



COMATEC®

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Editorial

Ten years after Lehman – the future looks bright



Over the last few days, we have looked back at the period after the investment bank LEHMAN crashed. Did we or did we not learn anything from the bankruptcy? In the autumn of 2008, the general opinion was that in Finland this failure would only have a small impact, if any. This proved to be a wrong assessment.

The year 2009 following the bankruptcy case marked large financial losses for the Comatec Group. One half of our equity disappeared in one blow. There were a lot of suspensions and dismissals. However, we got through all this by using determined strategies and cutting down costs. We started to build up the group and its business activities towards growth and internationalisation. The evolution process took eight years. They were laborious years.

The upturn started after eight years. There were already signs of growth during the autumn of 2015, but it really accelerated during the first part of the 2016 financial period. The most important reason for this was the labour market competitiveness agreement. Even though the agreement was not unanimous, it was still enough to start investments

in Finland. World-wide investments started much earlier.

During 2015, we launched a development program in the group that would last several years with the goal of strong growth abroad. We aimed at becoming established in Poland, Sweden and Germany by the end of 2018. We have exported directly to those countries for several years. We have reached the goal very well. We have companies running smoothly in Poland, Sweden and Estonia. Our establishing into Germany is well under way. At the moment, we have one hundred employees abroad.

Internationalisation has brought with it a significant amount of additional turnover and profitability. An indication of this is the growth in turnover of c. 40% in 2017, compared to the previous year. The balance sheet equity grew significantly. Even though the input into growth and internationalisation led to more costs, we still reached an operating margin of more than 10%. This result of business activities and the good prospects for business development are a sound basis for developing future operations.

The future seems bright. The new

business plan for 2019 – 2021 is now being prepared. The fourth development phase of our more international group started at the beginning of this year. We have started a new project concerning the ERP system. The new ERP system will especially increase the organization's operational capital. During the next financial period, we will make significant inputs into increasing intellectual capital by training our staff for more demanding design tasks. Those skills are needed for international operations.

We would like to wish all our readers a most pleasant autumn.

Aulis Asikainen
President and CEO
Comatec Group

International project looks for breakthrough in fusion energy production

ITER project's test facility built in Southern France

A fusion power plant is a project, which after completion would produce clean and safe nuclear energy for the needs of all mankind. Fusion is difficult to control and maintaining it calls for more energy than what is produced. There have been attempts to solve this challenge for decades. Fusion energy production will revolutionize the world when it finally becomes successful. The research reactor ITER, currently being built in France, is one of the most ambitious energy projects in the world.

TEXT: TAINA SYRJÄNEN

Fusion energy is a nearly perfect form of energy. Its benefits are enormous. A few litres of water and one mobile phone battery could produce fuel for one man's needs for decades. The fuel, the heavy isotopes of hydrogen, will be easily available for hundreds of years.

The production of fusion energy does not create dangerous high-level nuclear waste like a traditional fission nuclear plant does. Such waste must be stored for centuries. While a traditional nuclear power plant could cause a catastrophic accident, as in Chernobyl or Fukushima, fusion energy does not lead to similar dangerous situations. In case something goes wrong in the fusion, the reaction simply stops. In addition, no greenhouse gases are released in fusion energy production.

The sun's energy comes from a fusion reaction. A controlled fusion reaction would create an emission free, safe and almost endless energy source. As a matter of fact, fusion energy is expected to revolutionize the entire world some day.

Regrettably, the experiments of many decades have not succeeded in producing more energy by fusion than what is needed to keep up the reaction. Despite that, exceptional inputs are currently being made into fusion energy research facilities.

ITER – a full-size fusion reactor

ITER, the International Thermonuclear Experimental Reactor, is the world's most ambitious energy project. The aim of the project is to realize the world's first full-scale fusion reactor with the task of proving that fusion energy can develop into a feasible form of electricity production. This would mean a solution for the future energy needs of mankind.

According to the EU Commission, the goal is to feed fusion energy to the network by 2050. The research reactor ITER is a central phase of this plan. The ITER test facility is being built at Saint Paul-lez-Durance in the South of France. The construction has been going on since 2010. The goal is that the first plasma would ignite there in 2025. The estimated cost of this the world's biggest product development project exceeds €15 billion. It is funded internationally.

