

TUKES REVIEW

2/2000

NEWS FROM THE SAFETY TECHNOLOGY AUTHORITY OF FINLAND



Structural timbers for a safe future

What is it that TUKES is striving for in its selected field of activity and what are its goals and vision for the future? Last spring this question was just what was purposefully addressed with the combined input and energy of all of TUKES' personnel. Our intense brainstorming resulted in a concise summation which carries a clear characterization of the goals our operations are steered by.

We desire to create a safe and technically reliable society in Finland which does, in fact, already have many technical fields which have realized high levels of safety and dependability. It is with safety and conviction, together with comfort of mind, that citizens can rely on future technology. Any accident is unacceptable and not a single one need come about in our fields of operation.

The best of technology is not in itself alone sufficient for ideal safety results. A good and safe future can only be accomplished if the knowledge, total commitment and actions of society and enterprises are set on the correct course. Safety should become a value which should be seen as an intrinsic component of

everyday life, as for example, when the employees of a company take care of and pay attention to their own safety and also that of their fellow workers and colleagues. Another instance might be when the consumer actively seeks to purchase a safe product and then fully follows the instructions for its proper operation or usage.

A good result has to be set against the assumption of a workable and effective control system. To this end, the structural timbers for this require that up-to-date legislation and an open and functioning co-operation network is in place. TUKES is an important part of the control system and strives to be a co-operative and capable driving force in its field.

We accept the challenges and responsibilities of our task with commitment and an eye to constant improvement. This is our vision and sincere aspiration.

Seppo Tuominen
Director General

TUKES REVIEW, published by Safety Technology Authority (TUKES), brings you current information about technical safety and reliability in Finland.

Founded in 1995, TUKES is a streamlined expert organisation and surveillance authority. We operate within the realms of process safety, pressure equipment safety, electrical safety, rescue service equipment, and legal metrology and articles of precious metals.

On the Internet, you will find us at <http://www.tukes.fi>.

TUKES REVIEW

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The VARO review

The VARO Accident Database

TUKES maintains a database known as VARO for recording accidents associated with dangerous chemicals, pressure equipment, mining, electrical equipment, and elevators. We also register the reported near-misses occurred within the domain of our operations.

The accident data are collected e.g. from companies who are legally obliged to notify of severe accidents in their operation. We also gather information from other authorities and newspapers. In 1999, we introduced an electronic media follow-up system for improved information retrieval. Despite the legal obligations and the active follow-up, all accidents still do not come to our knowledge.

We also investigate the accidents to find out their causes and to prevent new ones. In 1999, we nominated four accident research groups to work on the following cases:

- fatal explosion accident on a fine-chemical plant
- gas explosion succeeded by a fatal fire at a test combustion plant
- fire in a lubricating oil factory
- fatal accident in use of LPG.

Accidents and near-misses in 1999

In 1999, we were informed of 201 accidents and near-misses occurred within our domain, the majority of them involving chemicals or electricity. They caused the death of 5 and injured 81 people. Of the fatalities, 2 occurred in industrial handling of chemicals, 2 in domestic use of LPG. Furthermore, 1 fatality was recorded as an electrical accident. The total number of accidents showed a slight decrease, compared with 228 accidents the year before.

There were 59 chemical accidents and near-misses, of which 12 were serious. The accidents included 2 fatalities and 7 injuries. A total of 14 accidents happened in storage of chemicals, 13 in loading and unloading, and 12 in other handling. The most important chemicals involved in the accidents were heating oil and sulphuric acid.

