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VdS SCHADEN-VERHÜTUNG

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s+s report

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Managing Director of VdS Schadenverhütung Hans Schüngel resigned

In late February 2011, Hans Schüngel *who had been Managing Director of VdS Schadenverhütung* since 1997 resigned from the Management Board after reaching retirement age. Hence, a figure who has made some important contributions to and left his mark on VdS' success story is resigning from active work. In our topical interview, we asked Hans Schüngel about the development of VdS Schadenverhütung and his view on the future of the organisation (see p. 6-9).*

Reinhard Conrads *who had been head of the Security division at VdS Schadenverhütung died on 5 December 2010 after a long severe illness. As a result of his staunch commitment to loss prevention, he enjoyed high esteem throughout the industry. Colleagues and staff, customers and partners of VdS as well as comrades-in-arms in various national and international bodies are going to miss Reinhard Conrads. Please read our obituary on page 47.*

Ingeborg Schlosser, *Director of Training Centre & Publishing House*

VdS' Training Centre & Publishing House division *has experienced greater interest in its diversified trainings, seminars and conferences offering last year which is encouraging. We would like to thank all customers for that. On pages 48-49, you will find a follow-up report on the international VdS conference on fire extinguishing systems held in Cologne in December 2010 as well as a report on the international expert conference on fire protection systems to be held in Warsaw on 28 September 2011. The great support we received last year is both incentive and motivation for us to further improve and extend the activities of the Training Centre and Publishing House in 2011.*

As usual, this edition of s+s report *also features topical expert articles with highly valuable information. We start with an article on "Smoke detectors' susceptibility to false alarms" (see p. 10). The authors elaborate on the development of a new inspection facility to test smoke detectors' susceptibility to false alarms triggered by dust, which makes it possible to obtain qualified and precise information on the sensitivity of smoke detectors to dust. Different tests explored optimum dispersion parameters for the sake of reproducibility. Based on these results, it is possible to develop an optimum test method and define response thresholds for the object under test. There are also plans for tests with steam, mist, sprays and other aerosols to determine the response of smoke detectors to other factors relevant for false alarms. The objective is to develop a standardised test method.*

Failure-resistance of alarm system components *is the topic of the article on page 42. The author explains software tests on such components carried out in VdS laboratories. Software tests on alarm system components are more important than ever since software nowadays controls the function of almost every electronic device.*

Ingeborg Schlosser

** Schadenverhütung is the German term for loss prevention*

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Our topical interview

Hans Schüngel – more than 38 years of commitment to loss prevention at VdS

Since VdS Schadenverhütung GmbH was established in 1997 Dipl.-Ing. Hans Schüngel has been its Managing Director – first teaming up with Gero F. Poppe and later with Robert Reinermann who replaced Gero Poppe after having resigned. In total, he has been with VdS for more than 38 years. Schüngel was head of the VdS laboratories for intruder alarm systems from 1973 to 1984. As from 1985, he had also been responsible for the fire protection laboratories. For many years, Hans Schüngel has also been in charge of loss prevention activities in the context of the European Insurance Association (CEA).

In late February 2011, Hans Schüngel resigned from VdS Schadenverhütung's Management Board after reaching retirement age. The organisation is losing an important figure who identified with the principal ideas of loss prevention like nobody else and has been a catalyst for the successful development of VdS over decades. During the following interview, we asked Hans Schüngel to take a retrospect, to take stock, and to venture an outlook on the future development of "his" organisation VdS Schadenverhütung.

Just to set the record straight: it took our editorial team considerable persuasion to get Hans Schüngel to agree to this interview. He is not someone who likes to use such occasions for self-adulation. Just like he has always put the success of VdS first instead of his own career during his active time at VdS, he prefers to look to the future rather than taking stock of his personal achievements now that he is retired.

Nevertheless, we were able to convince Hans Schüngel that a retrospect on the loss prevention achievements of VdS that are inextricably linked to his commitment would be worth the while. Not least as motivation for all those who wish to continue the VdS success story as members of the VdS team.

1 In 2008, VdS was able to celebrate a rather remarkable anniversary: 100 years of loss prevention. How has the organisation evolved over this period of time?

Hans Schüngel: The development of our institute really started with the successful application of the so-called fire sprinkler which was the predecessor of today's sprinkler systems. The fire sprinkler was an American invention. Following a number of fires at his factory, a piano manufacturer from Newhaven had an idea: he wanted to protect his factory with these simple sprinklers.

When this technology was introduced to Europe and first sprinkler systems became installed in Germany, operators found that this extinguishing technology required maintenance and repair. Hence, in 1908, the sprinkler inspection association of private fire insurance funds (Sprinklerüberwachungsstelle der privaten Feuerversicherer) became the direct predecessor of what is today VdS Technical Inspection Services (TIS). Later, the organisation was called sprinkler inspection institute of German fire insurance funds (Sprinklerprüfstelle der deutschen Feuerversicherer).

After World War 2, the association of non-life insurers (Verband der Sachversicherer e. V. (VdS)) was established taking over from the sprinkler inspection association. Ever since, the acronym VdS has be-

come a trademark; today, it means "Vertrauen durch Sicherheit" (confidence through safety and security). To begin with, VdS focused on fire protection, but a department for loss prevention and technology was established in 1963 adding burglary and theft protection to the service portfolio.

2 How did VdS adapt to changing market needs during this period of development?

Hans Schüngel: Sprinkler systems whose monitoring marked the beginning of our loss prevention activities continue to be of paramount importance. While there was only a handful of people in the early days, VdS' Technical Inspection Services now employ some 130 engineers who are not only working in Germany, but also all over Europe and across the globe.

Modern sprinkler technology has a case because of its great reliability and as an indispensible part of loss prevention. However, VdS has considerably extended the service portfolio of its Technical Inspection Services. A number of modern fire safety technologies have been added to fire detection and alarm systems. Examples include gas extinguishing technology, water mist extinguishing and voice alarm systems.

3 It is well-known that your name is associated with the establishment of VdS' first own laboratories in the early 1970's. How did this development which is so crucial for VdS come about?

Hans Schüngel: The first laboratory that was able to start working was established in Cologne, in a district called Ehrenfeld; its task was to test intruder alarm systems (IAS). In October 1970, it conducted the first preliminary tests on intruder alarm systems. Later that year, the fire protection lab also started its activities; the next year, a high voltage and sprinkler laboratory was set up.

Before VdS laboratories were established, the insurance industry had commissioned the Technical University of Aachen to test IAS, which had already been testing fire detection and alarm systems as well as water extinguishing systems. At the time, the university decided to discontinue its testing activities – allegedly as they did not represent a technical novelty – this motivated VdS to establish its own laboratories which, then and now, did not merely see themselves as an agent responding to test contracts but an active player in loss prevention activities. Both national and international standardisation efforts, for instance, have been profiting from VdS' commitment. Examples of relevant VdS initiatives include the IAS classification system, burglar-resistant glazing and lock cylinders, the key box for fire brigades, the new Guidelines on Security Containers with high security locks, testing of fire detection and alarm systems for electro-magnetic influence, development of testing, measurement and computation methods for gas extinguishing systems and many more.

I have always been an integral part of the VdS laboratories. From 1973 to 1984, I had been head of the lab for intruder alarm systems which, at the time, was being extended to become an inspection institute for mechanical safeguards. As from 1985, I had been in charge of the fire protection laboratories as well.

4 When you look at VdS' highly modern laboratories at the new headquarters at Amsterdamer Straße in Cologne, what has changed since 1970?

Hans Schüngel: I would say, it is hard to find any equal to today's VdS laboratories in Germany, maybe not even in Europe or elsewhere in the world. While there was only a handful of engineers in the early days who conducted the tests with comparatively simple instruments, nowadays, there are 76 highly qualified people working there who have access to state-of-the art equipment that includes instruments to test electro-magnetic compatibility as well as components of water and gas extinguishing systems, to name only a few examples.

Building of the new VdS headquarters at Amsterdamer Straße in Cologne

Nowadays, VdS laboratories have state-of-the-art equipment. This is a test of batteries for application in intruder alarm systems

5 There are also other certification institutes aside from VdS. How does VdS stand out compared with them?

Hans Schüngel: VdS approvals are indispensible aids for all market players. Planners, installers and users need minimum requirements and classifications that help them judge the performance of components and systems. They need reliable certifications validating that equipment and systems comply with defined quality requirements and ensure reliable handling.

VdS Schadenverhütung predominantly focuses on two core areas: fire protection systems and burglary and theft protection. Based on decades of experience, VdS is able to respond to changing hazards and risks quickly and flexibly. This degree of flexibility is indispensible for effective loss prevention. In this context, we regret that this crucial flexibility is increasingly being thwarted by European international standardisation. If burglars are changing their intrusion methods or new storage technologies are challenging tried and tested fire protection concepts of an industry, it does not make sense to wait five or even ten years to update the relevant standards in these fields. Instead, it is necessary to respond swiftly and reliably by making adjustments to requirements and/or concepts.

It is also crucial to have one organisation that subjects innovative technologies to competent assessment. This is where VdS has established itself as a competent partner for industry. VdS experts have been providing constructive criticism, often making important contributions during the approval process and helping engineers to develop products that already have market maturity.

Our most important asset is our autonomy – VdS does not depend on any vendor/s, which is beneficial for planners, installers and users alike. This is where we take a clear stance: it should and must not be up to industry to certify its own products. However, we also stress that it has been and still is obvious for us that all test and certification as well as all regulatory activities have to be carried out in close cooperation with all interested parties involved, in particular industry.

6 VdS' activities go beyond Germany, extending to Europe and the world based on international harmonisation of relevant standards. Are you satisfied with the success in this field?

Hans Schüngel: At this point, I should like to elaborate on loss prevention in Europe promoted by the insurance funds associated in the Comité Européen des Assurances (CEA). European fire and burglar and theft insurance funds have been closely cooperating for years in the field of loss prevention under the auspices of CEA. CEA recognised early that the European standardisation organisations CEN and CENELEC would increasingly have to look into components and systems of security and fire protection facilities, an area that had been covered by national insurance funds.

Regarding fire protection, CEA has made some progress over the past 30 years. In many cases, the high quality standard of fire extinguishing and detection and alarm systems achieved in Germany could be maintained in particular thanks to active contributions by CEA experts to CEN committees. The regulations developed by CEA often became the basis for subsequent European standards. Many harmonized standards in the field of fire protection have been formulated by the insurance industry.

7 Now let us take a look at your management career at VdS. Corporate success stories are always the result of productive team work. Based on your experience, what is the best way to motivate your team to face up to new competitive challenges again and again?

Hans Schüngel: At VdS we have been very fortunate: with a fresh start after World War 2, we were continuously challenged to solve more complex and also completely new tasks. During the critical years, a very young team learnt to grow together; we had a modern concept from the outset committed to flat hierarchies, lean reporting lines and project-related activities. Actually, we have been adhering to this principle to the present day even though our organisation has grown considerably.

VdS has always had little fluctuation in its workforce over the years. In fact, it is rather common for VdS employees when they reach retirement age to look back on decades of VdS employment.

Since VdS Schadenverhütung GmbH was established in 1997, we have become a corporation that is assessed on the basis of its profitability and exposed to increasingly fierce competition. That we continued to grow and were able to increase our re-

venue is definitely the result of a team effort. Our management has always been open about the challenges posed by competition – and our team stood up to these challenges and managed to cope very well. In return, VdS offers safe jobs, extraordinary fringe benefits and attractive career opportunities. Interestingly, there is now a completely new generation on the level of business unit directors; all positions were filled with candidates from our own organisation. Whoever joins us will see that it is possible to get promoted at VdS.

8 *So much for the retrospect and analysis of the current situation. From your perspective, how well is VdS prepared for the new challenges of the future?*

Hans Schüngel: The objectives are clear and all employees have subscribed to them: it is necessary to increase acceptance of VdS approval in the markets. This would in turn support customers whose VdS-approved products need to be competitive. At the same time, this makes VdS approval even more attractive for manufacturers, which in turn will increase the demand for test and approval processes.

Moreover, VdS is well prepared to respond to new products and technologies swiftly and competently. The test areas of VdS' Technical Inspection Services, for instance, will be extended. Aside from the classical business of approval and overhaul of fire protection systems and expert audits in the field of building regulations, it will increasingly offer other services, including risk assessments and hydrant inspections.

Another objective is an increasingly international VdS service portfolio; the current focus is on the Eastern European market in particular.

9 *If you were to make a forecast – how will VdS Schadenverhütung do in the long run?*

Hans Schüngel: The course has been set. I already mentioned that a market analysis has shown that the German market is pretty much saturated. We can only grow by capturing new market shares abroad. VdS has prepared for an increasing globalization of markets as a result of which more and more products, systems and services in the fields of fire protection, burglar and theft protection will compete with one another. Planners, installers and users world-wide will see an increasing need to turn to neutral assessment institutions for guidance. Without reliable certifications it will be virtually impossible to implement concepts for fire, burglar and theft protection in a way that ensures successful loss prevention.

Against this background, VdS has excellent opportunities with its service portfolio. Neutral testing and certification in combination with a high level of expertise and competence will be in demand more than ever before. In this context, VdS will also have to seek and extend international cooperation with like-minded organisations. This is where VdS will and must play a leading role.

The clear objective is to turn VdS even more into a European and also global test and inspection institute – I am confident that VdS will succeed!

10 *And finally a few words about your personal future. Are you going to stay in the field of loss prevention in one way or another? And what are the goals of the private citizen Hans Schüngel for his retirement?*

Hans Schüngel: Regarding loss prevention, there is not going to be an abrupt transition. Instead, I will continue to be of service to VdS also in future, providing support and advice where necessary. This has become a time-proven tradition at VdS. When people leave, VdS actually makes a point of benefitting from their knowledge, technical competence and not least their fruitful contacts in the industry, which is beneficial to all parties.

At this point, I should like to use the opportunity to thank all VdS clients, companions and employees for their trusting cooperation which in some cases lasted many years.

Let me now tell you about my plans for retirement. I hope to be able to dedicate more time to my musical interests which have often been neglected. Classical music comes at the top of my list. And I also intend to get my violin out again, maybe even take piano lessons.

Moreover, I have always been extremely interested in contemporary history. I am hoping to delve more into this hobby. A large pile of reading material is waiting already, no chance of getting bored.