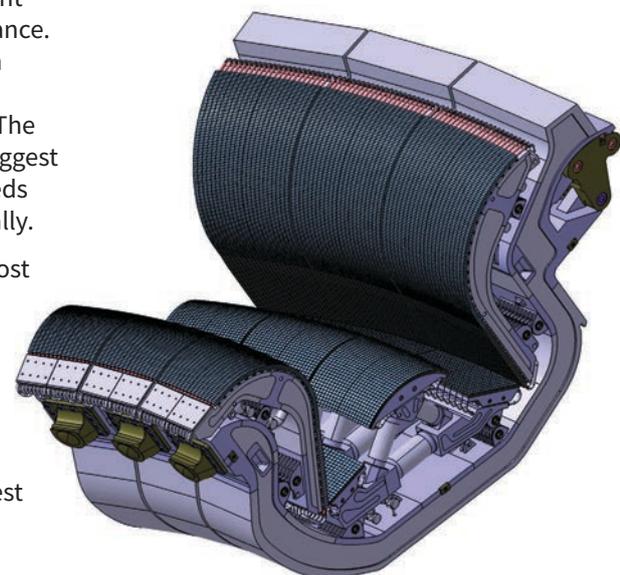
The ITER reactor is said to be the most complex machine in the world. Its purpose is to produce ten times more energy than what is needed to heat the fusion. Just the core of the fusion reactor, the Tokamak, weighs more than three Eiffel towers. This gives a picture of the test facility's measurements.

For more information: www.iter.org

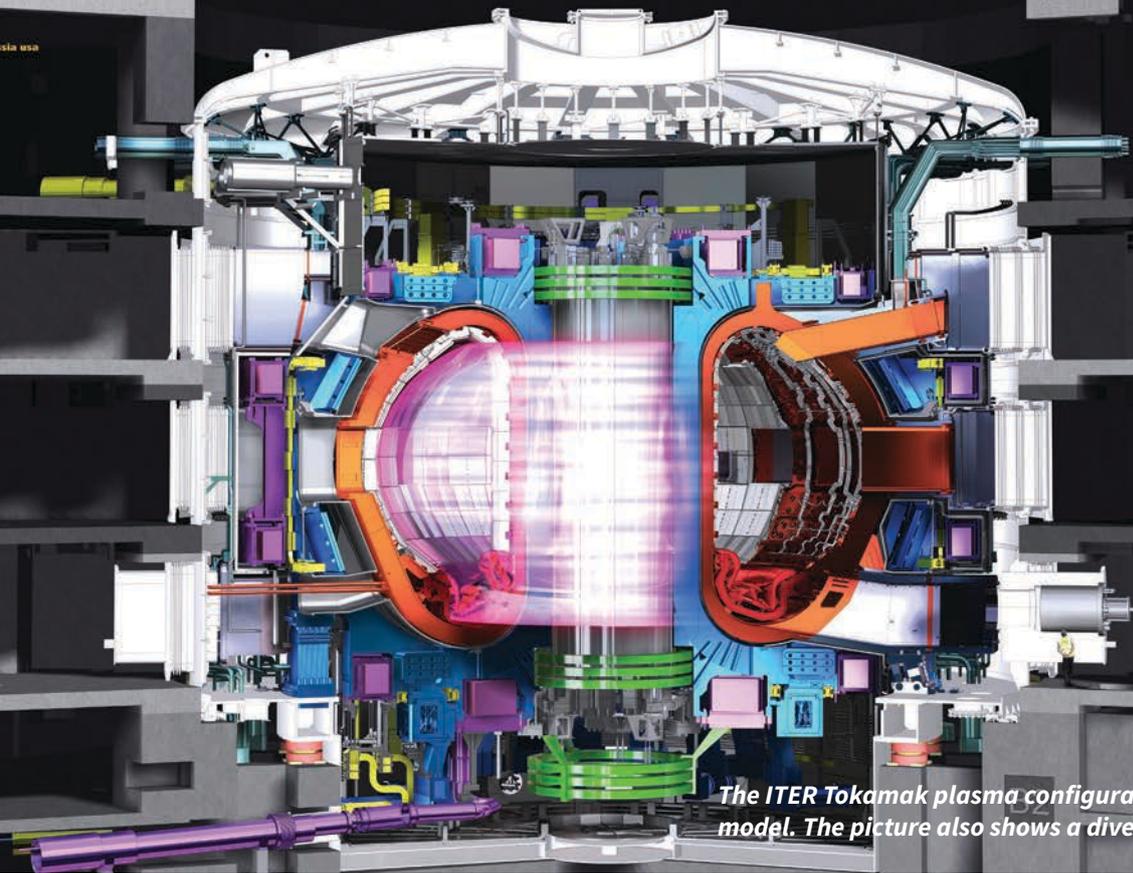
Comatec takes part in the concept-level work

"We have been involved in the project already since 2012 and our design work there continues", says Comatec Group's Sales Director **Arto Timperi**.