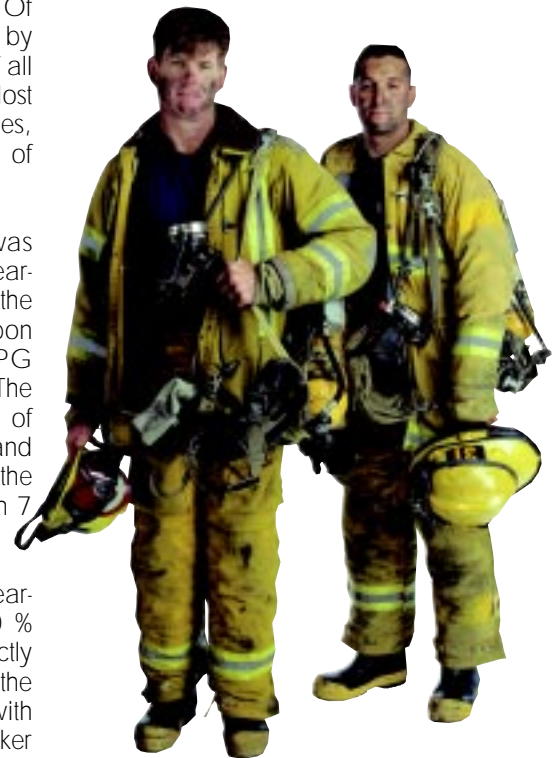
Accidents and near-misses in 1999

Accident category	Total	Fatalities	Injuries
Chemicals	59	2	8
Liquefied petroleum gas (LPG)	18	2	5
Electricity	44	1	40
Use of fireworks	17		15
Elevator accidents and damage	13		9
Pressure equipment	16		3
Explosives	5		1
Transport of dangerous goods	11		
Aerosol dispensers	9		
Transportable gas containers	6		
Natural gas	3		
TOTAL	201	5	81

We recorded a total of 44 electrical accidents, of which 1 was fatal. Of personal accidents, 26 were suffered by laymen and 15 by professionals. Of all victims, 6 were under 16 of age. Most accidents occurred in public premises, shops, offices, and in assemblies of switchgear and controlgear.

Liquefied petroleum gas (LPG) was involved in 16 accidents and 2 near-misses. One of the accidents caused the death of 2 persons due to carbon monoxide poisoning. Other LPG accidents left 5 persons injured. The accidents happened in private use of LPG, at summer houses, caravans and boats. There was a clear increase in the number of accidents, compared with 7 accidents recorded in 1998.

Pressure equipment accidents and near-misses numbered 16, of which 50 % were fires. Only 5 accidents were directly involved with pressure equipment, the 11 other cases being connected with accessories, e.g. with the solid-fuel stoker of boiler. The pressure equipment accidents involving chemicals are included in categories "Chemicals" or "LPG", the accidents with transportable gas containers being separated in their own group as well. Of chemical accidents, pressure equipment was involved in 11 cases. The fatalities (2) recorded in chemical accidents happened with use of registered pressure vessels. The LPG accidents (2) involved pressurised pipeline. Furthermore,



pressure equipment was involved in 5 accidents with transportable gas containers.

Use of fireworks caused 17 accidents, leaving 15 persons injured. Explosives factories suffered 5 accidents injuring one person.

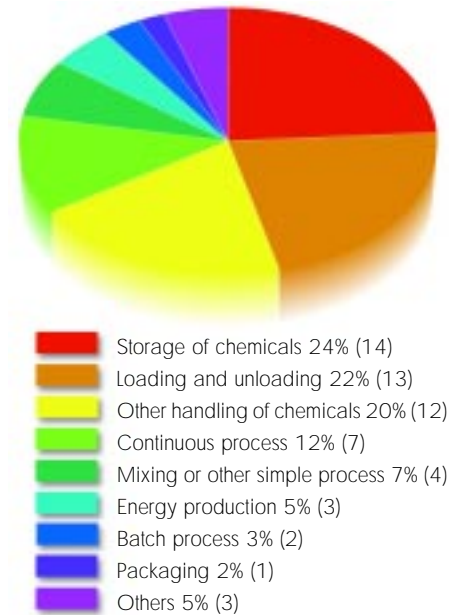
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Chemical accidents by technical cause

