufacturing of the required building materials. A material property which directly affects the energy consumption of the built environment is the heat conduction coefficient. That is why SGS INTRON laboratory is currently investing in the technique and know-how to measure the heat conduction coefficient with the highest possible qualification (CEN Keymark).

Measuring the heat conduction coefficient is closely related to many existing laboratory services of SGS INTRON. For example, the testing of insulation materials will be further expanded and a measuring set-up was chosen which allows for the study of other insulation materials on this parameter.

Due to our extensive options to imitate atmospheric influences and stimulate ageing cycles in the laboratory, the heat conduction coefficient can also be determined under special conditions. As was mentioned in the previous edition of this bulletin, SGS is a participant to a cross-border initiative called BIHTS (Building Integrated High Tech Systems) which is aimed at open innovation and contract research for the application of new energy in a built environment. Within this context the measurement of the heat conduction coefficient will also take in an important place.

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