"During the spring of 2018, Comatec received altogether three orders for the fusion energy project. One of these involves the ITER project and two are to do with the DEMO project that follows the ITER. ITER is a large-scale research reactor and DEMO is a power plant that comes after



Three of the 48 divertor cassettes



The ITER Tokamak plasma configuration control model. The picture also shows a divertor cassette.

the research reactor. It demonstrates the commercial electricity production from fusion energy.”

”Comatec carries out both practical engineering and concept planning. We have done modelling, strength calculation and mechanical and electromechanical machine design. For the DEMO facility stage we perform remote-controlled robotics design”, Arto tells us.

Solutions, which will come into use in the 2040s

ITER is a huge project, thousands of design engineers take part in it world-wide. Comatec’s design engineers are among them.

The research results from the ITER stage will be utilised in the designing of the DEMO power plant. The DEMO is meant to concentrate on the recovering of energy, while ITER concentrates on controlling the plasma.

The heart of the fusion reactor, the Tokamak, is a machine designed to utilise fusion energy. Inside the Tokamak, the heat generated through atom fusion is absorbed into its walls. This heat is used to produce steam and then electricity with turbines and generators, just like in traditional power plants.

The construction of the DEMO is planned to start in the 2030s and it should be

operational in the 2040s. Comatec’s Senior Design Engineer **Stefan Mühlig-Hofmann** takes part in the DEMO stage engineering. At the moment, Stefan is involved in the divertor cassettes’ replacement trolley design project.

There are 48 divertor cassettes under the Tokamak, which are like ashtrays in a way. Impurities are steered to fall into the cassettes. During the fusion reaction, they face a heat of over 150 million degrees. The cassettes become worn out and are all replaced during the maintenance phases.

”Even though the fusion reactor is turned off during maintenance, it is one hundred degrees hot near the cassettes and there is such an amount of radiation that a maintenance person cannot go near the reactor. This means that these divertor cassettes that weigh seven tonnes are replaced by remote control, using trolleys that move along a chain-cogwheel-wheel system. I have been involved in engineering this replacement trolley”, Stefan tells us.

”The system must be fool-proof and the trolley has to come out of the tunnel without anyone going inside. In the event that the trolley gets stuck in the rail, or the chain breaks, then the reactor would be practically useless.”

”The trolley will probably later have a robot arm that works inside the reactor and makes sure that the trolley runs smoothly. There are many places in the reactor that

use robot technology, because humans cannot be there to carry out maintenance.”

”The heat of the plasma during the fusion reaction is one hundred million degrees. The magnets behind the shell keep the plasma in control. The magnets work when they are cooled down to -270 degrees. Naturally, a great many cooling pipes are necessary”, says Stefan.

”Each time a divertor is replaced, the cooling pipes connected to it must be cut. In addition, the cooling pipes only last for a certain period of time, because the material becomes brittle due to the radiation.”

”The cooling pipes are cut and welded by laser. I am also involved in one work package of this team project. It has to do with the design engineering of a robotic cutting, welding and welding after-treatment device”, Stefan tells us.

”The device is operated at least 20 metres from anyone and it is inside the reactor and the pipes, where it cuts off the old pipes and welds new ones in their place. The cutting and welding heads are small remotely controlled robots. Their outer dimension is only 75 millimetres. I design a small quickly detachable coupling for the laser cutting and welding device”, says Stefan.

”This means that we take part in the engineering of parts with the size of both 7 tonnes and only 12 millimetres.”

Virtual reality adds a new dimension to 3D modelling

Virtual reality (VR) is increasingly becoming part of various areas of life. VR is known best from the entertainment and gaming industries, but it also offers new opportunities for more traditional areas of technology. Comatec is bringing VR into the visualisation of 3D designs. When Comatec's designs or the customer's own models are made virtual, they can be entered by using VR headsets to see what the product will actually look like.

TEXT: TAINA SYRJÄNEN



– Comatec has carried out 3D planning for a long time. We have now taken a step further and are able to visualise 3D models for our customers in VR, says **Mikko Helminen**, Business Unit Manager, Expert Services at Comatec.

– Using a VR headset to create a virtual field of vision around the user, 3D designs can be viewed as completed products in virtual reality.