VdS is now offering its services world-wide. This is a booth at the trade show Intersec Middle East in Dubai

Cooperation between Airbus and University of Duisburg-Essen

Development of a test installation to determine false alarm susceptibility of smoke detectors

AUTHORS: WOLFGANG KRÜLL, THORSTEN SCHULTZE, INGOLF WILLMS & ANDRÉ FREILING

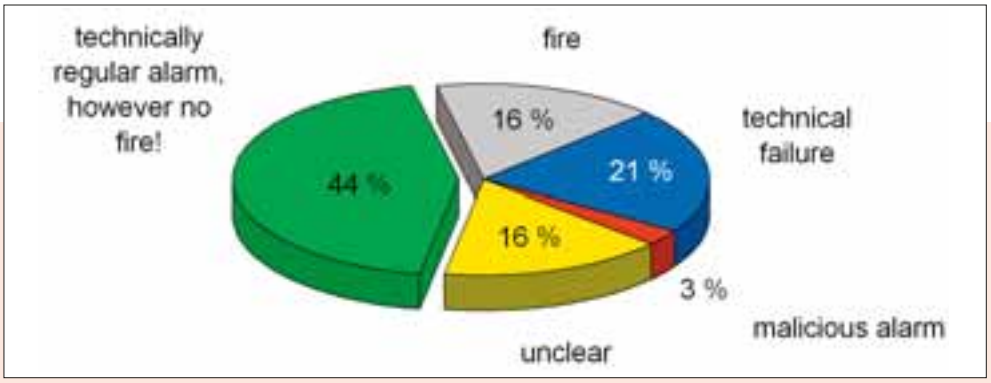

Figure 1: Alarms of automatic fire detection systems in Duisburg, 2008.

Comprehensive tests in line with EN54 have to be conducted to certify fire detectors. The aim of these tests is to certify that the object under test is able to detect fires sufficiently quickly and to operate reliably. In this context, the problem of false alarms is left out in some important points. This article will present a newly developed test apparatus which checks smoke detectors for their susceptibility to false alarms caused by dust. The aim is to develop a standardised test method.

The authors of this article:

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Introduction

The purpose of automatic fire detection systems is quick and reliable detection of an incipient fire in order to minimise any loss. In most cases, a fire will first develop as a smouldering fire, often producing smoke and combustion gases over hours before a visible flame arises. This is the reason why smoke detectors are applied; they are able to detect even smallest smoke concentrations. However, during the "fire-free" lifetime, smoke detectors installed are barely exposed to clean air. Since the particle size of, for instance, dust is similar to that of smoke particles caused by a fire standard smoke detectors are often unable to distinguish a non-fire situation from a real fire situation with certainty. Aside from dust, false alarms may also be caused by water vapour, mist or other aerosols, for instance. The problem of false alarms must not be neglected because the costs incurred e.g. in aviation are considerable.

The pie chart in Figure 1 shows the alarms triggered by automatic fire detection systems for 2008 as determined by the Fire Brigade Duisburg [1]. In the year under review, 374 fire alarm systems were directly connected to the fire brigade; in total, 533 alarms coming from automatic systems were registered.

Only 16% of the alarms were triggered by a real fire. It is rather remarkable that the smoke detectors were working perfectly in 44% of the alarms without a fire. That is to say that the detectors were obviously triggered by non smoke particles. Consequently, the detectors were not able to distinguish between smoke and other aerosols.

In aviation, the situation is even worse: the false-alarm ratio is about 99 % [2]. As a result of the high safety standard, fires in cargo compartments of airplanes must be reliably detected within 60 seconds. This is verified by way of a paraffin smoke generator. This method brings about highly sensitive smoke detectors with low alarm thresholds, though unfortunately, a high rate of false alarms as well. Such a situation is not acceptable

There are various approaches to reduce the false alarm ratio through structural design, e.g. by changing

the wavelength of the transmitter diode and/or the scattering angle. The conference documentation of the "14th International Conference on Automatic Fire Detection" AUBE '09 provides a good overview of the different options and state-of-the-art technology [3].

However, a developer of new detection technologies is faced with the problem of a lack of suitable methods to compare the effectiveness of different technologies. In contrast to the extensive tests in line with EN54 which attest to the object under test that it is able to detect fires sufficiently quickly and operate reliably, there are no reproducible test methods to determine detectors' susceptibility to false alarms.

This article introduces a newly developed test apparatus applied to determine smoke detectors' sensitivity to dust. The aim is to develop a standardised test method. The test channel described was developed by Airbus in cooperation with the University of Duisburg-Essen. The focus was on evaluating the smoke detectors' response to dust which is the main cause of false alarms in aviation. Applicability of the test apparatus to other disturbing aerosols, e.g. mist and spray is currently being explored.

Sources and properties of dust

When developing a test procedure, knowledge of the properties of dust is essential to specify a suitable type of dust. The influence of dust had been neglected over a long period of time. In more recent years, there has been increasing interest in dust as an environmental factor due to its influence on our climate and the global ecosystem. Aside from information on the spreading behaviour of dust, new measurement methods allow a precise description of dust properties. It has been established that larger particles (> 100 µm) such as domestic dust, coarse sand and carbon particles easily deposit. Medium-sized particles (e.g. pollen, fly ash, coal dust, fine sand) between 1 µm up to 100 µm deposit slowly. Small particles (< 1 µm, e.g. carbon black and tobacco smoke), however, deposit extremely slowly. In a steady atmosphere, they may linger in the air for years and travel more than 1,000 km but can be washed out by rain [4]. Figure 2 shows the particle size distribution in the air of typical cities [5]. Aside from cosmic dust (40,000 t per year [5]) there are also sources of civilisation (e.g. carbon black, power plants, industrial plants, agriculture, households, abrasion from vehicle tires) as well as natural sources (e.g. volcanic eruptions, soil erosion, sea salt, forest fires and conflagrations, pollen, sandstorms).

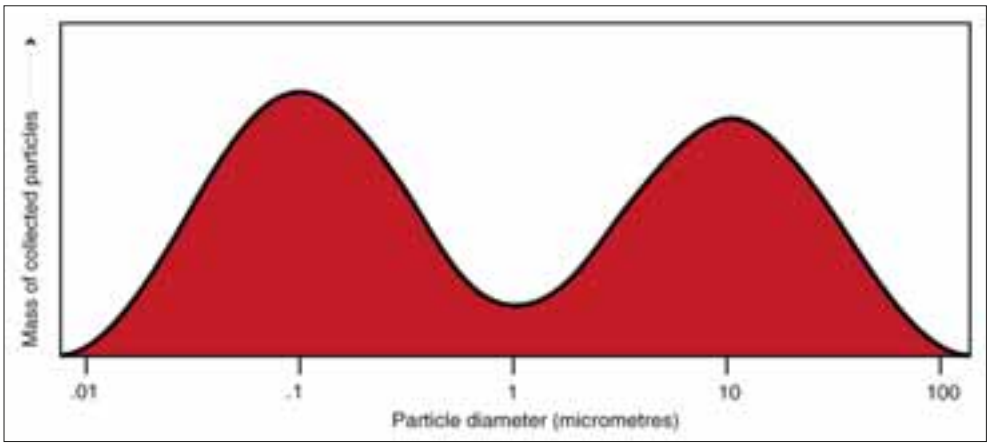

Figure 2: Particle size distribution of urban air [5]

Aerosols are solid and liquid particles that can be classified by size [6]. PM10 (particulate matter) defines the total volume of particles with a diameter ffi 10 µm. These are respirable particles. Figure 3 shows the particle size of some environmentally-relevant aerosols. The graph also shows that the size of some disturbing aerosols is the same as that of smoke particles caused by a fire. Therefore, it is not easy for a standard smoke detector to distinguish a fire from a non-fire situation. The structural design of the smoke detector (e.g. scattering angle and wavelength of the diodes) has a great effect on its false alarm response. There are numerous options to reduce false alarms but there is no qualitative and quantitative comparison. The test installation presented here has the following objectives:

- ❏ Providing a tool for development engineers that helps minimizing the false alarm rate.
- ❏ While the detector is being certified, it is also possible to classify its false alarm behaviour.
- ❏ Gives users the possibility of classifying smoke detectors based on their false alarm behaviour.

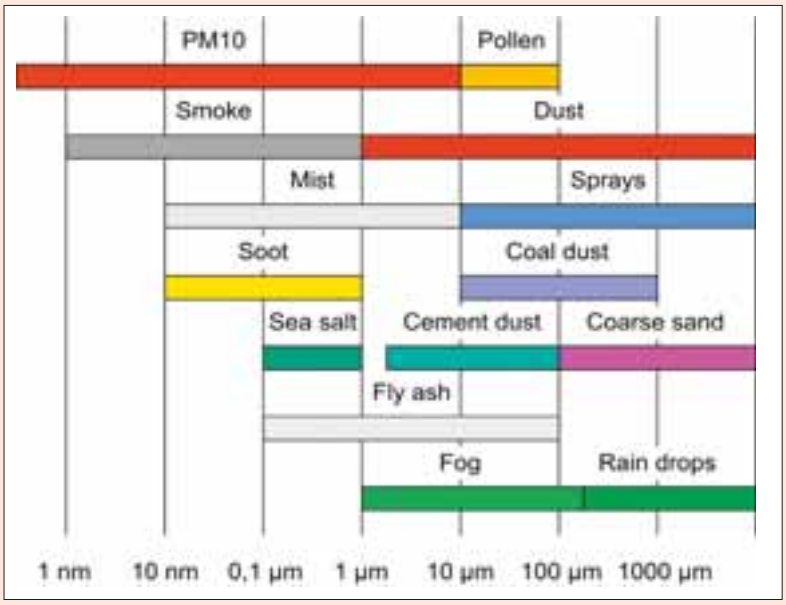

Figure 3: Example of particle size of environmentally-relevant aerosols [7]

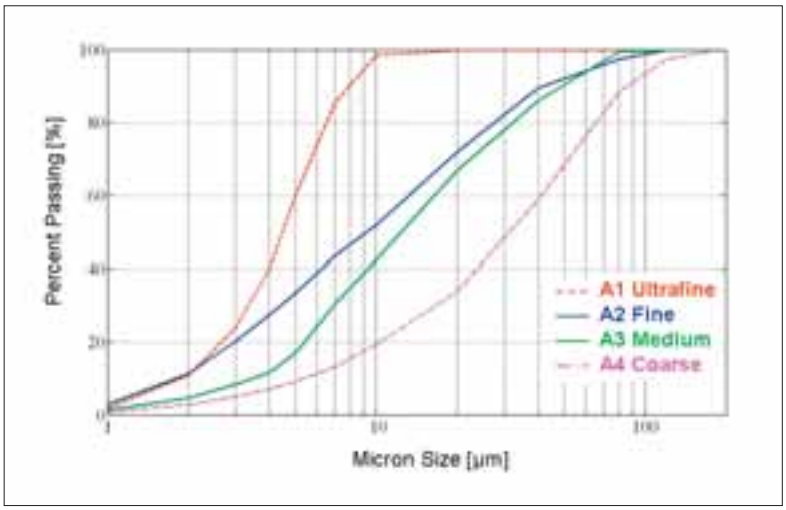

Figure 4: Graphiccal comparison of ISO 12103-1 test dust grades [10]

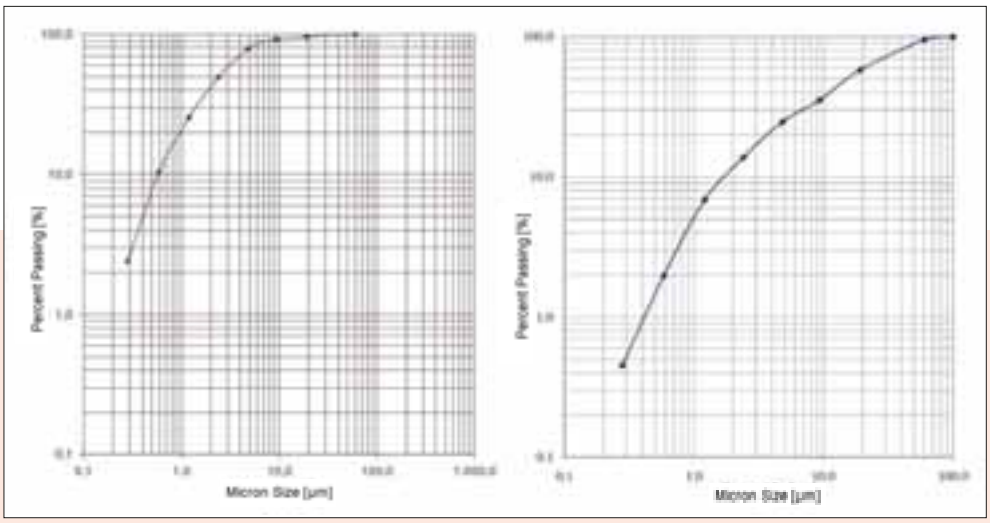

Figure 5: Graphic comparison of DMT test dusts Dolomite 10 and Dolomite 90 [11]

Aside from the type of dust, the increase in dust concentration in the test channel as well as the total time of the detector's exposure to dust are essential factors for the dust test to be developed. Similar to the extensive description of standardised test fires in line with EN54, different types of dust are also classified. The definition describes dust as "small solid particles, commonly with a diameter of less than 75 µm that linger in the air for some time but deposit due to their own weight" [8].

ISO 12103-1 describes 4 different grades of test dust in terms of their particle size distribution and chemical composition [9], Figure 4 shows a schematic comparison of average grain size. It was necessary to introduce a standard on test dust to give users more specific references [10].

Test dust in line with ISO 12103-1:

- **A1 Ultrafine test dust** with particle sizes of 0-10 µm
- **A2 Fine test dust** with particle sizes between 0-80 µm
- **A3 Medium test dust** with particle sizes between 0-80 µm with a lower 0-5 µm content than A2
- **A4 Coarse test dust** with particle sizes between 0-180 µm

However, the test results presented here have been obtained by DMT with quartz-free test dust for health reasons; they also have a standardised grain size [11] comparable to the ISO dusts. Dolomite is a mineral vacuum cleaner test dust in line with DIN IEC 60312, Figure 5 shows the grain size distribution of test dusts used: Dolomite 10 and Dolomite 90.

Dust bin for tests

First non-fire tests were conducted in the EN54 smoke channel of the University of Duisburg-Essen (see Figure 6). The main drawback is the large volume of the channel and the resultant large amount of dust. Moreover, the tests showed that the dust particles soon deposited due to their weight, and did not reach the detector.

In order to achieve a workable dust concentration it was necessary to increase the dust volume. After completion of the test, clean-up of the smoke channel was very time-consuming. Therefore, it was necessary to develop a new test chamber.

Siemens Aerospace in France developed a test barrel for testing multi-criteria detectors which are installed in Airbus A380 airplanes [13]. Figure 6 shows a reproduction of such a dust bin for tests. The bin consists of a plastic/carbon hemisphere with an attached cylinder (see Figure 7), and it is in many ways similar to the test installation developed by Siemens. The installation is supplemented by a Palas powder disperser RBG 1000 that blows dust into the chamber. The two fans ensure turbulence inside the test installation.

An obvious drawback of this test bin is completely unrealistic turbulences around the detector. The air flow was measured at different points inside the bin. The strongest turbu-

Figure 6: EN54 smoke channel and test bin for dust tests

lences were found directly at the detector (see Figure 8). Light extinction was measured 100 mm below the lid, transmitter and receiver were mounted to the side walls.

