RISK MANAGEMENT JOURNAL 2/2015



From fire to nature reserve

Smart technology

Electricity related fires are a severe risk



Who's in charge?

HOW TIME FLIES... It's been more than a year since we had the biggest forest fires in modern Swedish history. The fires in Västmanland were a national disaster for Sweden and they continued for many weeks. Overall, the fires were not as financially costly as was initially feared, but many people and businesses were hit hard and the effects are still seen and felt.

In this edition, you can read more about what we in If and other stakeholders have learned after the fires were extinguished. I was struck by the enormous forces we were facing. They were far more severe than I could ever have imagined. We must take this into account when assessing risks.

Another key lesson for us to learn is the importance of a clear answer to this question: Who's in charge? There must be someone at the top willing to take the - not so popular -decisions at a time of crisis. It was only when the position of leadership had been clearly established that the work of extinguishing the fires became effective. I think that there are a lot of lessons for us to draw upon from this experience.

If had a very proactive approach towards claims handling in this case, and I am proud of the work that was carried out for our customers. The feedback confirms that our customers really appreciated this. You can read more about these dramatic events on pages 4-5 of this edition.

This edition of the Risk Consulting Magazine covers many different aspects - just as we do at If.

I hope that you will appreciate the vast experience that our organisation has to offer in order to further improve your business. This is our ambition - to further enhance the competitiveness of our clients!

NICLAS WARD. Head of Business Area Industrial. If





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rocked the port city of Tianjin, China, 15 August 2015. **Explosions and a fireball** at a chemical warehouse killed at least 85 people in the north-eastern Chinese port city of Tianjin late on 12 August. EPA/WU HONG

The Tianjin disaster

Port of Tianjin, China explosions may result in potential losses between USD 1.6-3.3 billion according to Guy Carpenter. The explosions are likely to constitute one of the largest insured man-made losses to date in Asia and will certainly be considered one of the most complex insurance and reinsurance losses in recent history.

The fireball and shock wave blasted shipping containers; incinerated vehicles; destroyed warehouses and production facilities; impacted the nearby Donghai Road Railway Station and blew out windows within residential structures for several kilometers.

7 094 777 Lithuania +370 5 210 9800 Russia +7 812 313 51 46

Finland +358 10 19 15 15 Sweden +46 771 43 00 00 Norway +47 98 00 24

00 Denmark +45 7012 24 24 France and Luxembourg +33 1 42 86 00 64

50 Great Britain +44 20 7984 7600 Estonia +372 6 671 100 Latvia +371

Germany +49 6102 710 70 The Netherlands and Belgium +31 10 201 00

If P&C Insurance,

contact information

New risk management survey

Aon's 2015 Global Risk Management survey, compiled from responses from over 1,400 risk management professionals in 60 countries, shows companies grappling with new risks but differing on how they rank and how best to address them. Threats to companies' reputations and cyber risk rank high among business leaders' top risk concerns, while economic and regulatory risks along with increased competition and the inability to retain or recruit needed talent continue to rank high.

Underinsurance challenge

Underinsurance in property is a global and growing challenge, says latest Swiss Re sigma study.

The global natural catastrophe property protection gap has risen steadily over the last 10 years, and 70% of the economic losses, or USD 1.3 trillion, were uninsured.

Catastrophe models estimate the global uninsured losses from future natural disaster events to be USD 153 billion annually.

Out of these, the largest uninsured natural catastrophe exposures are in the US, China and Japan.

In the emerging markets, 80-100% of the losses are uninsured

Combined with other "general property risks", there is global total property underinsurance of USD 221 billion in expected losses.

Risk analysis of major cities

Llovd's City Risk Index 2015-2025 analyses the potential impact on the economic output of 301 of the world's major cities from 18 man-made and natural threats. Based on original research by the Centre for Risk Studies at the University of Cambridge Judge Business School, the Index shows how governments, businesses and communities are highly exposed to systemic, catastrophic shocks and could do more to mitigate risk and improve resilience. Identifying the risks, modelling and measuring their impacts, and investing in greater resilience - from better infrastructure to increased insurance protection are the first steps in this process.



In the wake of a forest fire

The forest fire in Västmanland destroyed everything in its path and left in its wake a charred landscape, burning roots and falling trees. However, it also set in motion something new, as the fire ravaged woodland was transformed into new nature reserves.



little over a year has gone by since the biggest forest fire in Sweden in modern times ravaged the landscape in Väst-

manland. Although the embers had long since been extinguished, it was only at the end of May that the ban was lifted and people were permitted to visit the fire-affected forest.

The fire started on Thursday, 31 July at a logging site in the north-eastern part of Surahammar Municipality. The cause of the fire was a spark from forest machinery, and during the first twentyfour hours the fire razed 150 hectares of woodland.

On what has become known as "Dark Monday", the fourth of August, the fire area swelled to five times its original size and the fire reached its height during the day. That evening, approximately 3,100 hectares of woodland burned.

A thousand people were evacuated from their homes and the fire was upgraded to a matter of national concern. The decision was made to transfer responsibility for the fire-fighting work

from regional authorities to the state via the County Administrative Board.

The Incident Commander and Chief Fire Officer, Lars-Göran "Uddas" Uddholm was designated as Head Coordinator. He had had previous experience in times of crises in connection with the Boxing Day tsunami in 2004, and was about to jump straight back into the action.

Up until Sunday, the strategy had been to employ traditional fire-fighting methods, but Monday became a catastrophe. The tactics were completely inadequate and the fire spread without hindrance. When a fire reaches such vast proportions and there is such a forceful exchange of heat and energy, there is nothing else left to do but flee.

"By the time I arrived in the picture, the conditions of the fire had declined, and the operation's prospects had improved, largely owing to the abating winds. Any concerns that the fire would reach the community of Norberg on Monday evening were put to rest as the progress of the flames was tempered somewhat", says Lars-Göran Uddholm However, Monday did see the fire

claim its first victim.

"THE SITUATION SWITCHED from fighting a fire to assisting a community in crisis".

One person was deceased, another was critically injured, and the whole community was affected as people and animals were evacuated from their homes. People were very worried and there was a great need for information.

"My job was to manage the whole lot. The fire-fighting efforts were a very important part, but I had colleagues on the ground to take care of that. I focused on what needed to be done in the community and created a joint action team made up of all the key players affected by the situation on one level or another. The objec-



tive was to be prepared to answer any and all of the questions that would be asked".

The number of people affected was considerable, around 200. Everyone from residents of the area, summer cabin owners and small forest owners to large forestry companies.

One of the large companies affected was Bergvik Skog, which is one of Sweden's biggest forest-owning companies and harvests 6.2 million m3fub (a Swedish scale to measure timber) annually.

Early in the summer of 2014, Bergvik Skog came to an agreement with the Swedish Environmental Protection Agency to substitute land in high conservation value areas so that they could be used for purposes of nature conservation. This is part of a government initiative to protect valuable forests in Sweden to help achieve an environmental goal termed "Living Forests".

The terms of the agreement involve Bergvik Skog relinquishing a total of 34,000 hectares of forestry land in exchange for government land with an equivalent value.

"The deal came into force shortly prior to the fire breaking out in Västmanland," explains Mikael Perérs, Property Manager at Bergvik Skog.

Included in the exchange was a parcel of land in proximity to Hörnsjöfors, which the company received from the

state approximately two months before the fire. Large tracts of this area and another area farther south at Ramnäs were affected by the conflagration.

"Once the fire was over, we promptly made contact with the Swedish Environmental Protection Agency as we were aware that there was an interest in creating nature reserves in areas that had burned, and this was also an especially large area," says Mikael Perérs.

FOREST FIRES ARE incredibly destructive but, by creating a reserve, a unique opportunity is provided for scientific studies on how animal and plant ecology reacts to large-scale forest fires.

Based on this, the scope of the agreement increased by 1,700 hectares.

"We are pleased with the process. It should also be noted that the value of the land we received in the original exchange and then ceded after the fire, decreased by half, even though there was still forest left standing," says Mikael Perérs.

"For Bergvik Skog, the land exchange is a way for us to help in the creation of more nature reserves, with a view to achieving the "Living Forests" environmental goal."

Bergvik Skog's land in Västmanland is tended to by other forestry management companies. It was on Bergvik Skog's land that the fire started.

"A process relating to insurance law is under way, of which we don't yet know the outcome. Generally speaking, there is ongoing debate on whether silviculture preparation, in any form, should be permitted during dry conditions. Bergvik Skog is participating in these discussions, and we are utilising the knowledge emerging from the process. Procedures have been scrutinised and some strident measures have been implemented," says Mikael Perérs.

Today, Bergvik Skog no longer owns land in the fire-devastated area, but Mikael Perérs recently visited and took a walk through the forest previously owed by the company.

"The scene of the aftermath of a huge forest fire makes you feel little."

The forest in the areas sold for the purposes of nature conservation are still there, just as after the fire.

"I feel that more trees have fallen during the winter, and it looks like a giant game of Pick-up sticks out there. One gets a post-apocalyptic feeling when moving through the area."

"I've also visited the fire area not set aside to become a reserve, which is owned by AB Karl Hedin, and in there they have worked extensively to salvage raw materials and to chop up trees. Time has been of the essence, because the approach of spring and summer also signals

the arrival of blue stain fungi, which attack the dead timber trees.