– At Comatec, around 400 designers continuously produce 3D data that only needs a little additional work to be used in virtual reality. Virtual reality enables us to create added value for customers and illustrate the environment or product that we have been designing.

Visualisations can also be carried out based on the customer's own designs. Visualisation is suitable for all types of design, from trains and ships to work machines and factories, says Mikko.

Enter a design, using a VR headset

When using VR headsets in virtual reality, users can enter a design in an industrial hall, for example, to view various lines and their operations and move about in exactly the same manner as in an actual industrial hall. Users can walk about and look around inside a VR model and see how the model

would work in their own production environment.

– When using VR headsets, it's easier for those not familiar with 3D models to see how the design works in practice, as the product looks exactly the same inside the model as it will look in reality, Mikko explains.

Virtual reality shows operating situations and development needs

Making use of virtual reality provides customers with new types of benefits. Models can be used to study the

functionality of access routes and the ergonomics, maintainability and appearance of operating sites. Users are able to see development needs in advance, which eliminates the need for costly modifications to completed structures.

– Since any needs for adjustments are easy to see inside the VR model, the cost of production decreases with the need for alterations to the finished product, says Mikko.

– Virtual models of 3D designs also

reduce the need for prototypes. This may significantly decrease the time needed for product development, even if the time used for design remains the same. It also reduces the total cost, as prototypes are expensive.

– In addition, models can be used to carry out safety inspections and make any necessary adjustments before the design is implemented, Mikko continues.

– The safety of machinery and equipment improves when their visibility can be improved as early as the

planning phase.

– Models can also be used to provide users with training before anything has been implemented in practice.

– In a VR model, it's possible to examine the design from the user's perspective. For example, a playground can be seen and reviewed from a child's perspective.

Brain power for engineering

Meet us at fairs!

We participate in exhibitions and events each year to present our know-how, meet our customers and partners, and create new relationships. Take the opportunity to meet us and discuss with our experts about your needs in terms of design and partnership.

20.-22.11.2018 Smart Factory -exhibition, Jyväskylä, Finland

Appointments – New talent in Comatec Group

Mobile Machinery and Commercial Vehicles

Stefan Mühlig-Hofmann has started as Senior Design Engineer in the Mechanical Engineering Unit, **Ossi Hiekkänen** and **Dani Saarinen** have started as Design Engineers, **Jaakko Hulkki**, **Joel Hytönen**, **Rivero** and **Heini Murto** have started as Junior Design Engineers and **Tristan Cadden** as a Trainee. In the Expert Services Unit **Senni Klami** and **Piritta Jalkanen** have started as Documentation Engineers. In the Electricity and Automation Unit **Oskari Riuttala** has started as a Trainee.

Industrial Production Systems

In the Electromechanical Systems and Components Unit **Topi Tynkkynen** has

started as Senior Design Engineer, **Juuso Heikinheimo** and **Jose Hernandez** have started as Design Engineers. **Syed Kazmi**, **Hennadii Onyshchenko** and **Karel Reisko** have started as Design Engineers in Comatec Estonia OÜ. In the Processing Machinery and Plant Engineering Unit **Keijo Honkanen** has started as a Special Design Engineer and **Aleksi Ranta** as a Design Engineer.

Power Plants and Conveyors

In the Conveyors Unit in Oucons Oy's Pori office **Juha Mäkinen** has started as Chief Project Engineer and **Tommi Nieminen** as a Design Engineer, **Aki Koskenkorva** has started as Junior Design Engineer in Oulu office. In the Power Plants Unit in Rantotek **Kai Kärenlampi** and **Roopo**

Viita have started as Design Engineers.

Automation Solutions

Henri Kekkonen has started as Chief Project Engineer in A & D Automation Oy. **Saku Pöysäri** has started as a Junior Design Engineer in the Lifting and Logistics Systems Unit.

Group Administration

Janne Lammela has started as Chief Information Officer, **Tommi Mustonen** as General Counsel, **Päivi Luomanaho** as ERP Project Manager and **Riikka Heiskanen** as Business Development Specialist. **Virpi Keso** has started as HR Assistant, **Meri-Marika Levänen** as Payroll Officer and **Laura Nurmi** as an Accountant.



The VIRVE network will replace RAILI for railways

The Finnish Transport Agency will complete the transfer of operational communications from the RAILI radio network for railways to the VIRVE network for the Finnish authorities during 2018. The preparatory work began in 2016, as the current GSM-R radio network for railways is nearing the end of its technical and economic life cycle.