The measured light obscuration (in %/m) as well as the extinction (in dB/m) of two tests with the same parameters are shown in Figure 9. The result was an almost linear increase in dust concentration, though the increase was neither predictable nor easily adjustable. Hence, reproducibility cannot be ensured. Another drawback is the highly turbulent air flow without knowledge of the impact on the detector under test. The EN54 smoke channel with a square cross-section and an almost homogeneous air flow comes closer to the real conditions the detector is exposed to. Moreover, the EN54 channel is able to determine directional dependence on dust.

Powder disperser for extremely low and medium mass flows

A Palas RBG 1000 powder disperser for extremely low and medium mass flows is used to inject dust into the test chamber since only precise injection of dust particles produces reproducible results.

The test dust is injected into the cylindrical powder reservoir and transported onto a rotating brush by an adjustable feeder. A volume flow streams the brush and pulls the powder out of the brush. The required mass flow (see Table 1) is adjusted relative to the cross-section of the powder reservoir and the feeder. This installation allows for simple exchange of different powder reservoir and disperser lids, which makes it easy to determine and adjust the mass flow [12]. Figure 10 shows the principal scheme of a Palas powder disperser RBG 1000.

The dust concentration can be adjusted using the following parameters as a basis:

- ❏ Diameter of the reservoir: 7 mm, 14 mm, 28 mm
- ❏ Feed rate: 1 mm/h ... 590 mm/h
- ❏ Volume flow: 0.5 bar ... 2 bar
- ❏ Rotation speed of the brush: 600 rpm ... 1200 rpm
- ❏ Type of dust: DMT Dolomite dust < 90 µm was mainly used

Duct type test chamber

A closed channel with a square cross-section (150 x 150 mm) similar to the EN54 smoke channel was developed to avoid strong air fluctuation. The mean length is 140 cm.

The channel consists of two rings of polished stainless steel with a diameter of 300 mm respectively 600 mm. The channel's floor and ceiling consist of plastic; there is also a ring of polished stainless steel inside the channel.

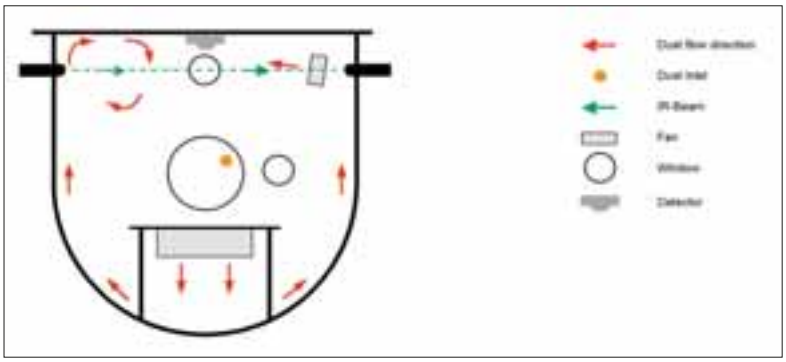

Figure 7: Schematic illustration of the test bin for dust tests

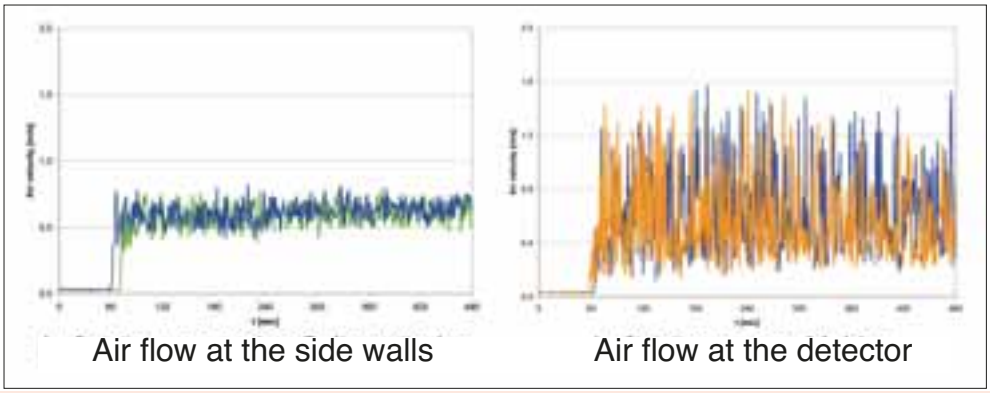

Figure 8: Air flow inside the test bin

Figures 11 to 13 show the developed test duct. Figure 11 shows the detector on the base plate simply to illustrate the design. In real life, it is of course mounted to the top plate.

The new test chamber boasts several benefits compared with the EN54 smoke channel and the dust bin used by Siemens France:

- ❏ compact design, which makes it lightweight and portable
- ❏ easy to clean thanks to quick disassembly and low volume (c. 32 l)
- ❏ only low vol. of dust required
- ❏ controlled and reproducible dust injection
- ❏ predominantly laminar air flow in the area of the detector to be tested
- ❏ flow direction and speed can be adjusted as specified.

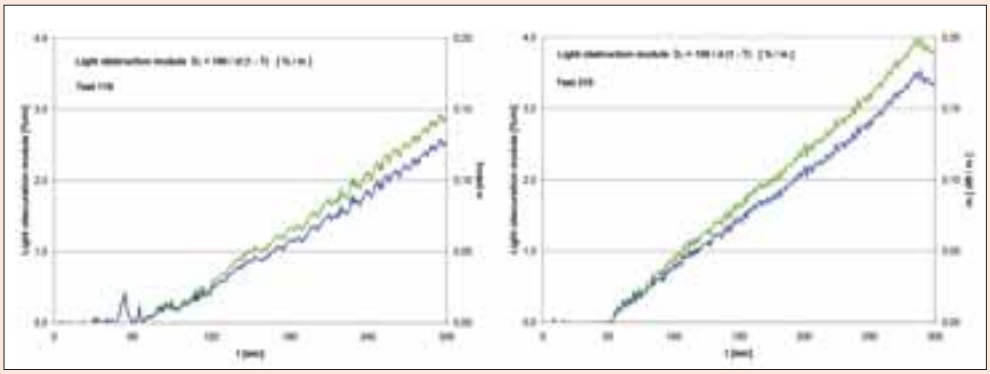

Figure 9: Dust concentration inside the test bin

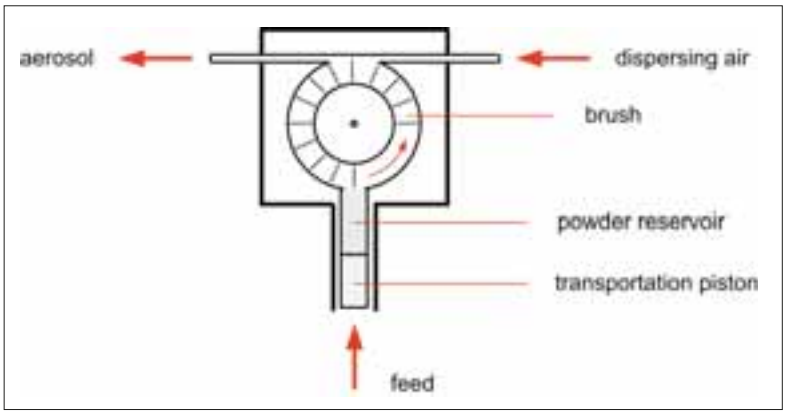

Figure 10: Schematic illustration of the Palas powder disperser

Storage container	Filling volume	Feeder 1mm/h	Feeder 5 mm/h
7 mm	3.1 g	38 mg/h	190 mg/h
14 mm	12.3 g	154 mg/h	770 mg/h
28 mm	49.0 g	616 mg/h	3080 mg/h

Table 1: Mass flows of the Palas-RBG-1000 [12]

The air flow is generated by a propeller. Analogue to EN54 tests with atomised paraffin oil, flow speeds of 0.2 m/s up to 1 m/s can be adjusted. Hence, the test method is similar to the functional test in EN54. For the sake of better comparability of measurement results, extinction is measured in line with the definition of EN54. Thanks to the high conductivity of the channel walls and the low volume, the channel may not only be used for dust tests but also for tests with hazardous and highly flammable aerosols.

Due to the low volume, very slow and precise injection of dust is required. Therefore, reproducible and high-range adjustable dust injection was a critical factor in the development of the test installation. Aside from the control of the powder disperser, a PC-controlled solenoid valve was added at the dust inlet, which makes it possible to set linear dust ramps with different rates of rise.

Measurement results

During the development of the new test channel, numerous measurements were being conducted. The results were visualized with a LabView-based software specifically developed in-house.

Measurements carried out to ascertain directionality and/or response behaviour of a smoke detector in line with EN54 must establish aerosol concentrations within the following limits:

$$0{,}015 \leq \frac{\Delta m}{\Delta t} \leq 0{,}1 \quad [\mathrm{dB\ m^{-1}\ min^{-1}}]$$

Measurements in an EN54 smoke channel ascertain a typical increase in smoke density of approximately 0.06 dB m^{-1} min^{-1}. Such an increase in dust density can easily be realised in the test duct developed. Figure 14 shows measurement results of different tests using Dolomite sand < 90 µm with all parameters of the Palas powder disperser RBG 1000 varied. The diagrams show that a predominantly linear increase in dust production can be adjusted to different rates oft rise in the channel.

Before measurements can be carried out it is necessary to clean all relevant components. This helps avoid large clouds of dust and thus, measurement errors at the beginning of measurements.

Summary and outlook

In contrast to the situation of clearly defined standardised methods to determine detection capabilities of smoke detectors, there are no reproducible and representative methods to describe the sensitivity of smoke detectors to relevant situations that lead to false alarms. A first step towards bridging this gap was the development of a suitable test apparatus.

The structure selected and a number of additional measures make it possible to obtain qualitatively precise conclusions on the sensitivity of smoke detectors to dust. However, a minimum of reproducibility is also required for the long-term tests to determine soiling of detectors. Different tests were able to obtain optimum parameters for dispersion for the sake of reproducibility. In the course of tests, it was possible to obtain further experience with the test apparatus.

On the basis of these results, it is possible to define optimised test

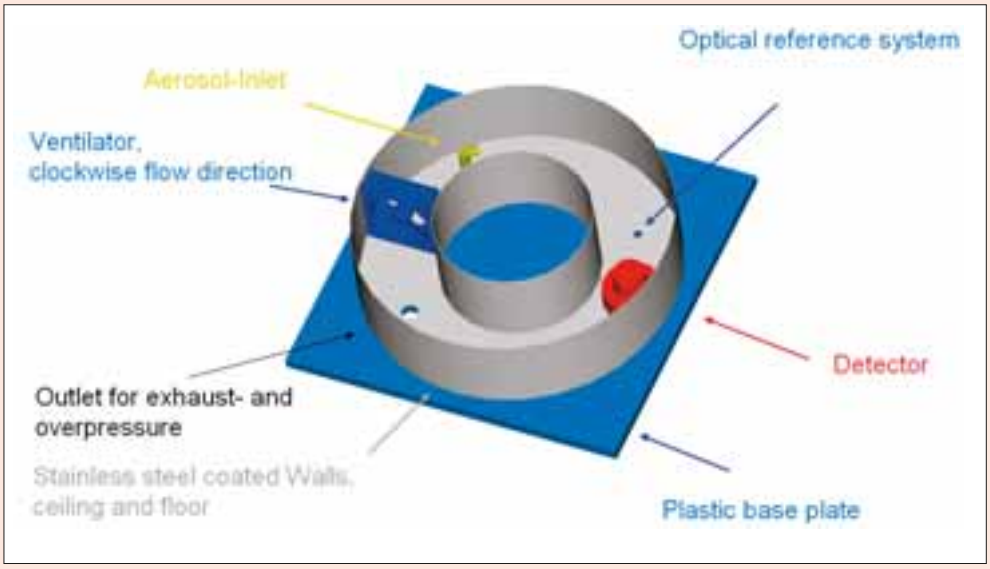

Figure 11: Outline of the developed test duct

methods as well as response thresholds for the detector under test. Tests with steam, mist, sprays and other aerosols are planned to determine response behaviour of smoke detectors to other events relevant for false alarms.

On the one hand, the test channel presented should give manufacturers the possibility to reduce false alarm sensitivity; on the other hand, it should be a useful instrument in the certification process. It should give system designers decision-making criteria to select a suitable smoke detector for a certain application.

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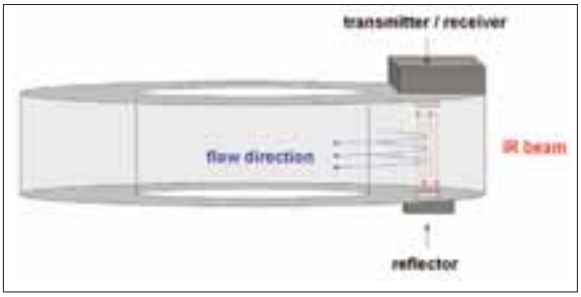

Figure 12: Sketch of the reference extinction path

Figure 13: Different views of the developed test duct

[11] DMT, Körnungskennlinie Dolomit 10 / Dolomit 90 (Characteristic granulation curve Dolomite 10 / Dolomite 90)
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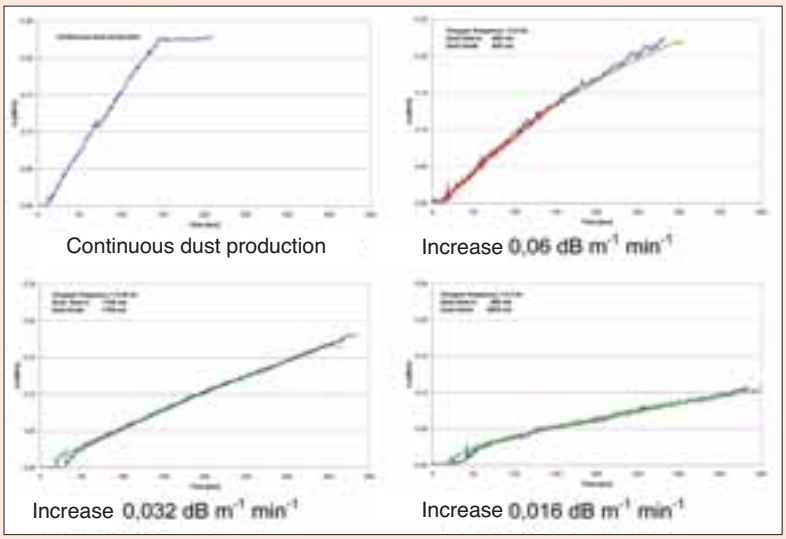

Figure 14: Examples of a predominantly linear increase in dust production at different rate of rise.

Protecting your hazard with a gas system

Halocarbon or inert gases?