IN ORDER TO prevent accidents in the aftermath of a forest fire, a free course has been offered on how to work in a firedamaged forest. A great deal of focus has been placed on the impact of a large forest fire on the psychological well-being of those affected.

For Lars-Göran Uddholm, the anniversary of the massive forest fire means the spotlight is once again cast on the incident and it emphasises the tremendous power of nature. When asked if anything can be learned from this, he responded:

"Awareness of the vulnerability of nature needs to increase. Here in Sweden, we are not used to having such dry spells and we lack the respect for nature that other parts of the world possess. This applies to organisations, companies, municipalities and so forth, but even the smoker taking a walk through a forest must understand that one cannot simply just toss a cigarette stub on the ground."

Sofia Fornell sofia.fornell@if.se



Automatic measurements improve safety

Automatic measurements of ground movements and the condition of various structures can significantly improve occupational safety on construction sites and prevent personal injuries and property damage.

arge and demanding construction sites involve numerous risks which, if they were to materialise, would cause property damage in the order of millions. Risks can be controlled through professional monitoring of construction sites. In this context, automatic measurements carried out in real time play a prominent role.

Smaller sites are equally prone to risk. In connection with groundwork, serious accident involving fatalities occur in Finland almost every year. Collapses in excavations causing accidents do not occur unannounced. Before a collapse occurs, small ground movements, measuring only a few millimetres or centime-

tres, are observable in the ground. Such movements can also take place over the course of several days, rendering them extremely difficult to detect.

However, even the smallest movements are measurable, with automatic surveillance equipment alerting the staff to any changes that have already taken place. This allows site management to take immediate action to respond to the changes,

improve safety and prevent the actual collapse from occurring.

FINMEAS LTD IS a forerunner in the field of automatic measurements. Our products enable the monitoring of ground movements and related phenomena, including the condition of various structures, in an easy and reliable manner. All our solutions make use of equipment which is installed in the location where measurements are intended to be obtained and which automatically transfers measurement data to our Internet service. Our service allows the setting of limiting values which, when surpassed, alert the responsible staff member by an SMS or e-mail message. This allows dangerous situations to be detected before they have time to become serious and lead to accidents.

Automatic measurements are more reliable and cost-effective than traditional manual measurements. Precise measurement data, obtained in real time, contributes positively to the safety of construc-

tion sites, facilitating the optimisation of the nec-Automatic essary structures. The fact that our equipment measurements can be read remotely diminishes the number of are more human errors and the reliable and amount of unnecessary cost-effective work, and it also reduces cost. This is why investthan traditional ments made in automatic measurement equipment have a short paymeasurements. back time.

manual

The safety levels are enhanced, as real-time

information is available at all times. Information on changes is available immediately when they occur, allowing time for corrective action. Due to the real-time nature of the data, changes can be linked with the reason behind them more accurately than before, further facilitating the completion of necessary measures.

Costs are reduced as the need to read the measuring equipment manually on



site is eliminated. Due to automatic remote reading, measuring equipment can even be placed in extremely challenging and hard-to-access locations, where necessary. Costs are further reduced because real-time measurement data allow the optimisation of structures so that they are exactly the right size.

By automating measurements, the safety of both construction sites and the surrounding building stock can be guaranteed. By conducting measurements, contractors can also produce evidence, if necessary, showing that their operations have not damaged the buildings or the environment adjacent to the construction site.

AUTOMATIC MEASUREMENTS ARE

used to measure ground movements,

settlements, anchor forces, water level and rock movements, for example. In practice, our measurement solutions can be built around any subject.

Measurements of ground movements and settlements are used for the monitoring of soil structure movements. The most common applications include railway and road construction and the monitoring of the condition of mines and preparation plants, embankments and foundations, reservoirs and landfills, as well as dams and other constructions. At critical locations, even the smallest of settlements may constitute a serious safety risk. Automatic measurements provide instant information on changes, enabling prompt, precise and efficient corrective action.

Measurements of anchor forces, as the

term declares, are used for measuring the anchor forces of bulkheads. Unforeseen increases in bulkhead anchoring forces are an indication of an increased risk of accidents in excavations. Real-time measurements ensure that excavation shoring is sufficient, thereby enhancing safety at construction sites. Structures can also be made lighter, with ensuing reductions in costs.

ments, the number of anchors can be optimised. At some sites, measurements have enabled the reduction in the number of anchors by as much as one-third.

Changes to anchor forces may be caused by factors such as loading behind bulkheads and frost action in the ground. Anchor forces have a tendency to rise when pressure caused by frost action be-



At this Skanska

Through the conduction of measure-

gins to mount. Should this happen, the bulkhead is heated in order to reduce the pressure caused by frost action and to prevent the capacity of the anchors from being overextended. Due to automatic measurements, heating can be started at exactly the right time, leading to savings that may amount to thousands of euros at large constructions sites.

Water level measurements can be used to monitor groundwater levels, waterways and reservoirs, for example, with automatic measurement equipment generating an alert if the water level exceeds or falls below a preset limit.

Rock movement measurements are used, for example, in the blasting of tunnels, parking garages and other underground premises. Planners working on rock engineering structures typically draft a model of the way rock will behave during blasting. Automatic measurements ensure the reliability of modelling. If measurements indicate movements that are more extensive than expected, immediate action can be taken at the construction site to strengthen shoring.

The principal problem with manual measurements is their rather long measurement interval. Over the course of a couple of weeks, major movements may take place in rock, leading - in the worstcase scenario - to rock slides. Through automatic real-time measurements, changes can be accurately linked to the time of blasting, explosives used and similar factors. Remotely-read equipment can also be installed in locations that are difficult to access.

CITY CENTRES TODAY have few vacant plots left, which increases the need for automatic measurements. New construction sites are located in increasingly confined locations, adjacent to other office buildings or structures.

Large construction projects often involve excavations more than ten metres in depth, with the adjacent building being located only one metre away from the edge of the excavation. Therefore, in practice, the bulkheads in excavations

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must not move at all. In order to ensure this, automatic measurements are the safest and most reliable method.

Because urban areas already are densely developed, construction in such areas is increasingly going underground. The number of premises blasted into rock is expected to grow.

However, not only vacant plots but also even the best rock resources in the major cities have already been taken up by construction. One consequence of this is that the more demanding a rock type is, the more important is the role that measurements play. Sites that are particularly critical include metro stations and underground car parks where a great number of people pass through every day. In such premises, highly precise real-time measurement data is required.

At rock engineering sites, it is very important to monitor groundwater levels, rock movements, vibration from blasting and settlements caused by buildings and other structures. Under normal conditions, rock is subject to certain stress which changes when rock is blasted. When a tunnel is blasted, its walls have a tendency to cave in and the roof to rise, due to stress inherent in rock.

Under such conditions, the engineering office responsible for the planning of work assesses the probable behaviour of the rock by constructing a model and verifying the reliability of the model by conducting measurements. If the measurements indicate rock movements that are more extensive than expected, the rock may contain as yet unknown risk factors.

In highly demanding construction projects, such as blasting, measurement instruments may need to be installed in extremely inaccessible locations. Remotely read measuring instruments are often the only reliable alternative.

AUTOMATIC MEASURING equipment makes ample use of the opportunities offered by the industrial Internet. Automatic measurements are expected to become increasingly common over the next few years. Those planners, building developers and constructors who have tried reliable and easy-to-use automatic measurements methods just once are normally reluctant to return to the laborious and less reliable world of manual measurements.

An investment in automatic measuring equipment has a short pay-back time. The benefits become apparent both in the form of direct cost savings and, above all, enhanced safety. Safety is the major priority of all the parties in a construction project that involves several operators.

FinMeas Oy



FinMeas is an expert in automatic measurement methods. Solutions developed by Fin-Meas are being used in several of the most demanding construction projects underway in Finland, including the Kalasatama area in Helsinki, the Länsimetro metro line, and the Rantatunneli tunnel construction project in Tampere.

Sami Ylönen, Doctor of Science (Technology), is CEO of FinMeas Ltd and one of its two founders. Ylönen also represents Finland in the ISO standardisation group for geotechnical monitoring. www.finmeas.com

Narrow excavations are a safety risk

In construction, the collapse of trenches remains a major occupational safety risk. Especially on smallscale excavation sites, the risk is not recognised.



cause in Finland 1 to 3 fatalities per year. Accidents at work involving a fatality are in-

ation of Accident Insurance Institutions (FAII; TVL in Finnish), which compiles and publishes a TOT accident investigation report of its investigations. Between 1987 and 2009, TVL investigated 19 excavation accidents, conducting a detailed statistical analysis of them *).

The analysis revealed that all the accidents had one thing in common: the risk of collapse had not been recognised. Another factor that the accidents shared was that the sites were managed by several different organisations, which meant that the dissemination of information on risks inherent in the work remained insufficient.

THE INVESTIGATION REPORTS iden-

tified a total of 265 factors related to the accidents; in other words, approximately 13 factors per accident. None of the accidents were attributable to one factor only. Of the factors involved in the accidents

- 48.3% were related to the practices and procedures of the organisation
- 29.4% were related to the working environment
- 20.5% were related to action by an individual.