Technical cause	Total
Lack of safety device/system	6
Corrosion	5
Equipment failure	4
Construction fault	2
Breakage	3
Wrong or defective construction material	2
Stress corrosion	1
Manufacturing fault	1
Component/Machinery failure	1
Inadequate safety device/system	1
Failure in control/measuring instrument	1
Illegal equipment or installation	1
Other technical causes	7
• Overfill	
• Excessive electric heating of indoor pipes	
• Undersized ventilation	
• Process automation programming, pipe blockage	
• Acid reacting with impurities	
• Hose loosening	
• Breakage of tank supports	
Not known	4

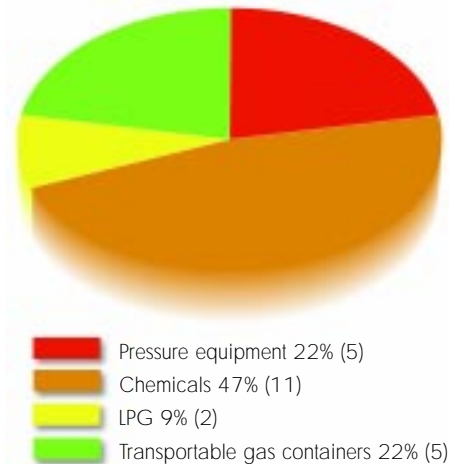
Chemical accidents by function and operation



Electrical accidents by victim and equipment voltage

Victim and equipment voltage	Professional	Layman	Total	Of which under 16 of age
Voltage AC > 1,000 V	4	7	11	2
Voltage AC ≤ 1,000 V	10	19	29	4
Voltage DC ≤ 1,500 V	1		1	
Total	15	26	41	6

Accidents involving pressure equipment or pressurised pipeline



Pressure equipment accidents by equipment or assembly

Equipment/Assembly	Fire	Damage	Personal accident	Explosion	Near-miss	Total
Boiler plant	6		2			8
Water boiler	1			1	1	3
Pressurised tank	1	2				3
Steam boiler		2				2



Plant and Installations Surveillance

Automatic extinguishing equipment placed under authority supervision

The Ministry of the Interior Regulation on automatic extinguishing equipment came into effect on 1 September 2000. The regulation applies to fire extinguishing equipment, the installation of which forms a condition for planning permission or other approval by the authorities, or the alarm system of which is connected to an emergency response centre. The Regulation includes transition periods for the registration of appropriate businesses and for the renewal of earlier qualification certificates by 28 February 2001. It also provides the minimum requirements for the implementation and maintenance of extinguishing equipment.

Extinguishing equipment can be installed and maintained by an installation business duly registered with TUKES. The business is subject to the requirements defined in the regulation, including the nomination of a qualified person responsible for the business.

The installation business should give the booker a written certificate proving that the installation has been carried out in accordance with the requirements. The annex of the installation certificate should show the individual information on the target, including drawings, a description of the design basis, the methods and test results used for proving the operational condition, and instructions for use and maintenance.

Before the introduction, automatic extinguishing equipment shall pass an initial inspection. Thereafter, the equipment is inspected every two years. However, extinguishing equipment and gas extinguishing equipment in dwelling-houses are inspected in four-year periods. The initial and periodic inspections can only be carried out by an inspection body duly approved by TUKES.

The owner or tenant of the building being responsible for the equipment's operational condition, is liable to nominate a person in charge of its maintenance. A detailed maintenance diary has to be kept. The owner or tenant shall also have the periodic inspections carried out on the equipment.

The conformity with the requirements provided by the Decree is supervised by TUKES and the local rescue authorities.

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Decree on industrial chemicals challenges safety activities

In connection with the enactment of the SEVESO II Directive in February 1999, the regulations on dangerous chemicals were renewed. The changes emphasising the safety management system have been considered necessary because of the shortcomings in organisation management, working methods and safety control found on the background of serious accidents that have occurred lately.

Periodic inspections were introduced as a new surveillance tool. The obligations imposed on the enterprises and the inspection frequency depend on the amount and characteristics of the dangerous chemicals involved. In Finland, the periodic inspections were started by TUKES in 1999.