AUTHOR: DR. CARLOS PÉREZ

Halocarbons	
HFC227ea	Heptafluoropropane
HFC125	Pentafluoroethane
HFC23	Trifluoromethane
FK5-1-12	Dodecafluoro-2-methylpentan-3-one
Inert gases	
IG100	Nitrogen (100%)
IG01	Argon (100%)
IG55	Nitrogen (50%), Argon (50%)
IG541	Nitrogen (52%), Argon (40%), CO_2 (8%)

Table 1

1 Introduction

Gas systems have been in use for many years to protect high value added goods that are contained in a closed room against fire , being carbon dioxide and halons the most representative examples. With the ban of halons due to environmental concerns different alternatives and solutions have appeared in the market. Among the new options we can find new gases with generic characteristics similar to halon.Those new gases can be categorized as halocarbons or as inert gases. While under each category there are a number of different products which are widely available in the market, it seems to happen a first selection that chooses to use either a halocarbon or an inert gas, and later on the specific gas is decided.

During the discussion below it is intended to show what the differences are between both generic options and to develop the criteria for selecting one or the other. It will also be shown that certain properties of the halocarbons are different enough so that they cannot be considered as a whole. For inert gases while these differences are not so critical, may justify the selection of one over the others.

Carbon dioxide is an extinguishing agent with some common features to halocarbon and inert gases, as it had with halon. However it will not be included in the discussion as, generally speaking, the use of carbon dioxide follows a different approach to that of inert gases or halocarbons, mainly due to its toxic characteristics.

2 Gaseous extinguishing agents

Halocarbon agents can be described as organic compounds which contain fluorine, chlorine, bromine and/or iodine, showing extinguishing effects. They are produced by chemical reactions involving one or more steps from natural sources in chemical plants. That is the reason why sometimes they are named chemical gases.

Inert gases can be described as mixtures or pure formulations of gases that are present in the atmosphere, showing extinguishing effects. They are generally obtained by cryogenic and destillation processes from atmospheric air.

While there could be a large number of different formulations there are four different halocarbons and four different inert gases that are currently generally available in Europe. See table 1. All eight gases under this discussion are included in relevant international standards: EN15004, ISO14520, NFPA 2001 CEA4008/4045 partially)... The discussion below will consider the approach and design requirements based on the standards EN15004-1 to EN15004-8. Most of the consequences of this choice would also be applicable if other standards were considered.

The sort of risks these agents can protect is basically the same since all of the agents have the following characteristics:

- ❏ Clean after discharge
- ❏ Gaseous under atmospheric conditions or, at least, able to generate extinguishing concentrations in gas phase under atmospheric conditions.
- ❏ Non conductive of electricity.
- ❏ Able to reach hidden fires.

2.1 Description of halocarbon systems

Halocarbons are stored in cylinders as liquefied gases under pressure. Most of the agents require pressurization with nitrogen for ensuring a quick discharge. This feature results in the possibility of controlling the charge of the cylinders by pressure.

Flow in pipes and associated pressure loss produces a two phase flow that requires special attention in the design, like the need to ensure turbulent flow and correct distribution in tees.

Primary extinguishing mechanism of all halocarbons is by flame cooling due to the higher heat capacity of each of them compared to air. This results in relatively low values of extinguishing concentration. Chemical interaction is not considered relevant to explain the extinguishing effect.

2.2 Description of inert systems

Inert gases cannot be liquefied at ambient temperatures, thus they are typically stored in cylinders as

compressed gases at selected system pressures.

System discharge is produced from a very high pressure source. To allow the use of standard pipes and components, at least partially, systems incorporate either a restrictor or a valve assembly to ensure a significant reduction in pressure downstream these. There are no specific concerns on tee distribution as the flow is one phase only.

Primary extinguishing mechanism of all inert gas is oxygen reduction. This results in relatively high values of extinguishing concentration. Cooling is a secondary extinguishing mechanism due to their higher heat capacity compared to air, which may help to explain the small differences in extinguishing concentration for the different agents.

3 Differences between halocarbons and inert gases

From a fire perspective it is irrelevant if the flames are extinguished with one agent or the other. The fact that all agents are included in the same standards and that all generic conditions are applied to all of them makes them technically equivalent as extinguishing agents. i.e. all of them have shown to perform against fires succesfully in representative scenarios by applying the same pass/fail criteria to all of them.

However gaseous fire protection is not only applying a certain amount of gas to the fire area, and there is a number of additional conditions that have to be met from a fire engineering perspective, together with 'ancillary' conditions that may enhance the adequateness of a specific solution over the others.

Those conditions will be considered next and comparisions will be established. The cost conditions will also play a role on the decision but, being a commercial issue will not be considered in the discussion list.

So the list of conditions that may introduce differences between the gases, influence the selection decision that will be considered in the discussion includes:

- ❏ Design concentration.
- ❏ Safety for people.
- ❏ Discharge time.
- ❏ Overpressure.
- ❏ Retention time.
- ❏ Storage area.
- ❏ Environmental regulations.
- ❏ Decomposition products.

3.1 Design concentration

The basis for the design of a gas extinguishing system in a total flooding application is to generate and maintain a sufficient concentration of the extinguishing agent throughout the enclosure being protected. The value of design concentration by itself is not a determining condition for taking a decision on the suitability of one sort of agent over the other. These values are derived from fire extinguishing tests according to an accepted test protocol and depend on the extinguishing mechanism and the efficiency of the agent.

However the value of the design concentration impacts directly on nearly all other parameters. Maybe the most important being the safety for people, storage requirements, retention time and overpressure. In the next table values for class A surface fires as they appear in EN15004 are taken as reference for discussion. See Table 2.

A preliminary observation of these values shows the different extinguishing mechanisms. In the case of halocarbons the extinguishing concentracions are in the range of 5-16% while for inert gases the value is around 40%. From these values the standards describe methodology to determine the amount of gas required to reach these concentrations together with any additional quantities.

3.2 Safety for people

It is clear that safety for people is a national competence and that each country eventually legitimates the safe use conditions of a gas system based on their health and safety legislation. Standards may give guidance on safe exposure that may be taken as reference.

Common use of gas system is in areas where personnel is constantly present during working hours or can enter the room for shorter periods. Hence standards describe the effects that the different agents can have on people and suggest a minimum safety approach. To evaluate how this effect can affect the selection of a system it is necessary to know why the discharge of a gas can be of concern for personnel safety.

Halocarbons, as they are flurorinated compounds, are known to have an influence on the cardiac function when they are inhaled. The seriousness of this effect is depending both on the final concentration of gas in air and the exposure time to this concentration.

Inert gases when discharged in a closed room for fire protection, due to the design concentration required, dilute the oxygen to a degree where concerns may arise as the concentration being too low for normal breathing. Again the se-

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Table 2

Design concentrations for class A surface fires.

HFC227ea	7.9 %
HFC125	11.2 %
HFC23	16.3 %
FK5-1-12	5.3 %
IG100	40.3 %
IG01	41.9 %
IG55	40.3 %
IG541	39.9 %

riousness of this effect depends on resulting concentration of oxygen and the exposure time to hypoxic conditions.

The safety assessment in EN15004 considers these two potential dangers as the only ones relevant for fire protection. The practical approach to this issue is based on the concepts NOAEL and LOAEL and the maximum design concentration that can be reached in a given room. The recommendations are only applicable to the fire protection application.

In the case of halocarbons those parameters are obtained from experimental tests of gas inhalation in simulated stressful situations. The experimental data has relevance to humans through the use of the so-called PBPK model. As a result safe agent concentration values are suggested for an exposure time of 5 minutes. Each halocarbon agent has its own experimentally based value.

In the case of inert gases the concern is on low oxygen concentration obtained after discharge of the gas. So agent concentration values are based on the pysical effect of dilution of the oxygen present in the ambient air. Safe agent concentrations for an exposure time of 5 minutes are also suggested, based on the final concentration obtained when oxygen level is reduced from 21% to 12% (same values would be obtained with the application of any gas). See Table 3.

Safety margin in the table is related to the maximum allowance to an increase of concentration from the design concentration to the maximum value for a five minutes exposure in accordance to the standard. If this value is exceeded additional safety measures shall be placed. Except for one halocarbon the allowance for an increase in the final concentration is much higher for halocarbons than for inert gases.

There are a number of design circumstances that result in higher concentrations obtained than the specified design concentration, for example:

❏ Mathematical model used to determine the amount of gas needed is conservative to obtain a better fire performance. This effect is difficult to quantify as it depends on the room configuration.
❏ Temperature changes in the room: The amount of gas required is based on the minimum expected temperature in the hazard, while the maximum concentration is based on the maximum expected temperature. The higher the molecular weight the bigger the relative increase in concentration due to the difference between the minimum and maximum temperature. A 10°C difference between the two values implies a relative increase in concentration of about 2.5% on inert gases and between 3-4% on halocarbons.
❏ Additional quantities for system configuration: Inert gases have typically standard fillings which result in additional gas installed. This effect is reduced if the number of cylinders is high and the pressurization is low. For HFC23 typically 20% extra gas is included in the cylinders to account for its high vapour pressure. The other halocarbons do not require additional quantities for this concept.
❏ Volume occupancy: If the hazard is subject to changes in the amount of goods or it is normally high and no allowance for this is applied in design (as they are not fixed) higher concentrations are expected to occur. This is good for flame extinguishment but could represent a concern for personnel safety.
❏ Network complexity: In certain cases it may be required to increase the number of cylinders in a system to improve the discharge characteristics in order to meet the required discharge time. For halocarbons this practice does not increase the amount of gas, for inert gases it does due to the standard filling of cylinders.

Both inert gases and halocarbons are generally adequate to be used in occupied spaces without special provisions. Certain conditions are shown that should be considered when assessing safety for personnel.

3.3 Discharge time

Discharge time is defined as the period of time required to discharge the amount of gas needed to reach 95% of the design concentration. It is required that halocarbons are discharged in 10 seconds and inert gases in 60 seconds. Theoretically no fire can be expected to be extinguished before this time.

To understand how critical this can be the overall process that leads to extinction has to be considered. Once ignition has occurred there is a certain time span until detection sends a signal to the control panel and it decides that actuation of the system is required. Then the room has to be prepared for the discharge. Clearly during all this time (seconds?, minutes?) the fire has been growing and destroying the goods protected. A good emergency plan will have used all means possible to limit this time to the targets of fire protection, using adequate techno-

Table 3

Agent	Maximum concentration for 5 minutes exposure	Safety factor from design concentracion for class A
HFC227ea	10.5 %	32.9 %
HFC125	11.5 %	2.7 %
HFC23	30 %	84.0 %
FK5-1-12	10 %	88.7 %
IG100	43 %	6.7 %
IG01	43 %	2.6 %
IG55	43 %	6.7 %
IG541	43 %	7.8 %

logy (detection type) and protocols, depending also on the fire type and expected growing speed. Discharge time is added to this period of fire damage.

The discharge time should be compared to the duration of the rest of events in the emergency plan. The time from ignition to extinction and expected and assumed total fire damage should be considered to assess the speed of fire growing. It has also to be related to the importance of the increased destruction with burning time of goods and business interruption.

3.4 Pressure changes in the room

When a gas is added to a completely closed volume (e.g. tyre) the pressure in this volume increases proportionally to the increase of mass (in moles) added. Temperature changes also influence this process.

This direct increase could be the maximum limit applicable to gaseous fire protection but in practice it would never be reached due to the fact that rooms are no so tight. However damages to enclosures can occur at much lower pressure differences. So the changes in pressure depend on the speed of mass added, the thermal effects associated to a discharge and the ability of the existing open surfaces on the room to alleviate the pressure changes as they are generated. These pressure changes are always related to the period of time while the discharge of the gas is running.

When fire is present it influences also the pressure changes in the room because of temperature changes and for the addition of gases to the room from the combustion reaction. The discussion below will consider only the discharge of the extinguishing agents without a fire.

Both inert gases and halocarbons produce overpressure. Halocarbons produce also underpressure.

Underpressurization is produced in the initial part of halocarbon discharge as the temperature changes due to vaporization of the liquid flowing from the nozzles tend to be more important than the addition of gas. This effect is related to the heat of vaporization, the amount of gas released and the heat exchange with the surronding air and walls.

Overpressurization is due to the addition of gas in the enclosure and the effect is related to the speed of addition of gas. For halocarbons this speed can be considered constant during the discharge (the initial underpressurization theoretically helps to limit the overpressure as thermal effects are compensated after the end of the discharge). For inert gases there exists two different technologies of discharge. One of them the flow rate is limited by a restrictor and it turns out that the maximum flow rate is ca 4-5 times the average flow rate. In the other technology the flow rate/outlet pressure is kept roughly constant during most part of the discharge. In this case the maximum flow rate is ca 1.5-2 times the average flow rate.

The direct consequence of this effect is the need to consider the use of over/underpressure vents to limit the effects of the gas on the enclosure. EN standard does not give indications on how to calculate the vent area; CEA suggest to use the following relation:

$$\textit{Venting area} = k \cdot \textit{Flowrate} / \textit{Allowable overpresssure}^{0.5}$$

where k is a function of specific volumes of the extinguishing gas and the agent/air mixture.

If this equation is used to compare the relative area required for a given maximum overpressure allowed, the results would be as shown in Table 4. The values can only be approximate.

For inert gases the values are considering the use of restrictor technology. If constant flow assemblies are used the values could be one third of those in the table.

3.5 Retention time

To extinguish the fire, the designed concentration in the room has to be reached. But to avoid reignition an extinguishing concentration has to be maintained until this reignition is no longer possible. Both the extinguishing agent and enclosure itself determine the time that the concentration is maintained and which is known as retention time. This effect has to be considered from the end of the discharge.

The room has to be as tight as possible from the end of the discharge, i.e. any pressure venting has to be closed once the pressure changes have dissipated. It is clear that the retention time will be longer if the unclosable openings are smaller and also the distribution of the openings through the enclosure influences the retention time. But if the room conditions are fixed, the retention of agent will depend on the difference between the density of air outside the enclosure and the mixture of agent and gas inside the enclosure, as shown in the Table 5.

For gases heavier than air (all of them but IG100) leakage is from top to bottom which means that in case of presence of openings in the upper and lower parts of the enclosure

Required relative venting area for overpressure

HFC227ea	1.4
HFC125	2.1
HFC23	3.0
FK5-1-12	1.0
IG100	5.5
IG01	6.2
IG55	5.7
IG541	5.6

Table 4

Difference of density of agent/air relative to air	
HFC227ea	+ 40%
HFC125	+ 36%
HFC23	+ 23%
FK5-1-12	+ 56%
IG100	- 2%
IG01	+ 16%
IG55	+ 7%
IG541	+ 7%

Table 5

the entrance of fresh air is mainly from the top. For gases lighter than air (IG100) entrance of fresh air is mainly from the bottom under the same conditions.

While the design approach and studies carried out so far consider cold discharges, when a fire is present the heat released by the hot material after flame out will tend to decrease the density of the air in the room favouring the entrance of air from the bottom if the resulting density is lower than external air.

3.6 Storage requirements

Storage area maybe of concern when the available space for the battery of cylinders is limited. The differences in this case come, mainly, from the way the agent is stored and the amount of gas needed.