Among the practices and procedures of the organisation, two major groups stood out: defects in procedures, including risk management, and in the planning of work. The risk of collapse had not been recognised although this could have been possible, for example, in connection with maintenance inspections. The factors related to accidents in the working envi-

ronment concerned the excavation itself and its environment, which could involve deep and narrow trenches. In most cases, accidents involved a narrow trench more than 3 metres in depth. Action by an individual as a factor in an accident was related to a decision taken by the individual to work on the bottom of a narrow trench, coupled with the individual's inability to recognize the hazard associated with the situation, or to a decision taken by the individual to take a calculated risk. In the 19 fatalities, almost two-thirds involved an inexperienced worker (one with work experience of less than one year).

WORKING IN EXCAVATIONS ditches and similar locations can be classified as work associated with a special hazard which requires special safety precautions in order for the risks to remain under control (an occupational safety plan, a permit to work in confined spaces or a similar precaution). An excavation need not be deep and narrow in order for it to be dangerous; it is enough that exiting from the excavation is difficult and that working there presents a risk of being buried, drowned or suffocated due to material flowing into or accumulating in the excavation.

Even shallow excavations may involve a hazard. When workers are working on their knees or in a prone position, exit from the excavation will be difficult, and even a small amount of soil covering a worker may prevent the individual in question from standing up or lead to suffocation. For example, 0.5 m³ of sand may weigh as much as 600-850kg.

SAFE WORKING IN an excavation requires that

- the geotechnical properties of the ground and bedrock are investigated in order for the staff to be able to assess the risk of collapse in the excavamasses
- before the work is begun, there is a plan in place for the shoring or banking of the excavation, including other precautions
- the work is carried out according to

tion, and to obtain an understanding of the loadbearing capacity of ground

the plan. If that cannot be done, a new plan must be drafted under the leadership of a geotechnical expert.

• monitoring is carried out while the work is underway. While digging excavations, an assessment of the risk of collapse and of the loadbearing capacity of ground masses must be drafted.

CONSIDERABLE SPACE AND the

right soil types are required if collapses in an excavation are to be prevented through sloping. In most cases, a collapse is best prevented by ensuring that adequate shoring is in place, either in the excavation itself or outside it. The method of shoring depends on the depth, extent, bottom properties and environment of the excavation; on hazards caused by the water level, vibration and the weight of heavy equipment; and on the various economic aspects. Bulkheads used in excavations are commonly divided into three categories: sheet piling, double flying shoring and slurry walls. In addition to the above, narrow trenches can be supported through the installation of light structures, such as planking to prevent rocks and similar matter from falling into the trench.

Jaana Salo jaana.salo@if.fi



REFERENCE

*) Eeva Rantanen, Mervi Harju, Loviisa Norokorpi, Juha Uusitalo: Vaara vaanii kaivannossa ("Danger lurks underground research project on excavation safety."). a publication available in Finnish. Finnish Transport Agency (Trafi), Investment steering Helsinki 2013 Trafi Publications 9/2013 87 pages, 4 appendices.

Minimising fire risks at the planning stage

If's risk engineers give credit to Wipak for the opportunity of being involved in the plant planning process from the very beginning.

ackaging plays a key role in many sectors, including the foodstuff production chain, preventing foodstuff degradation and, thereby, forestalling the generation of much more harmful waste - catering waste. Packaging protects the product during transport, storage and retail sale. It also preserves the product fit for use. Stringent requirements govern cleanliness and hygiene.

Applied to foodstuffs, multilayer film materials produced by Wipak and Winpak enable a reduction in the amount of food additives used to preserve food for a longer time.

WIPAK AND WINPAK place a premium on quality and risk management, a fact that is clearly evident in the fire safety of the new production facilities in Poland and China "We have put in place the latest technology at our plants. This will protect the personnel and property against loss caused by accidents, ensuring continued operation in a sector that is extremely vulnerable to smoke and im-

purities," comments risk engineer Ari Ahonen. He was involved from the very beginning in the planning process of the fire safety at the plant in Poland, completed in late 2013.

Engaging If's risk engineers in the planning process at the earliest possible opportunity made also economic sense, because installing automatic extinguishing equipment after the facility is completed would be expensive and difficult.

"THE INSTALLATION of piping and fire detectors as well as the division of the production premises

into fire compartments is significantly easier and less expensive if such aspects are addressed right at the planning stage," remarks Håkan Edoff, emphasising this point. He was involved in the

planning of fire safety at Wipak's packaging facility in China, completed in 2014.

In addition to China and Poland, Wipak has production plants in Finland, Germany, France, Holland, UK, Spain and Italy. Winpak has facilities in the United States, Canada and Mexico.

According to Petri Leskinen, Treasurer at the Wihuri Group, which owns Wipak, collaboration with If's risk management has been a very positive experience.

"We are satisfied with the services offered by If's risk management and with the professional competence of their risk engineers. With regard to plant projects like this, beginning collaboration as ear-

ly as possible is extremely fruitful, both from the viewpoint of the enterprise and the insurance company," he says.

Risk management provides excellent support to quality work, which is vital in the production of medical packaging.

"Since we are engaged in international competition, investments in this area constitute part of the development of our operations and, through this, part of the development of our competitiveness," comments Leskinen.

"In the different phases of our production, we must follow the quality require-

Fires are always easier to prevent than to extinguish.

ment set by the health care system and the foodstuff and medical industries, as well as by external auditing organisations extremely closely," Leskinen says. The manufacturing process of packaging

material uses flammable liquids when patterns are printed in different colours, and the packaging material is formed under extreme heat.

"Raw materials for plastics will melt at temperatures of 200 to 250 degrees Centigrade. While in the refinement processes temperatures remain at a lower level, they may still be as high as 100 degrees," Ahonen comments.

IN COLLABORATION with If's risk engineers, Wipak's and Winpak's experts have explored means by which the fire safety systems of production facilities can be made as flawless as possible.

Despite ongoing changes in production technology, the principles of fire protection remain unchanged.

"Effective fire protection methods do exist. Structural fire prevention as well as a fire alarm system and an automatic extinguishing system form the foundation for all of this. Wipak was prepared to fully address these considerations, even though the regulations issued by the Polish and Chinese authorities did not require such solutions," Ahonen and Edoff sav.

"The primary element in fire safety is an automatic extinguishing system, or sprinkler, designed and installed in accordance with the rules. It must be coupled to a fire alarm system that detects the generation of combustion gases at a very early stage," Ahonen states.

"A well-designed and properly installed sprinkler system will not allow the fire to spread, and will contain or extinguish it where it breaks out."

AT WIPAK'S new plant in Poland, every effort has been made to take all relevant factors into consideration. If there is an unexpected interruption in the plant's power supply and the electric sprinkler pump stops functioning, an automatic diesel pump will provide the sprinkler system with a sufficient amount of water.

THE LARGE 680 cubic metre water tank of the automatic extinguishing system and the pumping station are located in a separate building. A water tank is sufficiently large with efficient pumps enabling the expansion of the extinguishing

system if the production facilities need to be expanded.

In addition to the sprinkler extinguishing system, the storage and handling premises for flammable liquids have been protected using a carbon dioxide extinguishing system, and the server room has been equipped with a FM 200 gas extinguishing system.

A major goal in fire protection is to prevent the fire and combustion gases from spreading beyond the fire compartment. The key passive protection method lies in dividing a building into smaller parts by means of structures forming fire compartments. In addition to this, the technical facilities such as the premises for electric equipment and flammable liquids comprise their own fire compartments. Fire doors must provide the same level of fire safety as the wall in which they are installed. They have also been equipped with a mechanism that automatically closes the doors in the event of a fire alarm. The cable and pipe penetrations between the various compartments have been sealed in a proper manner. The compatibility of the smoke ventilation system with the sprinkler system has been ensured.

Building materials play a crucial role in fire protection. Wipak's new production plant in Poland has a concrete construction, rendering it resistant to the spread of fire. The inner part of the wall structures that insulates temperature is made of mineral wool, making it considerably safer from the viewpoint of fire safety than wall structures constructed using a Styrofoam insulation.



BY TAKING ACCOUNT of fire safety from the planning stage onwards, major accidents can be prevented and an official permission to continue operations from authorities can be ensured in situations where a fire has damaged only a small section of a production facility.

In addition to cutting-edge technology, the personnel play a key role. The provision of regular training for motivated and skilled personnel in handling first-aid fire extinguishing equipment and similar technology is an important part of Wipak's and Winpak's fire safety system.

Harry Nordqvist harry.nordqvist@if.fi



WIHURI IS A global Finnish industry and trade conglomerate engaged in operations in four different business sectors.

One of them is the packaging business with an annual turnover of approximately one billion euros. Packaging produced by Wipak and Winpak is used in the food and medical supply industries.

The packaging business of the Wihuri Group, comprising Wipak in Europe and Asia and Winpak in North America, is one of the world's leading producers of packaging materials for the food and medical supply industries. The newest production plants of the Group are located in Poland and China.



Risks related to fires in large industrial warehouses are still a major challenge for risk managers, insurance carriers and authorities. Without well designed fire protection systems, fires get quickly out of control and result in significant damage.

CA is one of the largest tissue products companies worldwide. As such it handles and distributes large quantities of combustible goods on a daily basis and must cope with the challenge to control risks related to their warehouses, located all over the world. It is easy to understand that especially tissue products, stored in large quantities, rank very high with regard to fire risk control.

In common with many other companies in thousands of warehouses around the world, SCA has built their fire risk control on automatic sprinkler systems. Sprinkler systems have been known for more than a century and have proven to be an effective means to control fires.

Figure 1. How does ORS work? Working principle



"ORS is not a fire extiguishing system but a fire prevention.