The results of the inspections prove that there is still a lot to be done in systematic safety development. The target enterprises have developed their quality activity and environmental safety systematically; approximately 75% of them having a quality system. However, only one in four target enterprises runs exact overall safety targets, methods and prevention policy in order to manage major-accident hazards involving chemicals. A good safety system is based on systematic identification of major-accidents hazards and other dangers on-site. At the same time, the role and responsibility of senior management is emphasised in safety issues.

Service and maintenance prevent the emergence of problems and production disturbances. In connection with inspections, it was noticed that 60% of the enterprises had a written advance service plan, and about 45% had sufficient proof



of its functionality. In fact, shortcomings in service and maintenance have been a significant reason for the serious accidents that have occurred. Proper use of information technology, e.g. entering service and maintenance data into databases, would clearly facilitate the preparation of service and maintenance plans, as well as the follow-up of repairs. It is recommendable that the statutory periodic inspections of tanks, pressure vessels, pipelines, electrical equipment and earthing systems be included in the plans. Furthermore, on-site tours indicated that the general tidiness and order, the condition of the equipment and the safety of the loading and unloading areas should be improved.

Generally speaking, enterprises have a positive attitude towards the new regulations. Underlining the role of the management and its participation, they draw attention to better awareness among the personnel of the dangers related to the work they do. The inspection visits showed that the new regulations are very challenging, the enterprises still having much to do in bringing their operations in line with the requirements set for the safety management.

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Product Safety Enforcement

New Decree on transportable pressure equipment and tanks

The Decree of the Ministry of Transport and Communications on transportable pressure equipment and on transport tanks for dangerous goods for pressurised filling or emptying (579/2000) came into effect on 1 September 2000. It applies to the design, manufacture, inspection and approval of vessels and tanks containing gas or other dangerous goods, filled or emptied using compressed air. The Decree is based on the Finnish Act on carriage of dangerous goods, the ADR Agreement and the RID Regulations. Instead, the location, filling and emptying is carried out in accordance with the decision of the Ministry of Trade and Industry on the safety of pressure vessels (953/1999).

The new Decree does not change the earlier practices a lot, but TUKES is still responsible for the type-approval of the construction, the inspection bodies attending to the inspection of construction plans and to initial and periodic inspections. The Decree applies until the EU Directive on transportable pressure equipment (1999/36/EC) is enacted in Finland. For some parts, the Decree is applicable also after the enactment of the Directive, in accordance with the Directive's provisions for the scope and transition rules.



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Material flow of rescue service equipment

TUKES has studied the sales of portable fire extinguishers, smoke detectors and fire alarm equipment in the past two years. Assisted by consultants, the project covered both the manufacturers in Finland and the importers.

Portable fire extinguishers had a total of 13 domestic manufacturers and importers. Based on the material flow, the largest enterprise had a market share of 42%, and the three largest a total share of 82%.

Smoke detectors had a total of 24

importers. Based on the material flow, the largest enterprise had a market share of 25%, and the three largest a total share of 51%.

Fire alarm equipment had a total of 6 domestic manufacturers and importers. Based on the material flow, the largest enterprise had a market share of 53%.



Sales of rescue service equipment

Product	1998	1999
portable fire extinguishers	120,000 pcs	137,000 pcs
smoke detectors	453,000	1,217,000
Fire-alarm equipment*)	1,110	1,040

*) excluding equipment in navigation, and equipment parts and accessories

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TUKES starts market surveillance of construction products

Authorised by the Ministry of the Environment, TUKES will begin the market surveillance of construction products in Finland in compliance with the relevant EU Directive.

The surveillance aims at securing the right use of the CE mark. A CE-marked product shall comply with a European standard or approval. There must be possibilities to restrict or prevent any product which is in non-compliance with the requirements from being placed on the market or moved from one Member State to another. Whenever considered necessary, the manufacturer is liable to recall such products from the market.

For these purposes, we are prepared to start the market surveillance in 2001. The operations will be based on the response received from the field, i.e. from competitors, consumers, building surveillance authorities, and other operators, which will lead to actual surveillance process.