Halocarbons are stored as liquefied gases and the quantities required are relativelly small, allowing for relatively limited space requirements. Each gas allows a certain maximum storage factor which is related to transportation regulations.

Inert gases are stored as compressed gases and the quantities required are relatively high, what results in bigger space requirements. To reduce this footprint the storage pressure has increased historically up to 200 and 300 bar. There is no limitation to this value and in the future higher pressures may be offered if cost-effective cylinders are developed.

Table 6

Storage capacity required (l cylinder/m³ protected)	
HFC227ea	0.56
HFC125	0.72
HFC23	0.82
FK5-1-12	0.55
IG100	2.78 (2.01)
IG01	2.65 (1.85)
IG55	2.65 (1.88)
IG541	2.51 (1.81)
Values for IGs correspond to 200 bar (300 bar) systems.	

The availability of cylinder sizes also determines the footprint, but this is depending on system manufacturer. It normally allows to adjust further the footprint for halocarbons. Inert gas system cylinder sizes options are limited to a smaller number due to the high number of cylinders that are normally involved. For comparision the cylinder volume to room volume ratio is shown in Table 6.

3.7 Environmental regulations

There have been two different international agreements that have influenced the use of gas systems as extinguishing agents. Those are the Montreal Protocol and the Kyoto protocol, both have specific regulations developed in Europe.

Montreal Protocol is committed to the protection of the ozone layer, and none of the agents in the discussion is subject to regulation due to this effect as none of them deplete the ozone layer.

Kyoto Protocol is committed to protecting against climate change/global warming by the reduction of emissions of greenhouse gases. In the so-called Kyoto basket, HFCs are included as potential greenhouse gases.

Current status applicable in Europe is based on F-Gas regulation 842/2006/EC dealing with fluorinated gases in different applications, including fire protection. Annex II in the regulation states the uses that are not longer allowed and fire protection is not in the list, thus fluorinated gases are allowed to be used as extinguishing agents throughout Europe according regulations.

3.8 Decomposition products

Halocarbons decompose at flame temperatures to produce corrosive HF (hydrofluoric acid). The extent of this decomposition depends on how long the agent is in contact with fire and on the size of the fire.

The first issue is minimized by a short discharge as required by the standards (10 seconds) and the use of adequate agent concentrations. The second issue depends on the fire class and the type of detection. Class A, if considered as slow growing fire, together with a reasonable quick detection in relation with the value of the goods protected, also minimize the generation of HF. Values cannot be predicted but no damage on materials is known to be reported for this reason in real cases.

Inert gases do not decompose at flame temperatures, so there is no concern on this issue.

Fire itself produces combustion products that generate corrosive species.

4 Conclusion

A number of key points have been discussed that explain the different options. Generally speaking the bigger differences are between the group of inert gases and the group of halocarbons and the minor differences inside each group. However it has yet to be determined how critical or even excluding those differences are.

In the selection, every aspect has to be considered and quantified somehow so that one group or even specific agent is chosen as the best. It would be equivalent to determine the following :

Selected agent = Best of (Σ ai ·Pi)

Where *a* is the importance given to one specific discussed parameter (*P*). The values for the different *a* have to be assigned by the player that has decision responsibility, and probably should be different from one project to the other.

Experience from more than a decade of VdS tests

Ageing processes in sprinkler systems

AUTHOR: DIPL.-ING. JOCHEN KRUMB

1 Introduction

Due to different operating statuses of sprinkler systems as well as operational and atmospheric influences, damage to components becomes inevitable in the course of years.

Damage that influences the mechanics of components are detected during periodic tests or maintenance work over time. This applies also to damage on the piping or the sprinklers to the extent that they are visible on the outside. Such damage relates to e.g. alarm valves, pumps or outside corrosion on pipes.

However, damage to the system that is not visible on the outside poses a much greater problem; it includes damage to the piping and/or damage that compromises the sprinklers' function.

Therefore VdS Guidelines on Sprinkler Systems, Planning and Installation, VdS CEA 4001:2008-11 (03), section 18.4.6 requires an inspection after 25 years of operation for wet systems resp. 12.5 years for dry systems. On the basis of tests on random samples, the piping and sprinklers are examined.

As not every sprinkler system can be assessed in line with the current VdS Guidelines, similar requirements had already been laid down in the predecessor Guideline VdS 2092. Section A6.7 of VdS 2092 contains all requirements relevant for testing.

Annex K of DIN EN 12845 (2009-07) "Fixed Firefighting Systems – Automatic Sprinkler Systems – Design, installation and maintenance" also refers to an inspection after 25 years of operation.

Fig. 1: View through the video endoscope. The wall of the pipe with an extremely large corrosion occlusion. Size of the occlusion: c. 25 mm to 30 mm. Pitting is more than likely

The following presentation will therefore describe the process of an inspection after 25/12.5 years of operation to detect damage resulting from ageing processes. Moreover, it will outline factors that have an impact on the piping from the outside.

2 Inspection after 25 resp. 12.5 years of operation

The inspection after 25/12.5 years of operation is carried out by taking random samples. Depending on the type and size of the system, a certain number of pipes and sprinklers is examined. Based on the results of the random samples, the whole sprinkler system is assessed.

The detailed process and scope of the inspection is described in VdS data sheet VdS 209.

2.1 Selection of samples

The first criterion is the distinction between wet and dry systems. In case the sprinkler system to be audited is a wet system with a maximum of 10 groups, the inspection is limited to one group provided the groups are all in one building and/or the occupancy and environmental conditions are comparable. Such a limited inspection is not permissible for dry systems.

The second criterion for the selection of samples is the number of sprinklers of the group to be audited. The guidance laid down in table 1 defines the scope for the piping.

The prerequisite for any random sampling is a representative selection of samples. Therefore, the fol-

Table 1: Number of pipes to be inspected

Type of pipe	Minimum number of visual inspections
Branch pipe	1 pipe per 100 sprinklers, minimum 3 pipes
Secondary and primary distributor pipes	Minimum one pipe for three diameters

Fig. 2: Fixed deposits. More than one third of the pipe diameter is blocked.

lowing factors need to be considered when selecting samples:

- ❏ hydraulic conditions
- ❏ overall operating conditions
- ❏ external influence and
- ❏ experience from previous inspections.

Fig. 3: Ultrasonic testing of pipe wall thickness on a mains

2.2 Inspection process

In the context of a periodic overhaul of the sprinkler system, the technical inspection body first of all determines the components (groups) to be inspected. After that, the piping is inspected, while the sprinklers are dismantled for laboratory inspection.

The inspection process of an existing sprinkler system should be coordinated between an approved installer and the Technical Services of VdS Schadenverhütung.

2.2.1 Inspection of the piping

The inspection of the piping is split into a visual inspection and a corrosion test. During the visual inspection, sections of piping are examined for deposits and incrustations. During the corrosion test, the general appearance and the residual wall thickness of the pipe sections are inspected.

Both the visual inspection and the corrosion test can either be done on the installed piping or by dismantling the pipes for laboratory inspection. The selection of pipe sections has to be done by the Technical Services. The laboratory test can be carried out either by an approved installer or in the laboratories of VdS Schadenverhütung. The inspection on the installed system is carried out on site by the Technical Services of VdS Schadenverhütung. This method is the most common way as a laboratory test only makes sense in exceptional cases.

Visual inspection

For the inspection of the installed system, parts of the piping are examined with an endoscope, checking for deposits and corrosion damage. For this purpose, the endoscope is inserted through T sections of the sprinkler, flushing connections or disassembled pipes.

As alternative to an endoscopic inspection, it is also possible to take out and examine c. 50 cm long pipe sections at the laboratory. The pipe sections taken out are separated into two halves. The laboratory inspection provides information on deposits and corrosion damage on the pipe section. However, this method is only used in exceptional cases since in general, an endoscopic inspection on site allows for an overall assessment of a system beyond doubt.

In case both methods detect deposits of an acceptable magnitude, no additional measures are required other than those defined by the Guidelines (flushing, removal with at least 10 bar). In case there are deposits whose scope would influence the hydraulics and/or effectiveness of the extinguishing system, additional measures are required. Depending on the type and magnitude of the deposits, these may include e.g. thorough flushing as far as the branch pipes or a hydraulic test (measuring the design discharge at fully open area of operation). Within the framework of the hydraulic test, the effect of the deposits on the system's water volume is determined.

The endoscopic inspection of the piping is carried out by the Technical Services of VdS Schadenverhütung.

Corrosion testing

During the inspection of the installed system, the residual wall thickness is determined in those sections where the endoscopy detected corrosion damage, e.g. by ultrasonic testing. In case the ultrasonic testing does not produce conclusive results on the condition of a section of pipe, this section should be dismantled and inspected in a laboratory.

The laboratory inspection (of the disassembled section) first establishes the actual condition of the pipe. Next, the pipe is treated (brushing, sandblasting) and the residual wall thickness is determined by instrumentation.

To assess residual wall thickness, limits have been laid down that need to be met. The limits are based on DIN 2413 Part 1 and can be calculated by using the following formulae:

$$S = C_1 + S_v \times 0{,}7$$

$$S_v = \frac{d_a \times p \times 1{,}7}{2 \times K \times v_n}$$

S_v: rated wall thickness (mm)
S: reqired wall thickness (mm)
C_1: allowance for corrosion or wear and tear (mm)
p: rated pressure (N/mm²)
d_a: outside diameter
K: strength coefficient (N/mm²)
v_n: contracction factor

In case the wall thickness is smaller than these limits, either individual pipes or the entire piping (worst case scenario) have to be replaced.

The laboratory test of the pipe section may be done either by a qualified installer or the laboratories of VdS Schadenverhütung.

2.2.2 Inspection of the sprinklers

The number of samples depends on the size of the system to be inspected, the type of system and the number of different sprinkler types. Depending on the number of sprinklers in the system, the scope of sampling is determined in line with the guidance provided by Table 2.

For systems that consist of wet and dry stations, in general 20 sprinklers per section have to be subjected to inspection. For systems that extend across several buildings, one sample per building should be inspected.

In case pendent dry sprinklers (PDS) are installed, samples should also be reinspected every 12.5 years by VdS laboratories. The number of samples depends on the total number of pendent dry sprinklers in a system and is outlined in Table 3.

Visual inspection

The sprinklers are first inspected visually to sort out sprinklers that show obvious defects from any further inspection.

Examples include deformed deflectors, deflectors soiled with paint or dirt, damaged, empty glass bulbs etc. In order to obtain information that is useful for statistical purposes, a minimum of 20 sprinklers suitable for inspection must be available. The result of the visual inspection is documented.

Tests

A functional inspection test is carried out on 16 sprinklers applying 0.35 bar. The pressure is gradually increased for sprinklers that do not fully release the flow within one minute after activation (maximum permissible reduction 10%).

Number of sprinklers in a system	Number of samples
up to 5,000	20
up to 10,000	40
up to 20,000	60
up to 30,000	80
up to 40,000	100
more than 40,000	Depending on the risk, number determined by VdS Schadenverhütung

Table 2: Number of samples for sprinkler inspection

Total number of PDS installed	Number of samples
up to 100	5
up to 200	10
more than 200	In line with Table 2

Table 3: Number of samples for SDS

Full release of the flow must be achieved at 1 bar, if not, the sprinkler is attributed to defect category 1 (limited function). In order to determine whether the sprinkler's function is likely to fail, the pressure is then increased to 3.5 bar. In case the flow is not released at 3.5 bar, the sprinkler is classified as a failure.

Samples that are not assessed in a functional test are checked for their response temperature. In this test, the sprinklers must respond within the maximum temperature range permitted by the component test directive.

In summary, the laboratory inspection classifies two types of defects in line with the following scheme:

❏ Defect 1:
Failure of sprinkler function
– No response at 1 bar
– Jammed locking element
– K factor more than 30 % reduced
– Deflector comes off
– Response temperature more than 20 °C outside the tolerance

❏ Defect 2:
limited sprinkler function
– Obstructed spraying
– K factor reduced by 10- 30%

Fig. 4: Representative batch of 20 sprinklers from one system. The heavy incrustation of the plugs is clearly visible

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– Response temperature up to 20°C outside the tolerance

3 Findings from previous inspections

The following section will elaborate on the results of previous inspections in more detail. It will distinguish between sprinkler inspections at VdS laboratories and pipe inspections by the Technical Services.

These findings obtained from a number of inspections over the last 10 or so years are extremely useful for maintaining the high standard of sprinkler systems, and even improve it.

3.1 Results from piping inspections

As experience to date has shown, pipe inspections of wet and dry systems generate different results.

Figure 5 shows a statistical overview of pipe inspections of wet and dry groups conducted by VdS Schadenverhütung. All inspections listed in the overview have been conducted on the installed system.

To categorise the defects found during the inspections, three different classes have been defined. Each of these three classes has a certain profile with fewer or more defects. Various measures are proposed to eliminate the defects (see Table 4).

Fugure 5 shows the results of the piping inspections of wet and dry extinguishing systems – in line with the classification in Table 4.

The influence of air and presence of residual water and/or condensed water cause considerable corrosion damage in dry systems. Another severe problem of dry systems is an often undershot minimum gradient of mains and distribution pipes and/or the branch pipes themselves. In line with VdS CEA 4001 a minimum gradient of 0.4% must be met for branch pipes and 0.2% for mains in order to ensure perfect drainage of the system.

Such damage is only rarely observed in wet systems as the result of the evaluation demonstrates. This can be attributed to the fact that water permanently present in the wet system has only a low content of residual oxygen.

3.2 Results of sprinkler inspections

An analysis of the frequency of defects shows that c. 95% of all defects can be divided into four different types:

1. K factor reduced by 10 - 30%
2. Obstruction to spray caused by lodgements
3. K factor reduced by more than 30%
4. No response.

Almost half of all defective sprinklers shows a K factor reduction of 10 - 30%, which is predominantly caused by deposits on the sprinkler nozzle. However, some samples of sprinklers had a reduced K factor without any material deposits being visible. The cause here can be found in the manufacturing tolerances which 30 years ago were not compliant with today's standard.