WHY DOES THIS not always seem to be the best protection? The answer is quite simple. Sprinklers need a fire to activate! Sprinklers only react if a fire breaks out and has grown to the degree that temperatures at the ceiling level, where the sprinklers are positioned, have reached certain limits to open the closed sprinkler heads and to discharge the extinguishing agent,

water.

But fire is actually something nobody wants. A fire always results in heat and smoke, and can result in significant disturbances of the business process. The degree of such a negative impact depends very much on the quality of the sprinkler systems provided.

Sometimes the job is done quickly, with only small amounts of heat, smoke and water released. Sometimes huge amounts of these unwanted substances are discharged, which could mean that although the fire is finally controlled, the entire stock is destroyed and several weeks are needed to get back to normal warehouse operations. Needless to say this is not good for the business. Moreover, all sprinkler standards (e.g. NFPA13, CEA4001) define strict bound aries for the successful application of sprinkler systems. Especially the maximum storage heights, which are somewhere around 7 meters, are not in line with today's needs for efficient logistics.

SCA is operating with highly sensitive hygiene products, in a competitive market. If's therefore suggested to its client,

Figure 2. How does ORS work? - Residual Oxygen (ROX)



SCA, that they would look into better ways of reducing fire risks and of achieving a high degree of availability and flexibility. Modern material handling systems would be more efficient if the storage heights defined by sprinkler standards could be extended, SCA stated.

"PREVENT A FIRE, so you do not need to extinguish it". This is a basic rule of fire loss prevention.

All If P&C loss prevention engineers have applied this rule hundreds of times. Non-Smoking procedures, many means to control electrical energy, good operator training, preventive maintenance to avoid uncontrolled mechanical energy, etc. are focal areas for the engineers in their attempt to achieve a high level of fire prevention.In other words: Minimize the potential ignition sources!

However, even such excellent prevention work cannot reduce the risk to zero. For some industrial processes we actually have to accept a residual likelihood of ignition sources.

WE MOVE TO a totally different level of risk control if we can accept the remaining ignition sources without being threatened with a resulting fire.

This can only be achieved if we take away one of the three prerequisites for a fire, i.e. oxygen. The fire triangle, consisting of oxygen, combustible material and an ignition source, is disrupted and a fire cannot be sustained. (Figure 1.)

	Oxygen content	Impact on personnel
Plastics	21 vol -% 15 vol -%	Harmless
	14 vol -% 13,5 vol -% 13 vol -%	Working range
	10 vol -%	Lack of concentration
	6 vol -%	Tiredness, nausea, faint
		Danger to life



hazard exposures.

That is the starting point for the design of the oxygen reduction system "ORS".

The ambient air within the warehouse, which has a normal oxygen content of 21% Vol., is treated in order to decrease the oxygen concentration to a level no longer supporting combustion. (Figure 2.)

NITROGEN ADDED TO the ambient air displaces some of the oxygen. Usually the nitrogen is generated on site from the air by a kind of filtering process. No other gases or chemicals are needed.

A set of compressors and high efficiency filters generate nitrogen, which is then discharged via a few pipes into the warehouse. Several sensors measure the oxygen content and stop and start the generators as needed (Figure 3.)

The oxygen level needed depends on the commodity stored in the warehouse. For many materials it is in the range of 15%.

An oxygen level of 15% is not dangerous for human beings but it is not acceptable for permanent workplaces. Therefore, an "ORS" can only be implemented in unmanned automatic warehouses. However, the warehouse can be entered for maintenance or control tasks for shorter periods, under defined conditions and if special precautions are taken. If needed, the oxygen level can be increased for a limited time period. This would then be comparable to temporary sprinkler system impairment, with wellestablished safety measures.

THE ORIGINAL INSTALLATION cost of an "ORS" could be lower than the cost for a sprinkler system. This is especially true if the sprinkler water supply needs to be installed as well.

The operating cost might be somewhat higher than for the sprinkler system, as the generation of nitrogen requires energy. The energy cost depends very much on the tightness of the building (walls, roofs) and the frequency of product movements (in- out).

In addition to the system and the operational costs, the building costs are decisive. To modify an existing building might result in significant extra cost to tighten up the enclosure and to build a

lock system (conveyor tunnel with doors on both sides) for the material handling.

In general it can be said that the "quantum leap" in risk control and the principal availability of alternative protection systems have a greater influence on the decision to install a "ORS" than the costs.

PROS AND CONS

- + No health risks during firefighting and salvage
- + High flexibility regarding commodities and storage arrangements. No limits on storage heights, pile sizes, aisles, etc.
- + No damage by fire, smoke, water or other extinguishing agents
- High reliability due to very few compo nents and the fact that any malfunctions are determined prior to an incident. Correction can still be carried out. Several hours or even days may be available before the system is finally impaired.
- + Fire prevention is permanently ensured. Even during periodical maintenance, the system is not impaired.

- (-) Not widely spread. Limited practical experience of both contractors and authorities
- (-) Design standards do not cover all important design issues. Especially the required oxygen level needs detailed analysis on a case-by-case basis.
- (-) Can only be implemented in volumes not constantly manned by human beings.
- (-) For economic reasons usually not applicable for existing warehouse structures but only for new projects.
- (-) Damage to the warehouse enclosure results in an impaired protection system. Good separation and building construction is therefore needed.

AT ONE OF the largest tissue paper mills in the world, the SCA Mannheim mill in Germany, continuous site developments and capacity increases made it necessary to invest in a new automated warehouse for the storage of tissue paper.

The project manager, Mr. Josef Heintz, stated in the beginning that for logistical and efficiency reasons the so-called "mother reels" should be stored vertically up to 11 m high. Further restriction by the fire protection system had to be limit ed to a minimum.

Very soon it became clear that a traditional sprinkler system could not meet such demands and that no sprinkler design standard for such a warehouse is available worldwide. On the initiative of the local If risk engineer, the decision was taken to install an "ORS". Mr. Roger Schilling, the plant manager, supported the concept particularly because of the very likelihood to actually prevent a fire. A long process of detailed engineering and risk assessments followed. Major steps which had to be taken for this project, but certainly also for other similar "ORS" projects were:

- Basic fire risk control concept
- Risk assessment (e.g. FMEA-Failure Mode and Effect Analysis)
 - els, based on codes, but also on larger scale testing.
 - demands. (e.g. tightness)
 - procedures. • Design criteria to be reconfirmed by

conditions In January 2015 the warehouse was taken into operation. Since then, the "ORS" has worked well, although some fine tuning had to be implemented on the basis of experience gained during the actual operation. The project manager, Mr. Josef Heintz, stated: "The decision to adopt the "ORS" was a good one.

budget.

CERTAINLY THE ADVANTAGES listed above can make an ORS a preferred means for risk control for other occupancies. If you need to minimize your business interruption risk or if you have to cope with unusual occupancies, such as • Cold warehouses (e.g. food products) • Electrical and IT rooms

- High hazardous chemicals (e.g. reactive

Figure 3. Ngeneration



• Definition of the minimum oxygen lev-

• Building design to meet specific "ORS" • Detailed acceptance review and testing

on-site testing under normal warehouse

It provides me the flexibility needed and the running costs are even a bit below the

to O₂ or water),

an ORS is an alternative which should be taken into consideration. If a company is considering installing an ORS, local authorities, the insurance company and specialised contractors should always be consulted to support the decision making.

AN "ORS" REPRESENTS an excellent alternative to traditional fire protection (extinguishing) systems. The "built in" pro-active principle makes it a possible solution for a business which cannot afford any interruptions.

For some automatic warehouses and some special commodities, e.g. tissue paper reels stored higher than 7 m, an "ORS" might actually be the only solution to achieve a good level of fire risk control while at the same time meeting the demands of modern logistics.

In some cases, If see the use of "ORS" as a good alternative to sprinkler or gaseous extinguishing systems.

However, as for any other larger loss control system an "ORS" is not a standardised installation, but the implementation requires detailed planning and cannot be "copied from the shelf".

Ottmar Zeizinger ottmar.zeizinger@ if.se



GENERAL INSURANCE



Smarter technology calls for smarter thinking

Recent advancements in consumer electronics have served both as a source of fascination and a source for concern in the boardroom, writes Torbjörn Magnusson, president and CEO of If P&C Insurance.

ot a day goes by without new and exciting smart technology making the headlines: Smart watches, connected homes and

self-driving vehicles. In particular the past year, coinciding with the 25th anniversary of the Internet, there has been a great surge in the connectivity of seemingly ordinary objects around us. Not only are things coming online and connected, but also in turn interconnected. Digitalisation, the Internet of Things (IoT) and Big Data are prophesied to fundamentally change, even disrupt, any industry. Insurance has often remained unaffected by external change, but the question remains if this time will be different.

OUR INDUSTRY HAS a long tradition of applying digital technologies in order to streamline internal processes and service customers better. New sensors, coupled with cheaper data storage and cloud processing, could alter insurance on a more fundamental level, impacting underwriting, pricing and claims all together.

Appreciating that many customers never experience claims, and feeling challenged in the battle for customer attention, insurers are already exploring how

their business model could be extended. The main challenge is not to get seduced by all these gadgets, but instead learn how to navigate the constantly evolving landscape.