Tapio Raaska

The Finnish Transport Agency is responsible for the development and maintenance of the Finnish railway infrastructure. Its responsibilities also include communication related to the safety of railways.

“Communication plays a significant role in smoothly running rail transport, particularly under exceptional circumstances. Connections to moving fleet are an essential part of safety,” says Tapio Raaska, Senior Officer, account manager for the Finnish Transport Agency’s RAILI service.

“The current GSM-R radio network for railways is nearing the end of its technical and economic life cycle. The transfer from RAILI to VIRVE is based on a temporary exemption granted to Finland by the European Commission. Once VIRVE has been adopted, the GSM-R network owned by the Finnish Transport Agency will be dismantled, tentatively at the turn of 2018 and 2019,” says Raaska.

“With the transfer to VIRVE, key improvements will include group calls. The technical quality of GSM-R group calls is weaker. The VIRVE radio network is better protected from interference. Its frequency is 480 MHz, and it has authority status. GSM-R is comparable to commercial networks and has the same frequency: 900 MHz. The use of VIRVE is much more inexpensive than maintaining a separate GSM-R network that needs replacement.”

VIRVE network network is widely used

The VIRVE network is based on TETRA technology. The network is used to provide radio communication services at a heightened level of security and preparedness for the authorities and authorised operators involved in maintaining the critical infrastructure for society.

VIRVE is used by rescue services, the police,



Photo: © VR Group

the Finnish Defence Forces, social and healthcare services, the Finnish Border Guard, Customs, the Emergency Response Centre Agency, the Finnish Broadcasting Company and the Finnish Meteorological Institute, as well as ambulance and security companies and energy plants. The VIRVE network covers the entire country, including the Finnish waters and the Gulf of Finland sea area.

Transferring from RAILI to VIRVE on a tight schedule

The Finnish Transport Agency is currently serving as the mobile network operator that manages the GSM-R-based RAILI radio network. The network covers around 5,100 kilometres of railways and railway yards, with around 5,000 subscriptions. It serves traffic management personnel, drivers and guards, as well as exchange supervisors and rail construction managers. The use of the RAILI service is based on access permits issued by the Finnish Transport Agency.

The transfer from RAILI to the VIRVE network for the authorities began in summer 2016. The radio network has been modified, base stations have been added to VIRVE and coverage has been ensured in railway tunnels during the transition period. In addition, the communication system for traffic management personnel has been renewed.

Railway companies are responsible for acquiring subscriptions and terminal devices

The Finnish Traffic Agency is responsible for ensuring that the systems work and that the network has sufficient coverage. Railway companies are responsible for acquiring subscriptions and terminal devices.

– Comatec prepared specifications for SM5 local trains in Helsinki for the acquisition of devices for VIRVE. We also carried

out planning related to the installation of devices in trains for VR, says Jorma Nordfors, expert at Comatec.

The requirements for the replacement of the communication system with a new one included adjusting VIRVE's capacity to railway use and ensuring the necessary functionalities, such as emergency calls and the transfer of calls according to the task.

With the new RAPLI smartphone application, exchange supervisors and rail construction managers will be allowed to communicate with traffic management personnel via commercial networks. Traffic management personnel totals around 400, with nearly 90 employees working in different parts of Finland on a daily basis.

Source: <https://erveutiset.erillisverkot.fi/blog/2018/06/04/rautateiden-raili-vaihtuu-virve-verkkoon/> (In Finnish)

Prevention is the best way to avoid occupational safety offences

– Using an expert already when the risks are assessed helps in eventual legal cases

In Finland, around 40 occupational safety offences are handled by the court instances every year. For the part of physical occupational safety, many companies in Finland are already among the best in the world. However, there is still room for development in order for occupational safety matters not to end up in court.

TEXT: MARIA UURTO

Toni Sortti, LL.M., attorney-at-law, has written two books on occupational safety offences. He is familiar with occupational safety in Finland from the legal praxis point of view. Occupational safety offences are a demanding type of offence, because occupational safety legislation is extensive and the rules for liability distribution are often interpretative. Occupational safety legislation leaves the administrator of law room for various interpretations, even though the situations and events as such are often undisputed. In the industries and branches where physical occupational safety is important, typical cases involve the insufficient safety and protection of a machine or appliance. When a machine or appliance has moving parts, injuries are typically caused by a limb being caught between moving parts, wheels or belts. Because the event as such is often indisputable, the most central part of the investigation is often what happened before the accident.