Defects 3 and 4 are class 1 defects, i.e. the proportion of "failures" in the total number of defects amounts to more than 20 %. 75 % sprinklers of systems built up to 1965 did not comply with today's requirements. The high defect rate can to some extent be attributed to the specific design of individual sprinklers. Sprinklers that have an oversized deflector judging by today's design also imply a higher risk of so-called lodgements. In addition, some of these sprinklers which may be up to 90 years old also show a considerable level of external soiling and/or

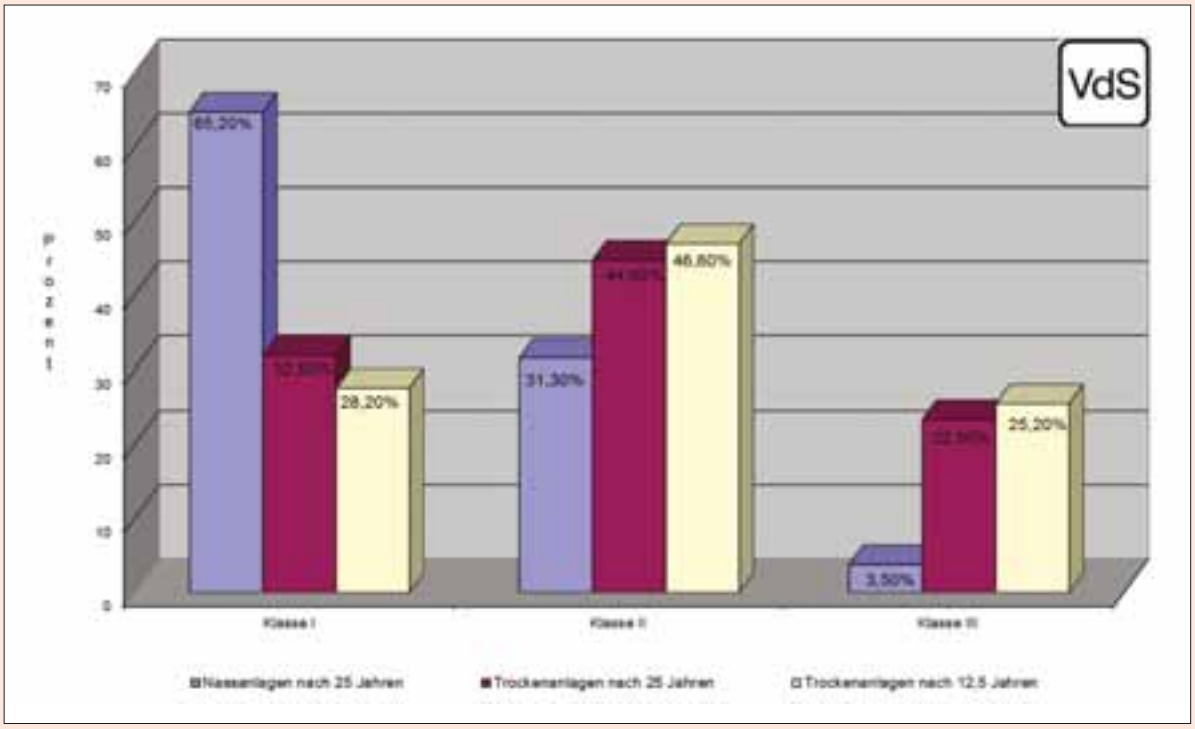

Figure 5: Evaluation of wet and dry systems 1998 until 2009

deposits inside the sprinkler nozzle. Another reason for adhesive deposits inside the sprinkler nozzles of older sprinklers is the sealant applied in former times – wax-like viscous material used to seal the sprinkler nozzle whose texture changed over time.

The reason why defect quotas declined as from c. 1970 is more than likely due to design improvements introduced by manufacturers.

In line with the current relevant VdS Guidelines all old sprinklers should be replaced by new approved types of sprinklers after 50 years at the latest.

4 Damage caused by external influence

Damage on components of sprinkler systems caused by external influences often becomes manifest before the 25/12.5 year inspection interval expires. Such influences include chemical, thermal and mechanical impacts.

Corrosive gases and vapours in particular may cause substantial damage on the piping or the sprinklers after only a short time. Corrosion damage on the piping becomes apparent due to blistering and/or leakage in a more progressed state.

The function of the sprinkler systems is particularly jeopardised if the system's response is obstructed by corrosion processes, e.g. sweating of the fusible link.
The sprinkler system's age is generally irrelevant for damage caused by mechanical impacts.

5 Conclusion

The sprinkler inspections conducted after 25/12.5 years arrived at the following conclusions.

In general, the pipe systems of dry systems are in a better shape than those of wet systems.

Defects are found only rarely in dry systems as shown by the results of the previous chapters. More than half of the groups inspected did not bring about any complaints. Once the oxygen in the water is consumed by corrosion, an equilibrium is achieved and corrosion no longer progresses. This equilibrium can only be influenced by oxygen supply, e.g. by frequent change of water. Normally, the influence on wet systems is so minor that corrosion problems only occur in few cases. These could mainly be found in the sprinkler equipment room, the distributor pipes or the mains downstream of the alarm valves. In case of multi-storey buildings, incrustations can increasingly be found on the top floors. This can be attributed to air being trapped during the filling of the group. Therefore, impacts on the effectiveness of wet systems should only be expected in rare cases.

As the statistical overview has shown, damage to the piping is more often to be expected in case of dry systems, and may cause the system to fail. Solid deposits (caused by corrosion damage) reduce the diameter of pipes, which in turn decreases the water flow through the pipes. In addition, when the system responds, large portions of these deposits may come off, stick to the sprinkler and block it. Moreover, corrosion damage leads to leakage and failure of individual pipes in extreme cases.

Often, turbid (loose) deposits were found in the piping of dry systems which more than likely do not lead to system failure; however, they should be removed by thorough flushing to avoid any further damage.

Classification	Profile	Measures
No defect (I)	Corrosion and deposits of acceptable scope	Flushing and hydraulic pressure test on piping in line with directive
Medium defect (II)	Borderline corrosion	Recurrent test after 5 years or extended inspection
	Increased corrosion on individual pipes, e.g. mains	Replacement of individual pipes
	Borderline deposits	Hydraulic test or flushing up to branch pipes
Substantial defect (III)	Heavy corrosion and considerable deposits	Replacement of the entire piping system or individual sections

Table 4: Classification of defects

The reasons for the above damage to dry systems include the following:

- ❏ Inadequate gradient of pipes
- ❏ Pipes not drained and/or inadequate drainage facilities
- ❏ Poor pipe quality
- ❏ Poor water quality.

The large number of sprinkler inspections conducted at VdS laboratories demonstrated that the sprinklers of different systems are no longer functional. K factor reductions, lodgements or defective response no longer guarantee the functioning of an extinguishing system.

Fig. 6: Wax-like sealing material that has cured over the years

Ensuring operational reliability and functionality

Competent maintenance of SHEVs is imperative

AUTHOR: DIPL.-ING. ALWINE HARTWIG

Smoke and heat exhaust ventilation system in off condition

Smoke and heat exhaust ventilation systems shall be serviced once a year – this is what the relevant regulations stipulate. But what else is required by the regulations specifically? Who is qualified to carry out maintenance work? When is it allowed/ necessary to deviate from requirements?

Fire protection systems can only work properly if they are serviced regularly: this is true of smoke and heat exhaust ventilation systems as much as of sprinkler systems, fire detection and alarm or hold-open systems. Compared with elevators or cars, for instance, where an inspection would generally identify any functional problems right away, fire protection systems are often in stand-by mode for years (decades) in order to fulfill their design function only in the case of a fire. In case the system has been serviced improperly or not at all since its installation, the investment in such a fire protection system might have been wasted: the system does not respond properly or fails.

This is why proper maintenance is required from several points of view.

VdS CEA 4020 (Planning Guidelines for Installation of Smoke and Heat Exhaust Ventilation Systems) stipulates:

"Natural smoke and heat exhaust ventilation systems, smoke curtains, existing components, supply air openings as well as power supply lines and accessories shall be serviced and, if necessary, repaired in regular intervals, at least once a year in line with vendor specifications by a competent maintenance technician who checks their functionality and availability. Inspections, maintenance and repair measures shall be documented in an operations log (VdS 2257)."

DIN 18232-2 lays down similar requirements:

"Natural smoke and heat exhaust ventilation systems and their operating and control equipment, opening aggregates, power supply lines and their accessories shall be inspected for functionality and availability, serviced and, if necessary, repaired in line with vendor specifications, generally once a year."

Maintenance intervals

The relevant standards and guidelines all require annual maintenance. However, if necessary, the maintenance frequency has to be increased. This may in particular be necessary in buildings with a corrosive atmosphere or where increased dust and dirt loads can be expected, such as buildings in the chemical industry or waste management operations.

Example: In case a service engineer of a maintenance company finds that the hinges of a smoke and heat exhaust ventilation system (SHEV) are so corroded that opening is not possible or only with great difficulty, the operator shall not only have the hinges replaced but also increase the maintenance frequency. The objective of maintenance is to ensure functionality and availability of the SHEV at all times.

Extending maintenance intervals to every two or three years in case of less problematic buildings does not make sense either as buildings with a "normal" occupancy might also damage a SHEV, or the possibility of a change of occupancy cannot be ruled out.

What does a proper service look like?

DIN 31051 defines "maintenance as the combination of all technical and administrative management measures during a life cycle of a system or equipment to maintain its functionality or restore it so that the system/equipment can perform its intended function."

Maintenance is divided into four areas: inspection, maintenance, repair and improvement; to some extent, these may also be performed by the operator.

Inspection refers to a visual check of a system to determine the status of the SHEV at the very moment of inspection. Visual checks may also be carried out by qualified staff of the operator during a maintenance cycle. FVLR Guideline No. 8 of the specialist association Tageslicht und Rauchschutz e.V. (Daylight and Smoke Protection) as the umbrella association of German SHEV manufacturers recommends a visual inspection by a qualified person every six months. In any case, inspection is part of every maintenance. It includes:

❏ Visual inspection of the hand-held control unit: the display must indicate availability of the system.
❏ Visual check of the fire detection elements: are the glass bulbs of pneumatic SHEVs filled and is the liquid visible? Are all the smoke detectors of an electrical system (still) in place? Are the smoke detection elements easily accessible or have there been any structural modifications in the meantime (e.g. installation of pipes, lights and the like) that prevent smoke and heat from reaching the detector? Is any damage visible?
❏ Visual inspection of the control and actuation unit and/or the electro-mechanic actuator: is any obvious damage visible?
❏ Visual check of the control wires: is any damage, for instance caused by vehicles hitting them, visible? Are the control wires not disconnected?
❏ Visual inspection of the supply air and smoke ventilation openings: have there been any structural changes to the supply openings (blocked, cluttered, incrustations)? Have there been any modifications affecting the smoke ventilation openings that obstruct the free flow of flue gases, e.g. installation of new ventilation ducts or power lines in the area of the smoke ventilation openings? Is the "freedom of movement" for supply air and smoke removal facilities ensured? Background: a free cross section of flow must be provided.
❏ Visual checks of the power supply system: are problems or damage visible?

The purpose of an inspection by a qualified agent of the operator is not manipulation or actuation of the SHEV. Since smoke and heat exhaust ventilation systems must be restored to stand-by status after activation, the inspection must be done by a specialist maintenance company. The purpose of the inspection by the operator is to identify and report any obvious problems and/or damage to the maintenance company.

Only a qualified maintenance company is authorised to carry out repairs, that is, restore the system to its original status. It is also responsible for assessment of the overall condition of the system, that is

❏ whether structural changes have been made in the building or whether the size of the smoke compartments has been modified,
❏ whether occupancy of the building has changed since the last inspection (e.g. increased fire loads),
❏ whether the SHEV's effectiveness is compromised by fixtures or refurbishments,
❏ whether the smoke curtains and supply air openings in the building are (still) in place and functional.

In case these requirements are not fulfilled, the operator has to be notified or – if a company has been contracted – the components need to be repaired.

The maintenance company has the necessary expertise and theoretical background to recognise risks caused by a "change of occupancy". To this end, proper and complete documentation of the system is necessary.

Maintenance implies any preventive measures to maintain the specified condition; they shall be carried out by specialised maintenance companies. The maintenance technician checks the SHEV by way of actuation, he inspects the specified function and takes any action required to ensure the system's avail-

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ability in future as well; this includes cleaning, readjusting, lubricating, replacing. The measures in detail:

❏ Activate the function of the SHEV with the energy specified for a fire scenario and check. The system is actuated by

1. the hand-held control unit and in addition
2. in case of at least one unit for each roof respectively smoke compartment surface, activation of the automatic fire detection system. That is to say, the hand-held control unit shall be activated in every smoke compartment. In addition, a smoke and heat exhaust ventilation device shall be activated by breaking the glass bulb (for pneumatic devices) or discharging test gas (for electrical devices) in every smoke compartment. The device opens with the opening energy specified for the fire scenario. The relevant device shall be recorded in the operations log in order for the inspector to activate a different one the following year.

❏ Complete opening of the smoke and heat exhaust ventilation devices shall be checked, soiling to be removed (e.g. of the fire detection components) and the parts lubricated in line with vendor specifications.

❏ The SHEV devices are to be inspected from the roof of the building. Seals, screw connections and latches as well as any wind deflectors are to be inspected and, if need be, cleaned on every SHEV device. The maintenance technician is required to use the proper personal protective equipment (PPE) to climb on the roof.

❏ The power supply and transmission lines of the SHEV devices shall be inspected; in case CO_2 or N_2 tanks are used, the weight has to be checked, in case electrical energy is used, battery capacity as well as availability of energy supply upon failure of the mains supply shall be checked. Storage batteries are to be replaced every four years (date of manufacture) with OEM parts (VdS approval). In case any weight reductions are found during the check of the CO_2 or N_2 tanks, they must be exchanged.

❏ The electrical alarm devices shall be checked as follows: triggering of the detectors, functional test of the alarm devices and facilities, fault simulation to check for broken wire, short circuit. Failure of energy supply: the SHEV must work properly, that is to say that VdS-approved systems should not open automatically in case of any faults.

After the service, availability of the SHEV must be restored. Any consumables used (CO_2 cartridges, ...) shall be replaced by OEM parts.

In case any defects are found, they shall be remedied during the repair using only OEM parts for the relevant systems. These repair measures shall only be carried out by specialised maintenance companies.

Any measures taken must be documented in an operations log including the date and name of the maintenance technician (initials) to be able to track whether and when any changes/replacements have been made. Operations logs (e.g. VdS 2257) can be obtained from VdS Schadenverhütung.

Who is qualified to carry out maintenance?

Pursuant to the relevant guidelines, smoke and heat exhaust ventilation systems shall be serviced only by companies who are specialised in SHEV technology. However, there is no definition of a "specialised company" in the guidelines or standards. Who is qualified to work on such safety-related systems?

On the part of VdS, the matter is straightforward: only VdS-certified SHEV installers (in line with VdS 2133) or VdS-certified SHEV maintenance companies (in line VdS 3440) are qualified to service VdS systems which are defined as systems that can be subjected to actuarial assessment. Also, smoke and heat exhaust ventilation systems that have been installed in line with the relevant standards or other references should also be serviced by VdS-approved companies, if possible. This ensures that the required technical expertise and sufficient spare parts are available, which is regularly verified by VdS.

VdS recommends building owners to conclude maintenance contracts with approved installers or maintenance companies.

Summary

Like all fire protection systems, smoke and heat exhaust ventilation systems have to be serviced regularly. Proper and competent maintenance by a VdS-approved specialist company is the only way to ensure operational functionality and availability of a SHEV. If cut backs are made on maintenance, the SHEV itself is wasted.