THE UNIVERSAL START-UP formula these days seems to be

1) find something that has not been digitalised,

2) put a chip in it and

3) connect it to the internet. Paired with a sharp drop in electronics and connectivity costs, the business model can apparently wait. Given enough users, revenue is bound to follow. With that, our digitalised society seems set on an exponential growth path: Gartner estimates more than 25 billion devices will be connected by 2020, fivefold the current levels. All these new sensors produce hitherto unforeseen amounts of data: some cars already today process 25 gigabytes, roughly a mid-size library's worth of

books, every hour. This explosion of data can easily feel overwhelming, but the key is to acknowledge that the world has not really become more complicated or complex, only quantified in new ways.

TRADITIONALLY INSURANCE HAS

built on risk proxies in order to predict the probability of loss events. The new sensor-driven world has the prospect to forever change the mechanics of pricing, by telling the story today left unexplored in our variables. On a conceptual level there could be a partial shift from "proactive" and enquiring underwriting practices, where customers are drilled for information, to "reactive" data collection where users simply comply to share their personal data streams as they live their lives.

In an industry as essential to society and heavily regulated as insurance there will always be a healthy distinction between what technology is capable of and what legislation will allow. This fine line could become nuanced if acceptance of technol ogy was to change.

The vast amount of data available should come to the delight of our actuaries, arguably the original data scientists, but is generally cruder. Data is often left unverifiable or even unstructured, and sets new pre-requisites for finding meaningful homogenous exposure units in the data. The constant flow of new data also implies that tariffs will need to be revised almost continuously, in volumes previously not seen before.

WHAT COULD MAKE this time truly different is how the same sensors could be used to empower customers directly, incentivising sound risk behaviour. Beyond

"The main challenge is to learn how to navigate the constantly evolving landscape."

this, new realms of sensory data are enabling proactive avoidance of hazardous situations all together. The effect of active safety systems, such as Volvo's emergency-braking system City Safety that even prevents crashes with cyclists, puts forward serious questions about future estimates for claims inflation and reserve provisions.

THE CURRENT LOW interest rate environment calls for an even stronger discipline on underwriting excellence, and new data connection is likely to become the battleground.

In IT it is noticeable that winners usually end up "taking it all", and so insurers not embracing the trends could ultimately find themselves outmanoeuvred: with potentially lower premiums, risks could become more heterogeneous and risk-peaks more prevailing.

Increased pricing accuracy could even leave some risks so extremely priced that they become unsellable. This asymmetry in risk assessment could be further exaggerated if adverse selection happens at ever lower premium levels. With billions on the line, however, there will undoubtedly be some entrepreneurs willing to take that risk.

Torbjörn Magnusson President and CEO of If P&C



Robotics Revolution

Artificial intelligence, digitalization and robotics are going to change the world big time. Autonomous cars without a human operator in control are already being tested on real streets and they will be a reality in a few years. In some decades they will form the majority of cars. This will change the risk picture of motor traffic dramatically.



ars have not become automatic overnight. Modern cars may already be delivered with many assisted driving devices. They are often intend-

ed to help the driver to avoid accidents but are also for convenience. Cruise control has become standard and is developing further. GPS navigation systems were first separate devices but are now often integrated into the car and its other functions. Recently, we have seen numerous gadgets such as parking assistance, lane holding assistance, blind spot vehicle detectors, smart headlights and even driver drowsiness alerts. Radar sensors scan other vehicles and obstacles and in case of danger warn the driver or use the brakes automatically.

The manufacturers have been developing new technologies all along. Many new features have been added to upmarket cars first and when production costs have decreased these features have existed in almost all cars.

But it is a big step forward to consider fully automatic cars. This is not one technology but rather many technologies interacting and depending on each other.

What have been separate solutions have to unite. Besides individual assist devices there are other relevant approaches in use

Under the term telematics, various systems and standards to improve efficiency and safety have been developed especially in heavy vehicles since the 1970s. Vehicles and freight containers have been monitored by GPS and RFID technology and wireless communication. This has led not only to systematic fleet management and resource allocation of vehicle and fuel use, but also to safety improvements based on online information of warning

signals and communication.

Several major car manufacturers such as Daimler, BMW, Volvo, Toyota and Audi have their own testing programmes going on. But this is no longer only about car companies. For example, Google is investing in its own autonomous car technology, and has already tested the prototypes for over one million miles.

In the USA, the federal government has approved a vehicle-to-vehicle (V2V) networking technology to be installed for testing in some areas. This would improve safety by allowing vehicles to "talk" to each other and ultimately avoid many crashes altogether by exchanging basic safety data ten times per second, such as speed and position.

Assisted driving technology is growing rapidly and is creating a serious business market around car manufacturing. In a recent estimate by Lux Research, the advanced global driver assist systems market will grow to USD 102 Billion by 2030. But even then the proportion of the fully autonomous highway pilot and parking assistant solutions would be only about 20% of the market.

The most realistic predictions say that the driver will still have a role for quite a while. The automated features will increase steadily before we can talk about fully autonomous driving.

HUMAN BEHAVIOUR CAUSES most ac-

timates vary, but it is believed that over 90% of all accidents are caused by people. The technological revolution will take quite a long time and meanwhile there will be both manual as well as autonomous cars in the traffic. This leads to accident types where the algorithms in the computer codes of the driverless cars must make decisions on actions to prevent or minimize the consequences no matter how unpredictable the other people involved. The moral aspects of the rules become fundamental: Should the car be allowed to cause some injuries or even death to prevent others? This is an uneasy question which even the philosophers and political scientists have finally woken up to thinking about. But, seldom have moral issues prevented technological evolution. In any case, human drivers will

cidents. Machines are more reliable. Es-

still be involved and cannot be freed from all liabilities overnight.

There have also been worries that the new technologies could become so expensive that this may prevent taking the best technology into use. It has been shown that it is possible to take over full control of a car by hacking. Cyber security and other safety related issues may hinder rapid progress. We expect much more from the safety of autonomous cars than from ourselves and other drivers.

LEGISLATION IN MOST countries prohibits driverless cars and requires a person to be in full control all the time. There are exceptions in some countries such as the UK, South Korea and some states of the USA, where at least testing is approved.

It will be a challenge for the legislators to create the necessary changes. They need to be international as the road traffic and insurance legislation must apply to cross border traffic.

Before the legal changes can be made, there must already be technical standards and platforms agreed between the \Rightarrow



producers. It involves massive specifications and international conventions on matters that are developing rapidly all the time.

If autonomous cars can be accepted in traffic from the technical and risk management point of view, a major remaining legal issue is the liability - and the insurance. Who will be liable in collisions or other accidents by autonomous cars? So far, the use of the car has been the basis for liability either as strict liability or based on the driver's negligence. But if the drivers are not involved and there is an accident, should someone else not be liable?

One alternative could be built on product liability. In the EU, this is harmonized through the Council Directive 85/734/EEC from 1985. Producers are liable for damage and injuries caused

by defective products. But it may still be complicated to create a functional system to handle the liabilities. Automobiles are constructed from numerous components and their manufacturers are also producers. And, as noted, driverless traffic is based on networking and uses services such as GPS, maps, telecommunication and cloud computing. There are telecom operators and other service involved. Product liability does not apply to services.

There will also be a very long adaptation period when there are both non-automated as well as highly or fully automated cars in traffic. To gather evidence on who actually caused an accident or whether it was the outcome of several contributing factors could be almost impossible and at least time-consuming and expensive.

To create an efficient liability regime might need new ideas. Maybe the future compensation system should after all be based on the use of the car no matter whether there are human elements or product defects involved. Then the insurance system to support the compensation model would also look more like it is now. Of course, the producers of defective products and service providers should also be involved somehow in the financial risk.

Matti Sjögren



Even the cars themselves could be totally different. There would not be the same limits on shape, construction, car if they are not driven by an unsafe human being. The use of raw materials, energy and the roads would change. Only our imagination sets the limage of digitalization and robots

and traffic jams could be a thing of the past in an integrated world.

interiors or activities inside the its to where we are going in the

It's all about traffic safety

Technology is developing, and small devices become more versatile, smaller in size and affordable to buy. Vehicle Tracking Devices are no exception and several new equipment suppliers have recently entered the market.



ositioning, route searching and monitoring or ex post monitoring of time, distance, average speed and consumption are all familiar and nor-

mal things for those who are sporty and exercise regularly. A meter is attached to the wrist, and the obtained data is activated through a mobile phone. What if the object would instead of yourself be vour vehicle and the meter attached to it? Still the mobile phone would continue to convey the information. Instead of calories you would follow the consumption of fuel.

ANTI-THEFT TRACKERS ARE the most traditional application. Depending on the intended use of the vehicle, you can set the device to sound an alarm immediately when someone attempts to move it, or select an area where the vehicle should be all the time – with an alarm to follow in case the vehicle moves outside this area. Trackers make it possible to follow the vehicle all the time, to locate it and get it back in case of theft.

The professional transport industry and companies in general aim at more economical driving style and efficiency. Usually drive flow is monitored: speed, braking, acceleration and of course fuel consumption as well as emissions. However, the savings in fuel costs are only one aspect. The data makes it possible to plan

routes and schedules better. Directing drivers towards a more economical driving style helps to manage costs, but it also improves traffic safety in general, as for example speeding is more difficult under constant supervision. For the driver this data might bring legal protection in cases where there is one word against another, such as after accidents.