The three cornerstones of occupational safety: Danger assessment, guidance and supervision

In the legal proceedings concerning occupational safety offences, the most

common grounds for prosecution are the insufficient assessment of dangers and risks and insufficient work instructions and supervision. As the events in physical occupational safety cases are often undisputed, the most important dispute concerns whether the accident was unpredictable or exceptional, or such that the employer could not have an effect on it- despite precautions.

“If it can be shown that the dangers and risks were assessed by the best own sources and possibly by an outside expert, this already indicates that there was an effort to identify the risks in the best possible way”, Toni Sortti defines.

”This could also have a meaning, for example, when the court considers whether the risk assessment was done carefully enough.”

”In addition to risk identifying, also things such as clear and understandable work instructions and carefully logged interpretations have an important role. For example, an unclear work instruction could function totally against its purpose, and in a criminal case the prosecutor could even name it as evidence of insufficient or contradictory instructions”, Sortti stresses.

The attitude is also crucial for occupational safety

Just like so many other things, the furthering of occupational safety is also a matter that the management must pay special attention to. Sortti’s opinion is that those companies rank high in the statistics where the message about this subject’s importance comes from the highest level, and where the entire management team is committed to improving occupational safety.

“Of course there can be very good occupational safety work on a local or department level, but it is certainly visible in the organization’s operations if the management finds the matter important and commits the entire organization on all levels to the work”, Sortti says.

Using an expert to assess the risks

The Finnish Occupational Safety and Health Act, section 10, subsection 2 mentions the use of outside experts for assessing risks: If the employer does not have adequate expertise for the action referred to in subsection 1, he or she shall use external experts. ”Despite this, according to Sortti, external experts are

surprisingly seldom used to help define risks, even in big companies.

”An expert from outside one’s own enclosure could, during the assessment phase, point out matters that even the best experts in their own organization do not necessarily identify. An expert can also take part in the preparing or reviewing of documents from the point of view of how they would eventually be assessed by the authorities, and how well the findings are recorded.”

”When, for example, a new industrial production line is taken into use, which is always a costly investment, the assessment work of an outside expert is only a small cost, compared to the entirety. Such an investment is more than justified when we are speaking of an important sector like occupational safety work as a whole is”, Sortti says.

”Often people make the somewhat wrong generalisation that the employer would lose these occupational safety cases, but this is not the case when the liabilities are well taken care of, which means that the employer has better chances to win in court”, Sortti adds.

Mental occupational safety

Mental occupational safety has also emerged alongside physical occupational safety in court cases. Toni Sortti has also studied these cases and his new book on mental occupational safety offences will be published by Edita during the autumn of 2018.

”Mental occupational safety is still being defined and I try to define it in this book through court cases. When we are speaking about inappropriate treatment, harassment and overloading, we are often already having a dispute about what is the injury mechanism or what causes the situation. In physical cases, this is usually the clearest thing”, Sortti says.

”Because the experiences are subjective and also one’s personality has an effect on the experience, it is important to find in the estimation the objective threshold, which must be crossed in order to endanger health, and in order to determine when a type of behaviour is constant and repetitive. The rules for mental occupational health will also become clearer when we have more legal praxis and cases”, Sortti believes.

A statistical look at occupational safety offences:

- During 2010-2014 a corporate fine was passed in Finland in 154 occupational safety cases.
- The average corporate fine was €10,700 and the most typical fine passed was €5,000.
- The confiscation to the state of the proceeds of crime was claimed in 10% of the cases.
- The major part (94%) of the convicted corporate bodies were private companies. 6% were made up of other corporate bodies, such as towns, municipal federations or state enterprises.
- The convicted company’s size was over 50 M€ for 27%, while 26.1% were in the size range of 10-50 M€.
- During the analysis period, 25% (28 instances) of the corporate fine cases passed by the District Courts were passed by the Pirkanmaa District Court.

Source: Final report: Yhteisövastuu, turvallisuus ja työturvallisuusrikos muuttuvan työelämän ja lainsäädännön käytännöissä [corporate liability, safety and occupational safety offences in the practices of changing employment and legislature]; Alvesalo-Kuusi Anne, Lähteenmäki Liisa, Janhonen Minna, Tapani Jussi, Räsänen Tuula; Finnish Institute of Occupational Health, 2017.

In his books, the attorney-at-law, managing director and partner from Roihu Oy, deals with the most important laws and legal cases concerning occupational safety offences. The newest book is the first in Finland that discusses the subject from the point of view of mental occupational safety.



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