References

VdS CEA 4020: Guidelines for Natural Smoke and Heat Exhaust Ventilation Systems (SHEVs); Planning and Installation

DIN 181232-2: Smoke and Heat Removal – Part 2: Natural Smoke Ventilation Systems; Calculation, Requirements and Installation

VdS 2257: Operations Log for Smoke and Heat Exhaust Ventilation Systems[1]

DIN 31051: Fundamentals of Maintenance

FVLR-08: Maintenance on Natural Smoke and Heat Exhaust Ventilation Systems (SHEVs)[1]

VdS 2133: Approval of Installers of Smoke and Heat Exhaust Ventilation Systems[1]

VdS 3440: Approval of Maintenance Companies for Smoke and Heat Exhaust Ventilation Systems[1]

[1] Note by the translator: This is not the official title of the standard.

Move towards open standards will stimulate innovation

Changes of today shaping the security industry of tomorrow

AUTHORS: MICHAEL LÜTZELER, SERGE MUELLER

In a few years, the population of the world will have grown by 20% and, the earth will be home to nearly eight billion people. More than half of the earth's population already lives in cities, and the trend towards urbanization is accelerating. These changes will, of course, impact on the things on which society depends: mobility, telecommunications, energy – and security.

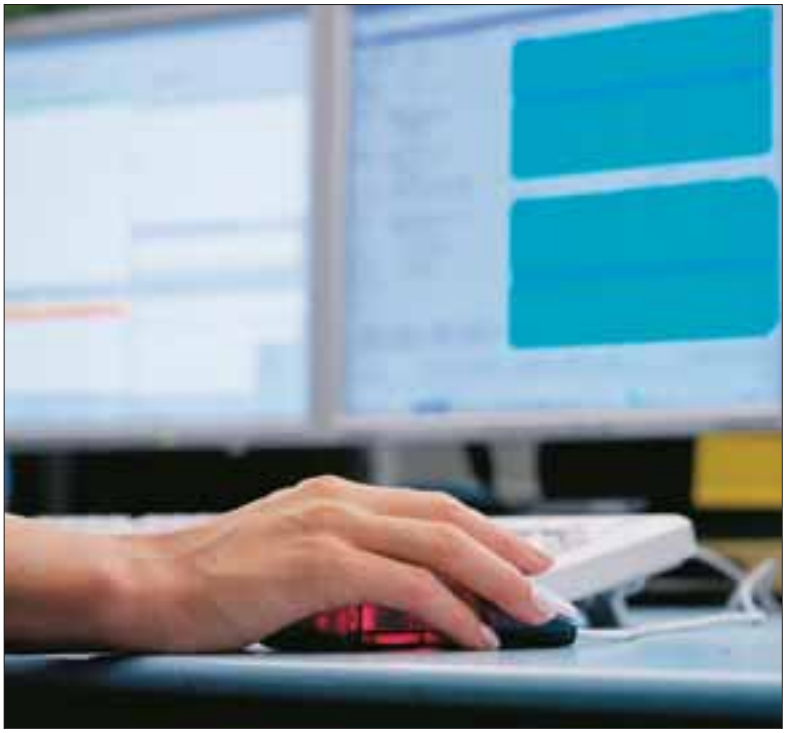
Partnership is key to offer customizable solutions

Security is already one of the most fundamental aspects of all our lives. It is important to every person and every business large or small, public or private. Siemens is aware of the different threats and the security industry has grown to meet the challenges of burglary, violence, robbery, theft and manipulation of data, acts of vandalism, sabotage and even terrorism. But security providers need to consider the protection of digital information and intellectual property because, as the risks continue to change, companies are looking for comprehensive security that ensures business continuity. Such solutions are influenced by progress in the IT sector. The rapid pace of technological development in areas such as digital image processing, biometrics, data transmission and location technology is already making genuinely "integrated" security solutions possible.

Integration and flexibility

Integration and flexibility are key in facing today's security challenges. The integration of multiple security disciplines – access control, video surveillance and intrusion detection – on one platform is already possible, providing the obvious benefits of continuous situational awareness along with centralized management and alarm handling. It enhances overall security and allows cross-functional capabilities. With video surveillance providing visual verification, security personnel can check via video-stream if there is fire, intrusion or any other unwelcome activity. Access-controlled doors can be linked to cameras and live video-streams provided to verify identification and recorded images tagged to specific doors for evidential purposes. But as well as the interoperability of security disciplines, there exists the possibility of integrating security with building automation systems. For instance, occupancy-based control – of lighting, heating and air-conditioning systems – can be employed through access and video events, thus reducing a building's operating costs and improving environmental efficiency.

As far as customers are concerned, a growing awareness of what is now



Siemens are working towards open standards and global interoperability

possible thanks to developments in digital technology, has prompted a demand for enhanced functionality of systems, with individuality and flexibility at the forefront of those demands, followed closely by customer-specific solutions and "intelligent" systems. As customers also become aware of the industry-led drive for open standards within video technology, the clamour for open standards is likely to grow. By choosing a system from a single manufacturer, customers are often currently "locked" into that manufacturer's service and pricing. But, with field devices increasingly seen as commodity products, the concept of singular "proprietary" systems will soon be a thing of the past.

Open standards and global interoperability

Michael Lützeler, Innovation Manager of Siemens Building Technologies Division, says: "Within Siemens Building Technologies Division, we believe that the potential of today's security technologies will be fully realized only with compatibility between different brands. We are working towards open standards and global interoperability – for network video devices in the first instance with the Open Network Video Interface Forum (ONVIF). Siemens was the first systems integrator to become a full member of ONVIF and, as such, is able to offer a different perspective, helping to set goals from the integrators' point of view – with a closer understanding of the end-users' current needs and future requirements. But it is our declared intention to expand the quest for open standards into other security disciplines, with access control being the next one," he stated.

Open standards would bring benefits to integrators, manufacturers and end-users alike. The benefits to the end-user alone – such as ease of use, flexibility in product selection and confidence that the chosen system will be future-proofed – are numerous and critical to the growth of the market. As a leading provider of security solutions worldwide, Siemens is putting significant development activities on the Siveillance software platforms in order to offer best fitting solutions to customers' security challenges. But, to offer the complete solution for which customers are looking, it is necessary to cooperate with external product suppliers as long-term partners in order to meet the high standards demands.

In 2009, after extensive evaluation of possible suppliers and the offering, Siemens announced the signing of a strategic supplier agreement in video surveillance with Bosch Security Systems, where they are supplying a comprehensive video portfolio focusing on imaging and recording devices in the European, Middle Eastern, African and American markets.

Serge Mueller, Head Partner Portfolio Management, Siemens, comments: "We entered into an intense relationship and finalized the first wave of deeply integrated Bosch products into our offering to customers. After only a few months, we already saw the benefits of the strategic partnership. Leveraging the strengths and technical competence of Bosch's video product portfolio combined with our integration expertise, we can offer an even more comprehensive solution based on our current Siveillance portfolio. Bosch's worldwide reach and support ensures that all products comply with local standards and regulations. After an intense introduction period following the announcement, their video product portfolio now fits and works well within various platforms such as the Siemens access control system, our security management station Siveillance Fusion and Siveillance SiteIQ, providing situational awareness for wide-area perimeter protection typically of seaports, airports, oil, gas, water and electricity suppliers as well as other similar industrial and commercial facilities."

Mr. Mueller continues: "We are also working with Bosch on 'out of the ordinary' collaborations, looking into options to further enhance functionality by elevating integration to a level that would not be possible in a regular supplier relationship. As a result, we are in very close contact on all levels, particularly regarding the exchange of information between the two development groups. This will allow us make full use of the features of the various Bosch products. However, our cooperation with Bosch is not exclusive. We have a long-term strategy to collaborate in other fields of security technology, by fostering alliances, some with partners with wider coverage of our portfolio needs and some offering specific

'niche' cover – with partners having specialized technologies or with specific strengths, for example. Within Partner Portfolio Managements, our challenge is to ensure that our product needs are fully covered by the portfolios of a limited number of partners. This will result in less integration effort and ensure maximum business for our partners, making our ongoing partnership an attractive proposition. This is the way forward for us and also probably for other manufacturers and integrators in the market."

"By conducting this kind of partnerships, as a system integrator, we are able to focus on own platform developments and the partners supplying us can concentrate on developing and providing the best-fitting product technology. With each partner having a clear focus within the partnership, the customer gets the customized solution they are looking for, along with optimum performance and functionality," Mr. Mueller concluded.

Integrated solutions

As for the future, Siemens sees the next likely step as supplying solutions in the area of physical and IT security. Because business processes depend highly on functioning information technology, IT infrastructure is generally protected to a high level from data theft. With the integration to a physical security solution, this level can even be increased. Further, measures against theft of a device or sabotage, are often inadequate. Security systems typically do not yet readily facilitate an exchange of data with IT security to a deep level. Such integration is of great advantage though. For example, an access to a user account will only be allowed once the authorized person is identified as being in the office by the access control system. In fact, IT security and physical technologies both increasingly use the same or similar resources and often run on the same IP network infrastructure. In terms of optimizing risk management, it is possible to link security systems in these two areas. At Security 2010 in Essen, Siemens introduced an integrated solution to link physical security and IT system for the first time, under the name "Siveillance Netwatch".

The security industry today is changing as manufacturers and integrators all compete to implement recent technological innovations into their products and systems. Developments such as the shift from analogue to digital and the introduction of IP technology, have had their effect on the product ranges and security systems that are now commonplace. But it is the way the industry is working today that will have the most profound effect on how it meets the challenges of the future. The move towards open standards itself is expected to stimulate another surge in innovation; the move away from single-brand reliance of systems and the new mood for collaboration, can only lead to an new era of possibility and opportunity.

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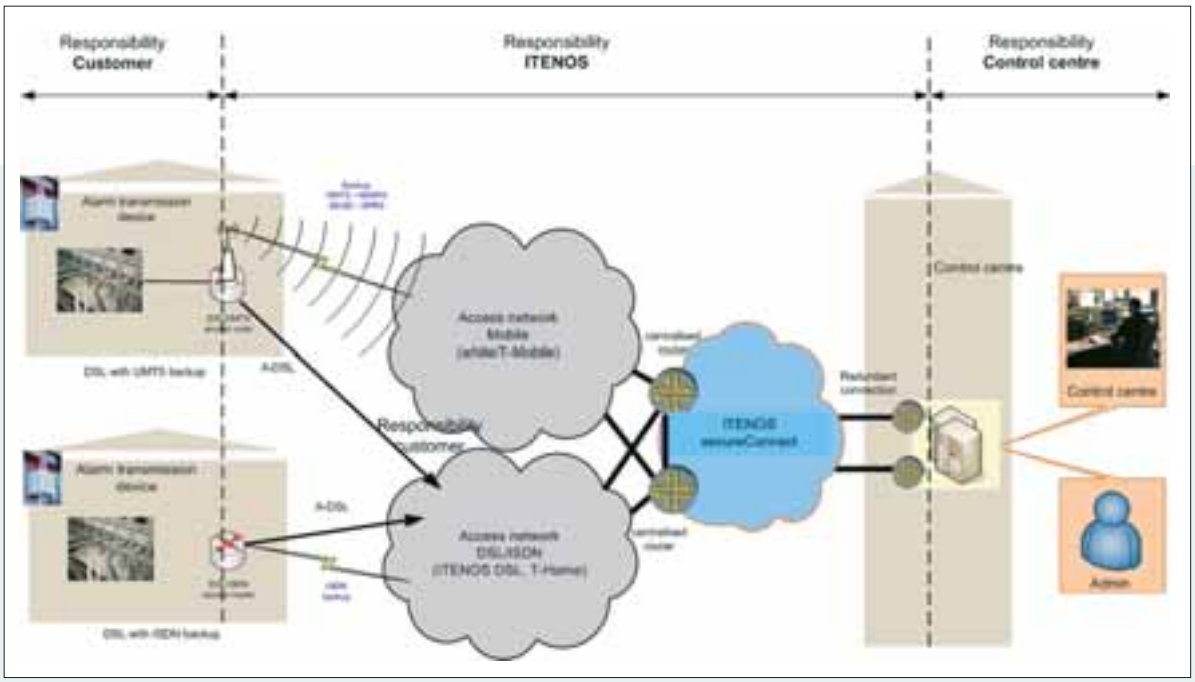
Independent of the Internet and efficient

Autonomous alarm networks boast great added value

AUTHOR: ANNE HORSTEN



Overview of alarm network

The IP transmission protocol which has become indispensible for many business and private applications is now also becoming increasingly established for alarm networks. Nevertheless, according to ITENOS, a company specialised in IT and telco security, users of solutions implemented should keep cool. The IT security provider has a package solution based on an autonomous network for potential IP churners in store. The Internet is left out – which offers considerable benefits.

In terms of IT and telco security, ITENOS GmbH who is linked to Deutsche Telekom is an accomplished partner for solutions. The company which has been operating for 17 years and employs 165 people has established a solution module called "Secure Connect" for secure data lines specially. This part of the security specialists' portfolio offers connection and networking of alarm systems.

ITENOS sees itself as a package provider, one-stop-shopping for concept development, implementation as well as individual operation of the network infrastructure in the context of alarm systems.

ITENOS attends to companies who want to continue to operate solutions implemented as well as potential churners who are heading for IP.

Martin Klimmasch, Account Manager Connect Services at ITENOS who is an expert for IT and telco security and alarm networks with approximately twelve years of experience recommends not to take any overhasty action in view of the IP trend: "Thanks to great bandwidth, diver-

sity of possible applications and availability, IP will be the transmission medium of the future, including alarm systems as well. Nevertheless, companies with other solutions implemented such as Datex P (X.31) who are satisfied with their choice and want to continue to use it also need to make provisions to preserve their status quo. They can be confident that they will be on the safe side for a number of years to come with their current systems, and that we will inform them about the IT world in due course and help them to migrate. There is no urgent need for migrating soon as long as the non-IP solution implemented can still be applied for the time being."

The Internet is left out

The security specialists offer an autonomous IP-based security network (Secure Connect) to companies that opt for an IP-based solution. Its highlight – the network uses inexpensive network access on the basis of DSL or mobile connections (UMTS/GPRS) without integrating the world wide web with all its uncertainties. The customer gets an autonomous network, virtually his own Internet which meets the highest security standards and performance requirements. "Our security network uses inexpensive DSL connections like those every Internet user already has and the access tools are programmable just like the Web connection", explains Klimmasch, "however, our IP-based solutions differ from the web-based option, offering considerable benefit since they simplify the entire alarm sector – in terms of handling, predictability of data traffic and security. Security is defined as the combination of availability, integrity and authenticity."

According to Klimmasch, integrity and authenticity can also be achieved by simple encryption and tunnelling in the public Internet, but the third crucial factor availability becomes the "spoilsport". Availability cannot be guaranteed with the Internet as paths and utilisation are not being controlled.