A private individual might perceive monitoring as stalking or limitation of freedom. These aspects must be considered, but there is more to it. An individual can track his or her own routes and driving in general, and perhaps even compare speeds and consumption. One very handy tool is an automatic mileage report to show work-related and leisure time driving. In Finland many families have acquired a tracker for their vehicle when a child has recently obtained a driving license. This makes it possible for the parents to monitor the first steps of a young driver - and it encourages avoiding overkills in traffic.

trical system or the battery of the vehicle. The device is based on GPS or mobile technique and data is gathered using sensors. Depending on the intended use of the device and the system, the device can be directly connected to the vehicle's own information system. If a tracker is only needed to prevent theft, then it is advisable to select a device that is easy to hide and has its own battery. Vehicles themselves collect enormous amounts of information, and the future will show how this data will ultimately be utilized.

equipment costs have decreased. Systems for analyzing the data have also evolved by leaps and bounds over a short period of time. New software and devices enter the market all the time and are available to all. The purchase price of a normal tracker is rather close to that of a smartphone. With affordable maintenance costs you get a comprehensive solution. The cost is quite low even for a single individual interested in driving data, and it will certainly provide valuable information.

MOTOR THIRD PARTY LIABILITY OR PRODUCT LIABILITY INSURANCE?

The number of accidents is going to drop dramatically, and why should not fall to close to zero in the end? This could mean the end of motor third party liability insurance in some decades. One option is to keep the current systems for a while where either the cars or the drivers are insured. There will be a need for this at least as long as there are some non-au-

tomatic cars left. The other alternative could be to create a liability insurance system including the product liability of the car manufacturers and other parties involved in the manufacture or services of automatic traffic. Whatever the solution, insurance companies need to be involved in the legislative processes.

More broadly speaking, the insurance industry must stay abreast of the development in order to be able to identify the insurable risks and supply ser-

interlinked risks of tomorrow are different. The shift to driverless cars looks at first sight to be significant because it reduces the number of accidents and changes the rules of liability and insurance. But it will po-

tentially create fundamental changes in our everyday lives, how and where we work, how we shop for groceries and move around. The profession of taxi driver could vanish. We would not need to own cars anymore

vices needed. The complex and

THE TRACKER IS connected to the elec-As the technology has developed, the

With more varied needs and larger fleets, the total cost naturally increases and can become a major investment. The user needs and objectives should be properly specified in advance, so that it becomes clear what kinds of equipment and software support the chosen targets. It is likely that the investment will pay for itself in a rather short period of time through reduced fuel costs and road accidents.

FUTURE SCENARIOS:

- The use of tracking devices is increasing and the technology is developing rapidly. All the relevant information is already available.
- Devices are diversifying and mobile technology will become increasingly involved.
- The obtained information might be used in navigator route selection on order to avoid traffic jams or even for selection of the best route based on individual driving habits. Perhaps even vehicle usage fees will be based on this data in the future?

As a company, If supports all attempts to improve safety on the roads. If your company is considering the purchase of tracking devices for your fleet, you are welcome to contact us. Our Industrial motor underwriters will assist and support you to the best of their ability.

Cost savings and collection of data are always mentioned first in connection with trackers. However, we should always remember that in the end it's all about traffic safety!

Drive Safe!

Sami Laine sami.laine@if.fi





When production downtime can cost millions of swedish kronor, minimising risks is vital. At Arctic Paper's Grycksbo paper mill, prevention means cleaning carefully, knowing what to do in the event of a fire, and relying on the long experience of the staff.



mill in Grycksbo.

t's a well-known fact that they make paper in Grycksbo, 15 km outside Falun. The paper mill, which was established in 1740, is one of the oldest in Sweden to have remained in continuous use as a paper mill, which makes those who

work there very proud. Every month over 20,000 tonnes of coated paper leave the mill; paper which is then used for printing books, advertising posters and other paper products requiring high-quality image reproduction. Quite a large mill in its niche, but nowhere near the size of the big newspaper mills.

WITH LARGE PRODUCTION machinery, the involvement of chemicals in the process, motorised equipment and a combustible final product, there are many risks to keep track of in safety work. However, Safety Manager Ove Nilsson, who has worked at the mill for many years, does not believe that success is achieved by try-

ing to tackle each risk individually. "In my line of work, one safety issue overlaps the next, and so it should. If you keep the place clean, you reduce the fire risk because there is less material that could catch fire. But you also reduce the risk of staff having an accident, and of various kinds of debris finding their way back into the production equipment," he says.

Inside the factory, three different machines transform pulp into wide rolls of freshly produced paper. The coating that gives the paper its special shine - somewhere in between a rough newspaper and a glossy magazine – is applied as part of the same process.

Further down in the factory are machines that cut the rolls up into more manageable sheets, which are then packaged for shipping to customers. The paper is then stored in a large warehouse before going out for sale - as sheets or on a roll.

Apart from a couple of major holidays, production is up and running 24 hours a day, all year round. With a total of 400 employees working in shifts, care must be taken to ensure that important risk prevention work does not fall through the cracks.

EVEN IN THE most well-oiled of production facilities, the machines sometimes stop. In a paper mill, this can mean paper flakes being torn loose and dust spreading through the premises, which has a major impact on the risk of fire. It makes cleaning very important.

"There must be routines and responsibilities. People clean around the machine they work at - no one can expect someone else to do it for them. If a machine

is at a standstill, we have a cleaning blitz on those places that are too dangerous to clean when the machine is running. Some machines even have scheduled cleaning stops," says Ove.

If's risk engineer Stefan Nyberg, who visits Arctic Paper to conduct annual inspections of their risk prevention work, is pleased with the mill's working methods

"This is the kind of system we want to see when we visit industrial companies. It does not work if only a few people know about safety; it has to be in-Founded: 1740. tegrated into the way Manufactures: Coatof working. And it is at Arctic Paper – they Arctic and AP-Tec. work actively to prevent risks and they are responsive to the comtonnes/year. ments we make," he dom, Germany, Poland savs. and the Nordic countries. There are techni-85% of production is excal fire warning systems ported.

everywhere. Depending on the particular room and machine in question, these can be spark

detectors, smoke detectors or temperature sensors, which register that something is wrong and automatically trigger sprinklers - in some cases even inside the machine. Alarm bells warn the staff, while automatic fire doors and vents divide the factory into sections and isolate an area if the sparks could actually develop into a proper fire.

BUT NOT EVERYTHING is automatic. Ove also highlights how important the staff are for the safety of the mill. "Those who work here have to be riskaware. When should I try to put out a fire and when should I evacuate? In an office, it's easy – when the fire alarm goes off, you leave your work and evacuate the building. But if you are at a paper machine that is rotating at full speed, it is not so easy. That in turn can create an additional risk for the fire fighters," he says. Staff turnover at Arctic Paper in Grycksbo is low and many of them have been working at the mill for a long time – Ove says that is a success in itself.

"It's about everyone keeping their eves, ears and noses open - or just having the feeling that something is wrong. If something doesn't sound quite right or it is unusually warm. That feeling comes from experience, which the staff have after working here for such a long time," he says.

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IF A FIRE were actually to break out, the mill has a weapon few others have – its own fire brigade. A team of 24 persons is based inside the factory area and has access to two fire engines, a water tanker and a medical vehicle. Five people are on standby 24 hours a day and the trip across the yard to the factory building itself can be done in a couple of minutes.

The team also serves as a local fire brigade in Grycksbo and the surrounding

Arctic Paper in Grycksbo ed graphic paper under the brand names G-Print. **Production capacity:** Approximately 265,000 Exports to: United King-

CEO: Michael Féjer.

that the mill's team is given important training. Although a fire is a main concern in terms

area through a partner-

ship with Falun munic-

"ordinary" fires in the

local area also means

ipality. Going out to

of the risks at a paper mill, it is not necessarily the worst risk to the company. Production downtime for one or more machines can have a major financial impact and overall do more damage to the

company than a fire.

An important part of the risk prevention work, therefore, is to ensure that the machinery is maintained and that parts are replaced before they can cause any problems. Bearings, cables and switchgears are inspected at regular intervals – many of them also have their own automatic warning system.

ON THE DESK in Ove Nilsson's office sits a dented LPG bottle. It was found several years ago after a long ride in a pulper, a machine that is a bit like a giant dough mixer. He has kept it as an example of what can happen if you miss something when cleaning - but also to highlight how important it is that workers share information.

"Passing the buck doesn't work - you have to be brave enough to report when something goes wrong. If one person can make a mistake, someone else could make the same one. But if information is passed on, we can all learn from the incident," says Ove.

Tobias Edlund Tobias.edlund@if.se

Electrical hazards

The greatest risk facing a small and medium-sized enterprise is not always the one that causes the loudest media outcry. The proportion of electricity-related fires is greater than we previously thought.



oss prevention measures hardly make the headlines or stir up a social media outcry, although such measures often involve the most common fire risk that

companies face, including the cost-effective methods for countering such risks. Everybody is familiar with the social media's tendency to overreact over petty issues, but few have heard of thermal imaging, although the impact of electrical fires on a company's operations and on its customers may exceed those caused by most social media sensations by a factor of several times.

In 2005, when we began to investigate fires that have affected our Corporate Customers Business Area – in other words, our small and medium-sized enterprise customers – we found out that the proportion of electricity-related fires was greater than previously thought. We discovered that as many as 25 to 30 per cent of all fires were recorded without any clear indication of their cause. Previously, fires were distributed evenly between all the known causes, but on closer inspection, a significant proportion of them turned out to be electrical fires.