In our organisation, the surveillance will be placed under Product Safety Enforcement. The operations will be run in accordance with the agreement signed with the Ministry of the Environment.

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Consumer guidance on electrical fires

In our efforts to prevent electrical fires, we are producing new consumer information based on the experiences and results of the recent research project. We aim at giving easy-to-read basic hints to help prevent the risk of an electrical fire. The literature also includes instructions for emergency in case of fire.

The information material comprises informative pages in magazines, a leaflet, special web pages, training slides etc. The material will be offered to rescue services, electric utilities, and real estate



organisations to support their information and communication.

We also prepare new training material for professionals, e.g. instructions for fire cause investigation and a training video.

In Finland, electricity is involved in about 2,000 fires each year. Most of them

could be prevented by using electrical equipment as intended and having damaged appliances repaired in time.

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TUKES supervises e-marked prepackages

Consumer packages often carry a small "e" next to the marking indicating the amount of contents. It guarantees that the actual amount of the contents in the package equals precisely to the nominal amount marked on the package.



The voluntary e-marking system based on the EU Directive on prepackages has been applied in Europe for more than 20 years. The system aims at serving the packaging industry by abolishing technical barriers of trade in the European Economic Area – the inspections of the amount of an e-marked product are carried out only once in the manufacturing country. The marking is also an important message to consumers on the conformity of the amount with the relevant requirements. A prepackage is a product which has been packed without the consumer being present. The amount of contents being a nominal value, the contents of the package cannot be changed without breaking the package. An increasing number of consumer packages consists of prepackages.

The e-mark can be used in prepackages produced in Finland provided that the inspection body has established, based on its evaluation, that the inspection methods applied for the package comply

with the requirements of the Decision of the Finnish Ministry of Trade and Industry on prepackages (179/2000). The inspection body in Finland is Inspecta Oy. Compliance with the regulations on prepackages is under TUKES' surveillance, attended to e.g. by means of market surveillance. We also participate actively in the international co-operation in this sector.

In the beginning of this year, TUKES participated in the joint market surveillance project of the authorities in Finland, Sweden and Denmark, investigating the quality of e-marked prepackages and developing methods to be used in market surveillance. Based on the results of the project we know that, as far as the amount is concerned, the regulations were followed well, but there were considerable shortcomings in markings, e.g. regarding the manufacturer and the place of manufacture.

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Frequency converter installations require care

TUKES has completed a market surveillance project to find whether the frequency converters sold in Finland are in conformity with the requirements on electromagnetic compatibility (EMC). For the purposes of the project, 24 models of frequency converter were tested in

accordance with EN 55022 or EN 55011.

A frequency converter is a device controlling the speed of rotation of an electric motor. Frequency converters can also be used to easily adjust the speed of acceleration or deceleration, braking, and change of running direction of a motor. In industry, the converters are used e.g. in process control systems, and in dwelling-houses and business premises for ventilation.

The high switching rate of a frequency converter and the quick switching of large currents, characteristic of AC drives, may cause electromagnetic disturbances. In dwelling-houses, electromagnetic disturbances may be seen as a poor picture of a TV set or a monitor, or as disturbing noises in a radio receiver. In industry, disturbances may cause operational disturbances and impede data transmission between various devices.

Typical disturbances caused by a frequency converter are due to incorrect design and installation. Such problems can be avoided when both the converter and the system utilising it comply with the requirements of the EMC Directive. In the design and planning, attention must be paid to the installation method and place, the earthing, and to protection and filtering.

The tests were carried out using the installation accessories supplied with the devices. During the tests, the emission of disturbances in as many as 14 converters exceeded the threshold values of the testing standard. Eight models measured consistently in excess of the threshold values. The test results proved that the use of a frequency converter does not comply with the requirements, if the installation instructions are not followed at installation and if correct installation accessories are not used. A re-test was carried out on some models, in which a few of them still exceeded the threshold values. A sales ban for these models is under consideration.

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