Our analysis indicated that the proportion of electrical fires was as high as 36%, instead of 25% as previously thought. As, at the same time, in the 2000s, damage caused by storms was steadily increasing in volume, we found this figure to be alarming considering the scant attention it had received. In practice, this issue is hardly discussed at all. News on fires normally contains the standard phrase "the cause of the fire is being investigated." Reports on causes are seldom published, even if the causes were clarified later. Fires that cause no threat to humans are not investigated as a general rule, as such investigations are difficult and expensive to carry out.

IN 2008, WE began to recommend to our customers thermal imaging of switchboards, carried out by external partners. It proved an effective means of detecting hidden risks of electrical fires in commercial properties. Our best partners detected spots which indicated overheating and required immediate action, and the best of the best suppliers even required rapid measures. One experienced thermal imaging operator went as far as to require an immediate halt to the company's production in order to ward off a fire risk – a request that at that time was unheard of.

The major challenge presented to our partnerships was the variance in the quality of service between the various service providers. Where one supplier used an excellent camera, possessed considerable experience and had the courage to take decisions, another would enter the switchboard premises with no clear idea of what they were supposed to do with their camera, or they would carry out imaging without even opening the covers of the switchboards. At the time, the business was so young that the best practices were missing, and experienced professionals were hard to come by.

In 2010, If employed Jussi Lehtonen an experienced thermal imaging entrepreneur, to develop a thermal imaging concept geared to the needs of an insurance company. At the same time, we promoted the initiative proposed by the Federation of Finnish Financial Services on the certification of thermal imaging entrepreneurs.

LEHTONEN CREATED A model that won over If's Corporate Customer Business Area management. We were given permission to conduct a two-year study for which we recruited five young engineers. These engineers were given thermal imaging training under Lehtonen's tutelage. The target was to inspect the switchboards of one thousand customers using a camera and visual observations, then compile reports of the observations and deliver the reports to the customer and enter them in If's data base.

During the investigation project, If's Safety Academy, comprising these young experts in electrical safety, investigated more than 1,000 individual sites; in other words, they carried out thermal imaging on 1,631 premises and on more than 11,000 switchboards, recording the results using a uniform model. The results give cause for grave concern to say the least: more than 90% of the premises in commercial use exhibited deficiencies with safeguards against electrical fires, requiring repairs.

The number of observations recorded during the investigation period totalled 8,918. In other words, each property in commercial use had, on average, 5.5 deficiencies requiring repairs. Approximately one half of the observations presented no immediate threat to life or a risk of fire, enabling them to be repaired during the next servicing. On the other hand, almost ten per cent of the observations were so serious that, metaphorically speaking, the fuse was already burning.

ACCORDING TO EXPERTS, the emphasis in the Electrical Safety Act is on the avoidance of immediate threats to life. Between 2010 and 2014, on the average 2.5 people died each year from an electric shock in Finland. Today, fatalities are only rarely attributable to deficiencies in electrical systems; those who have died have often been young men who have climbed onto the roof of a train or non-professionals dismantling electrical equipment.

The Executive Director of the Safety Investigation Authority, docent Veli-Pekka Nurmi has developed a physical variable of his own – the ratio of fatalities per terawatt-hour – related to the fatalities caused by electric shocks and measuring the risk in relation to increased electricity consumption. This variable clearly indiBetween 2010 and 2014, considerably more people, on average 14 each year, died as a result of fires caused by electricity. On the other hand, nearly 100% of these fires were household fires, indicating that the direct or indirect risk of death in a corporate environment is small.

Instead, according to Nurmi, in a society increasingly dependent on electricity, a lack of electricity is a risk that is becoming ever more important. Today, few companies can operate without electricity. Without electricity, livestock on cattle farms will perish without food and ventilation, a machine tool will stop functioning whereby the absence of cooling will ruin the piece being machined, and consumers will be unable to buy groceries such as bread and milk.

A total of 90% of enterprises in a society dependant on electricity exhibit deficiencies with electricity, of which as many as 50% may halt the operations of the company in question in the near future. Outsourcing electrical servicing also has a tendency to make things worse. It will decrease anticipatory servicing, leading to corrective measures to be taken only when there is a real shortage of power. Nor will regulations issued and inspections carried out by the authorities tackle the risk of power outages in any effective way in the foreseeable future. Unlike cyber safety, electrical safety has no sex appeal in the media; consequently, electrical safety does not normally make the headlines.

Consequently, the only party that really can affect the risks facing an enterprise is the enterprise itself. If company management wish to ensure an uninterrupted



power supply, they should have thermal imaging of all the switchboards at the company, including a network analysis if necessary, in addition to which an uninterrupted power supply must be ensured by putting in place a UPS system.

Niko Satto niko.satto@if.fi



Cyber Risks for Industrial **Control Systems**

Industrial Control Systems are simplifying the life of companies - and also increasing vulnerability to computer network-based attacks.

"Traditionally

these systems

independent.

ndustrial Control Systems (ICS) are typically used in industries such as electrical, water and wastewater, oil and natural gas, chemical, transportation, pharmaceutical, pulp and paper, food

and beverage, and discrete manufacturing (e.g., automotive, aerospace, and durable goods.)

ICS is a general term that comprises several types of control systems, including Supervisory Control and Data Acquisition (SCADA) systems, Distributed Control Systems (DCS), and other control system configurations such as

Programmable Logic Controllers (PLC) often found in industrial sectors and critical infrastructures. Actual implementations of ICS may be hybrids incorporating attributes of both DCS and SCADA systems.

THE RISK ENGINEERS from If are constantly on the lookout for emerging risks that could threaten your assets or business. One of the risks we usually inform you about is of course the cyber risk.

We also recommend you to protect your business Information and Communication Technology systems against attacks, for example by installing anti-malware protection and keeping that updated, and also to use different user identity / password combinations for separate functions and while on the internet, as well as to create safe storage locations for your data and back-ups. This and many more should be implemented in your companies with protocols in place and annual reviews and revisions being made.

However, ICS are typically not (yet) on the radar of organizations when they contoday were developed years ago, long before public and private networks, desktop computing, or use of the internet were a common part of business operations. These systems were designed in or-

sider their cyber security. Most ICS in use

der to meet performance, reliability, safety, and flexibility requirements. In most cases, they were physically isolated from outside networks and based on proprietary hardware, software, and communication protocols that included basic error detection and correction capabilities, but lacked the secure communication capabil-

ities required in today's interconnected systems. While there was concern for Reliability, Main-

tainability, and Availabilihave been totally ty (RMA) when addressing statistical performance and failure, the need for cyber security measures

within these systems was not anticipated. At the time, security for ICS meant only physically securing access to the network and the consoles that controlled the systems.

In the last few years, ICS have passed through a significant transformation from proprietary, isolated systems to open architectures and standard technologies that are highly interconnected with other corporate networks and the internet.

Today, ICS products are mostly based on standard embedded systems platforms, applied in various devices such as routers or cable modems, and they often use commercial off-the-shelf software.

All this has led to cost reductions and ease of use, and has enabled remote control and monitoring from various locations. However, an important drawback introduced with the connection to intranets and open communication net-



works, is the increased vulnerability to computer network-based attacks. For example, the US Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) has revealed US industrial control systems alone were hit by cyber-attacks at least 245 times in the 12 months between 1 October 2013 and 30 September 2014.

In the past, accidents, inappropriate employee activity and disgruntled employees accounted for most of the problems. However, this changed rapidly in the new

millennium. There are a number of possible explanations for this development.

FIRST, THE EMERGENCE of automat-

ed worm attacks starting with Code Red1 on July 19, 2001 shows that many of the intrusions have become non-directed and automated. The control system has become just a target of opportunity rather than a target of choice.

Second, common operating systems (e.g. Windows or Linux) and applications (e.g. SQL Server) now dominate the Human Machine Interface (HMI), engineering workstation and data historian systems (Data Historian Systems provide current and historical manufacturing information to plant and enterprise personnel.). These often come configured more appropriately to business requirements, and are vulnerable to a wide variety of common IT attacks and viruses. The inadequate application patches to these critical systems worsens the problem.

Finally, the increasing interconnection of critical systems has created interdependencies we have not been aware of in the past. As the 'Slammer Worm' incident documented by the North American Electric Reliability Council illustrates, internet incidents can indirectly impact a system even when that system does not use the internet at all.

Public interest was raised especially when 'Stuxnet' appeared in 2010. This Trojan targeted an Iranian Uranium Enrichment Facility and was extremely sophisticated. It appeared to be designed with this very specific target in mind. Its successors 'Duqu', 'Flame' and 'Gauss' also shared some of its code / design sophistication, but neither were reported to have had an impact on physical equipment, as 'Stuxnet' did. These attacks are, however, a strong indicator of the growing interest in SCADA systems as a target.

The damages caused at a German steel mill in 2014 show the potential of such an attack.

Here, multiple attackers used an advanced social engineering attack so as to gain access to the company network and then worked their way onto the control system network. This resulted in an incident in which a furnace could not be shut down in the regular way and the furnace was in an undefined condition, which resulted in massive damage to the whole system.

The likely impact of being unable to view or control the process or system underlines the importance of reliable emergency and safety systems. Traditionally, these systems have been totally independent of the main control system and have generally been considered 'bullet proof'.

However, mirroring the trend in the design of the main control systems, these emergency systems are also becoming based on standard IT technologies (such as TCP/IP). They are increasingly being connected to or combined with the main control system, increasing the potential risk of common mode failure of both the main control system and the safety systems.

Consequently, in the future, the systemic risks of cyber-attack need to be considered in the design of not just the control systems, but also the safety systems.

When you decide to improve security for your ICS operating systems (OS) and applications, you may find they typically do not tolerate common IT security practices. Legacy systems are especially vulnerable to resource unavailability and timing disruptions.

Control networks are often more com-



plex and require a different level of expertise (control networks are typically managed by control engineers, not IT personnel). Software and hardware are more difficult to upgrade in an operational control system network. Many systems may not have desired features, including encryption capabilities, error logging and password protection.

Preventive maintenance and Management of Change (MOC) are paramount in maintaining the integrity of both IT and control systems. Unpatched software represents one of the greatest vulnerabilities to a system.

Software updates on IT systems, includ-

ing security patches, are typically applied in a timely fashion based on appropriate security policy and procedures. In addition, these procedures are often automated using server-based tools.

Software updates on ICS cannot always be implemented on a timely basis because these updates need to be thoroughly tested by the vendor of the industrial control application and the end user of the application before being implemented. Another complicating factor is that ICS outages often have to be planned and scheduled days / weeks in advance. The ICS may also require revalidation as part of the update process. Another issue is that many ICS utilize older versions of operating systems that are no longer supported by the vendor. Consequently, available patches may not be applicable. MOC is also applicable to hardware and firmware. The change management process, when applied to ICS, requires careful assessment by ICS experts (e.g., control engineers) working in conjunction with security and IT personnel.

To ensure adequate risk management, it is recommended to apply a Framework for cyber security. For example, the US National Institute of Standards and Technology in 2014 published a Framework for Improving Critical Infrastructure Cyber-

security. This Framework, created through collaboration between the US government and the private sector, uses a common language to address and manage cybersecurity risk in a cost-effective way based on business needs without placing additional regulatory requirements on businesses. Because it references globally recognized standards for cybersecurity, the Framework can also be used by organizations located outside the United States, and can serve as a model for international cooperation on strengthening (critical infrastructure) ICS cybersecurity. The framework is available from: http://www. nist.gov/cyberframework/index.cfm

Help on security can be obtained from government organisations. For example, the European Union Agency for Network and Information Security (ENISA) acts as a facilitator and information broker for CERTs/CSIRTs. As an EU Expert body, it stays in touch with all the CERT/CSIRT communities in Europe and beyond. CERT stands for Computer Emergency Response Team. A more recent term is Computer Security and Incident Response Team (CSIRT). The name explains what makes these entities so special: like a fire brigade, they are the only ones which can react when security incidents occur.

REFERENCES

The majority of the text in this article is derived from documents and pages on the internet produced by the National Institute of Standards and Technology (NIST), which is part of the US Department of Commerce and the European Union Agency for Network and Information Security (ENISA). Both organisations promote the sharing of knowledge on cyber security, and their websites are listed in the references below. Examples of attacks are derived from the document produced by BCIt & PA Consulting Group as listed below. • NIST, Security and Privacy Controls for Federal In-

formation Systems, SP.800-53r4, 2013

- NIST, Framework for Improving Critical Infrastructure Cybersecurity, 2014
- ENISA, Good practice guide for CERTs in the area of In-

dustrial Control Systems, 2013

- http://www.nist.gov/cyberframework/
- http://www.enisa.europa.eu/ activities/cert
- BCIT & PA consulting Group, The Myths and Facts behind

Cyber Security Risks for Industrial Control Systems, 2004

STANDARDS

Of course, over the years many standards on cyber securi-



Besides reactive services (incident response), they usually also provide a comprehensive portfolio of other security services for their customers, such as alerts and warnings, advisories and security training. Over the years, CERTs/CSIRTs have evolved into premium providers of security services.

Erik van der Heijden erik.van.der. heijden@if.se



ty, and risk management have been produced. For your information we have listed some examples for general use below. • ISO/IEC 27000:2014, Infor-

- mation technology Security techniques
- ISO 31000:2009, Risk management Principles and guidelines
 COBIT (www.isaca.org)

TRAVEL INSURANCE PHOTO: FOTOLIA

Severe health incidents on the increase

While we live longer, the life we live may include a chronic health condition and lifestyle habits that increase the risk of severe health incidents. Long-haul flights combined with work-related stress do not diminish the risk.



ccording to the Global Medical Trend Survey 2014 report by Towers Watson, cardiovascular disease causes the

highest incidence of medical claims all over the world, though cancer is increasing rapidly.

For the above-mentioned survey, Towers and Watson asked their respondents to evaluate the employee's or provider's behaviour as part of the cost development. The biggest concern among the re-

spondents was overuse of care by medical practitioners recommending too many services. Sometimes, this may be driven by profit-seeking or interest in using new medical technologies. The second worry was overuse of care by the insured party seeking inappropriate care. The third leading factor was the insured party's poor health habits. This share has increased over the years.

One important factor impacting the claim cost is the general medical trends. The medical cost trends are stabilising, but the overall health care costs are continuing to rise. With the exception of Europe, the medical trend remains at double the rate of general inflation.

TRADITIONAL METHODS HAVE been contracts with medical providers and preapproval of services. A newer approach is to limit certain services and identify the most expensive cases where the saving potential is significant. The latest trend

STOMACH PAIN IN BRAZIL

Although not always related to a chronicle health condition, previous surgery operations and complications may matter as the following example shows.

A product manager who travels 30-60 days per year was on his way home from Brazil. He started to feel a pain in his stomach and contacted an airport doctor who did not decline his travel. The

pain got worse, and 30 minutes before the flight the pain increased so much that he decided not to fly. The product manager contacted the

employer's local office to get help. A local contact person arranged a driver to the airport with information on a proper hospital. At the hospital, the doctors found a need for surgery that had to be performed in yet another hospital.

The local contact person started to

check the insurance cover together with the Finnish HR person. At this point the need for an ambulance flight back home and the suitability of the hospital in Sao Paulo were investigated. The hospital had a good reputation for these operations but the acute pain was related to a previous surgery where the Nordic method used was unknown to the Brazilian doctor.

The surgery was performed 12 hours after the pain began. It was successful. The

is chronic condition or disease management programmes. In the US, insurance companies have also introduced costsharing models. In the US, almost 70% of respondents mentioned this as a typical market practice. Annual limits and deductibles are also widely used.

At the same time, employers are introducing Staying-at-work programmes that include health promotion elements. According to the Towers Watson report there is evidence that well-managed health efforts offer payoffs. Globally, employers that implement these types of programmes have 34% higher revenue per employee.

> Managing the cost requires cooperation between employers and insurance companies. The traditional methods of cost management are still needed, but the introduction of health and wellbeing programmes will play an important role in the future.

AN INCREASING NUMBER of

people who travel frequently on business are suffering from transient ischemic attacks (TIA), strokes and heart attacks. Long flights, poor eating habits and stress increase the risk of cerebral blood circulation problems. These risks can be identified in annual health examinations. If P&C Insurance Company has no-

ticed a dramatic increase in TIA cases

Index of severe sickness claims compared with level in 2010



product manager's wife flew to Brazil for her husband's recovery and stayed in a hotel. A doctor from If's global claims handling partner SOS International followed the recovery daily. They were allowed to travel back home after two weeks.

Lessons learned:

- Listen to your body
- It is important to know which hospitals are good enough

among frequent business travellers: the number of reported cases has risen by approximately 50 per cent over the last two years*.

Factors increasing the risk of TIA include long flights and workdays, jet lag, poor eating habits, lack of exercise and constant hurry – all typical of frequent business travellers.

At their worst, blood circulation problems in the brain, such as a cerebral infarction or haemorrhage, may lead to disability or even death. Special attention should therefore be paid to the health of frequent travellers, including early identification of the risk factors.

ACCORDING TO SWEDISH Rikshöft's statistics, 80% of people in the age group 50-64 years have some kind of chronic health condition. Most of them feel per-

fectly fit to travel.

We recommend annual health examinations for frequent business travellers, enabling early identification and minimisation of risk factors causing severe health incidents. This may include an analysis of the person's eating habits and a blood pressure test.

Sirpa Peura sirpa.peura@if.fi

Global medical trends by region: 2012-2014

	2012	2013	2014*
Global	7,7 %	7,9 %	8,3 %
Americas	9,1 %	9,1 %	9,7 %
Asia Pacific	8,4 %	8,8%	9,3 %
Europe	5,3%	5,2 %	5,4%
Middle East / Africa	8,8%	9,8%	10,0 %

- Have information available on local contact persons • Make sure that your travel insurance is
- valid • Your previous medical history should
- be well documented and your employer should have access to the information if necessary.

*Source: If P&C Insurance Company's claims statistics 2010-2013 on incidents occurring during business travel abroad



* Proiected

APPOINTMENTS



JAN ARVE DALE Property Underwriter, NO



JUKKA FORSSÉN Nordic Head of Property Underwriting



MARK HILLMAN Risk Engineer, UK



EETU RAJALA Employee Benefits Risk Management Specialist, FIN



PEKKA SARPILA Head of Risk Management FIN



GINE TENDEN Property Underwriter, NO



NIINA VERTANEN Risk Engineer, FIN

"Human behaviour causes most accidents. Machines are more reliable."