The pitfalls common for web-based alarm systems such as false alarms resulting from connections lost, long packet transmission times or bottlenecks in bandwidth caused by insecure transmission paths are reduced by the autonomous alarm network or they are converted to secure connections based on DSL as well as mobile communication.

Moreover, web-based security solutions are always "reactive" – that is, they react to a real attack e.g. by a virus scan update. Security only lasts until the next new virus attack. "Potential attackers are generally always one step ahead", explains Klimmasch. "The autonomous alarm network, however, generally rules out the possibility of this shortcoming since it is neither accessible nor visible on the Internet."

Network management from A to Z

Secure Connect allows for data exchange on the basis of a secure and efficient IP-based network solution. There is no need for the client to invest in a network infrastructure of his own. ITENOS provides a scalable solution for a continuously monitored network– from control room router, covering the entire network and DSL platform to the alarm system router. Klimmasch elaborates, "we separate network surveillance of objects from the alarm receiving and service centre (ARSC) and incorporate it into our network management. We relieve the ARSC in terms of all the handling and monitor all components centrally, including technical support 24/7. This way, we take the load off our clients who are able to focus on their core business, which is receiving and processing alarms."

In addition, ITENOS' solution relies on a consistent back-up concept via mobile communication. After all, you are well advised to be on the safe side in such a highly sensitive sector as surveillance of buildings. Klimmasch says, "we intercept the mobile back-up paths upon entry to our platform rather than in the ARSC. This means that it does not make any difference for our network and hence for our ARSC whether an alarm system dials in via the primary path (DSL) or the back-up path (mobile communication). The benefit for the ARSC is that it does not have to provide and operate any receiver equipment for the back-up path. We are also able to intercept false alarms caused by lost connections since our specialists in the network management centre are able to monitor the connection paths 24/7."

M. Klimmasch, Account Manager Connect Services at ITENOS

Another crucial aspect of Secure Connect is the fact that it received a top certificate for transmission paths from VdS Schadenverhütung (VdS 2471 Class C), which is another benefit for the ARSC operator as he does not have to work on that.

Bank alarms "speak" IP

Secure Connect has already proven its benefits in the field. Niscayah, the largest provider of security technology in Germany who is independent of any vendors and is a global player for high-level security solutions is one of the users of ITENOS' solution. Niscayah operates, among other things, ARSC for banks. In order to "ultimately" meet the demands of these clients, Niscayah opted for Secure Connect. One of the reasons was that ITENOS is able to provide service packages.

Niscayah's intention had been to account for the changing needs of credit institutes – away from sending simple alarm messages, towards video transmissions in this environ-

ment. Moreover, Niscayah thought it was about time to harmonise alarm systems with the energy and building technology that was already using IP.

Jörg Frey, Head of Sales Bank Security at Niscayah, puts it in a nutshell: "IP is the technical basis of the future. Stability and highest security standards are taken for granted. Since we at Niscayah do not only want to provide mere network services, we teamed up with ITENOS to go one step further, fine-tuning the solution with our services to create our NIS Net which includes the necessary hardware and all services related to the network, offering clients a holistic solution."

With the support of Secure Connect and its services, Niscayah is now able to provide a state-of-the-art security network to its clients. This security network which is supplemented by Niscayah services is rather unique in the security industry. Thus, Niscayah installed video management systems in all branches of a bank from the South of Germany that operates nationwide. They had been using X.31 connections with ISDN transmission paths. The ARSC operator did not have to invest in his own network infrastructure since ITENOS provided just that.

Niscayah's client profits from an alarm network with DSL and IP technology including a bandwidth of 2 MBit/s downstream and 348 kBit/s upstream. The client now has the opportunity to actuate any branch from his central ARSC, to switch to the cameras installed on site in case of an overhaul or alarm and analyse images and/or video recordings.

In the meantime, alarm image transmission to Niscayah has been enabled, transferring video recordings from the client's branches to the Security Operation Centre of Niscayah in Frankfurt am Main.

In case an alarm is triggered, Niscayah can log into the client's network, retrieve the video data and check the situation to take immediate action, if necessary. The broadband DSL connections allow for this swift process and ensure high quality of images.

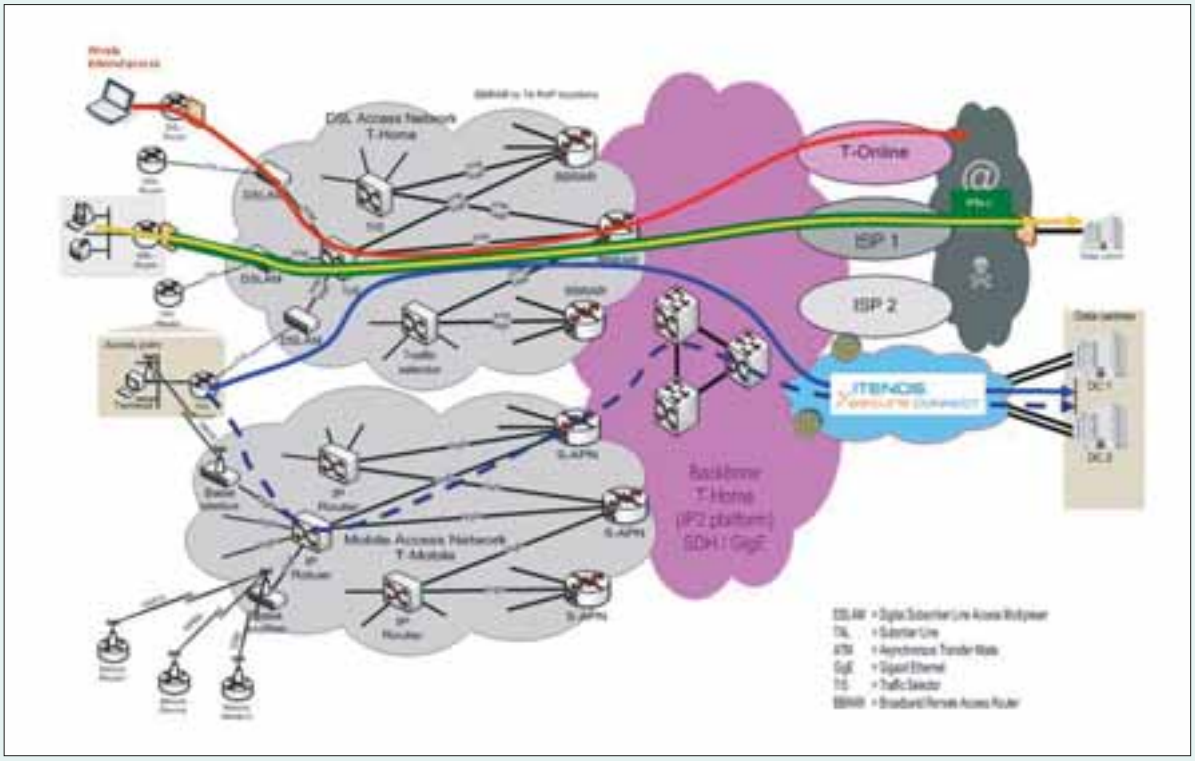
Security par excellence

The bank that uses Secure Connect's solution has now reached the peak of security thanks to VdS certification.

The system proved its effectiveness in the field not least thanks to an integrated fall-back solution which immediately switches to ISDN or UMTS in case of a DSL failure.

Frey's satisfied summary: "I could have bought cheaper connections almost anywhere. However, I was looking for top quality and freedom from interference elimination provided by a partner who was able to commit to that." If nothing else, he was persuaded by the fact that ITENOS created a package solution that also keeps costs under control. This way, Niscayah is able to offer Secure Connect to its clients for a fair price – hence, a win-win situation for all parties involved.

Internet-free alarm transmission, overview



Longstanding Director of VdS' Business Unit Security passed away

Reinhard Conrads went much too early ...

At this point, the editorial team of s+s report has to perform a sad duty and inform its readers of Reinhard Conrad passing away. On 5 December 2010, Dipl. Ing. Reinhard Conrads died at age 59 after a long illness.

His mission – to advance VdS laboratories

After his 1974 graduation in electrical engineering, Reinhard Conrads was first employed by the association of property insurers (Verband der Sachversicherer e.V.) which was the legal predecessor of today's VdS Schadenverhütung GmbH. Initially, he was working as a test engineer for intruder alarm systems at VdS' laboratories; as early as 1978, he became deputy head of the laboratories. He kept working tirelessly on advancing the laboratories whose service portfolio could be considerably extended not least thanks to Reinhard Conrads' commitment and ingenuity.

Commitment to every job: Reinhard Conrads working with his colleagues who are directors of business units at VdS

Reinhard Conrads who is well-known to our readers from his numerous articles in this journal passed away in December 2010

Important milestones in his career at VdS

In 1993, Reinhard Conrads was appointed deputy head of VdS laboratories, and in 1994, he became the head of VdS' certification body. In early 2002, he was given power of attorney and was appointed director of VdS' Business Unit Security.

International commitment

Due to health problems, Reinhard Conrads transferred this responsibility to his successor Thomas Urban in summer 2008; as from this time, he was in charge of European & International Affairs, a post that was tailor-made for him thanks to his international experience and excellent command of foreign languages.

Aside from his achievements for our organisation, he also contributed extensive knowledge and advice to numerous national and European bodies and committees for standardisation and the insurance industry with great success.

We shall always treasure and honour his memory. Our heartfelt sympathy goes to his family.

Test scenarios with conflicting priorities and possible solutions

Reproducibility versus practical relevance?

AUTHOR: DIPL.-WIRTSCHAFTSJURIST (FH) SEBASTIAN BROSE

Drilling test on a lock cylinder in line with VdS Guidelines

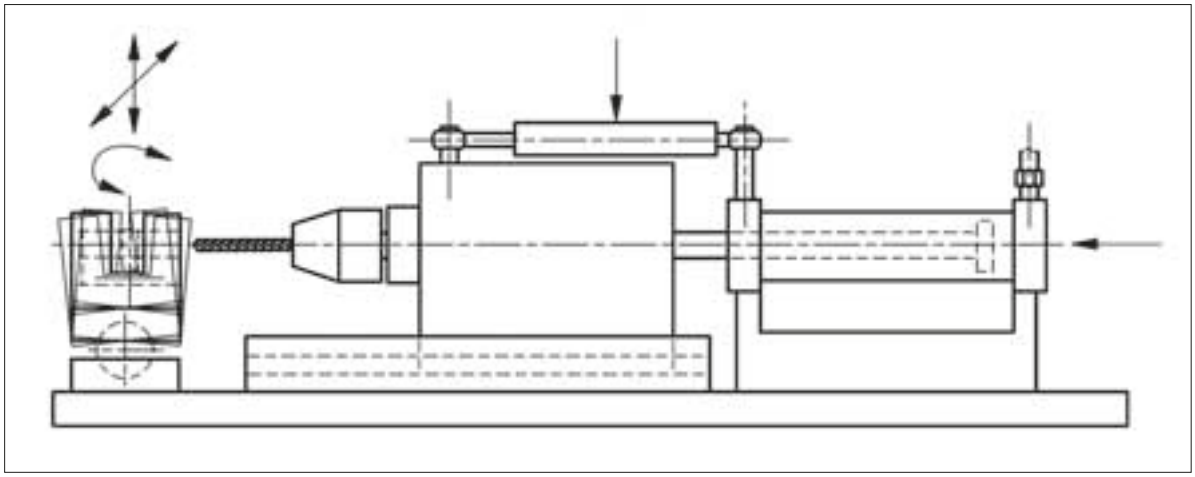
Introduction

Product certifications are based on test reports compiled by an accredited laboratory. The fundamental task of a test is to obtain readings (actual results) and document these in comparison with the readings required (targets). If the readings are within a specified tolerance and if they are plausible, the relevant product is considered to have passed the test. The certification institute then has to decide whether a certificate will be issued, which may depend upon compliance with other requirements, e.g. the existence of a quality management system at the vendor or a vendor declaration, for instance, confirming the number of locking differences in a series of lock cylinders for example.

There are many different measured parameters and processes in the context of the test. Verifying whether the dimensions of a lock cylinder are within the specifications defined by a standard or whether the output voltage in an electronic lock cylinder meets a defined parameter is fairly straightforward. By contrast, VdS Schadenverhütung's range of tasks also includes, for instance, manual tests of the burglar resistance of lock cylinders as well as façade elements or security containers. Speaking of the example of a lock cylinder, the following section will describe how the resistance against cutting attacks (attempts at drilling) is tested. While the quality of measuring results can be considerably streamlined through calibration of measuring instruments for validation of basic requirements (e.g. dimensional accuracy), certain test methods need different, additional means firstly, to achieve a consistent measurement quality in a test laboratory and secondly, to minimise differences between various laboratories.

Let us remain with the example of lock cylinders. In the course of the so-called drilling test, a drill is used to manipulate the cylinder in such a way that it can be opened without a key. For instance, drilling on the parting plane between cylinder cone and cylinder body could sever the pins and release the cone for turning. In order to prevent this, in general one (or more) protective pin(s) to prevent drilling are inserted.

The authors of the relevant standards on profile cylinders for door locks DIN 18252 and/or DIN EN 1303 considered how to standardise the drilling test. The test carried out in line with DIN respectively EN therefore envisages a drill (700 W ± 10 %, 500 - 800 revs/min) mounted to a slide on-axis and hydraulically operated is applied with a "maximum



Standardised test array for the drilling test on lock cylinders (Figure C.2 from DIN EN 1303:2005)

force of 300 N ± 5 %" to a spot of the cylinder defined by the test institute. Three high-speed steel drills (also known as HSS drills) of different sizes shall be used at the most.

Standardisation above all?

This test ensures a high degree of reproducibility. Thanks to the on-axis guide of the drill and precise specifications for the pressure to be applied etc., the test is nearly always carried out identically. Unfortunately, this does not consider the fact that the "common burglar" has been successfully defying any attempts at standardisation. Neither does he select tools that have been subject to standardised tool kits nor does he proceed along the lines of a standardised test. With reference to the lock cylinder this means that a drilling maschine as specified by the standard is hardly used in the field any more. Simple models for less than EUR 40.00 have a better performance and higher speed. To make matters worse, a burglar would never drill precisely axially. Every DIY enthusiast knows how easily a drill is distorted or deflects when it hits something hard. That is exactly what is going to happen to a burglar when he drills manually without a guide and hits a protective pin. While a drilling device mounted on and guided by a slide would wear out three drills almost immediately, a burglar would simply drill around the pin. Not to mention the fact that he would not necessarily use a comparatively soft HSS drill but a car-bide-tipped one instead.

True to the objective of not attempting to standardise the perpetrator but to adapt the standard to the perpetrator, VdS specified, among other things, a practice-oriented test in its standard on lock cylinders VdS 2156. A drill with a nominal speed of max. 1,000 W with a maximum of 3,000 revs/min. is used for the test. Moreover, and this is critical, the drill is hand-operated, and carbide-tipped drills may also be used. When the drill is hand-operated, one has to accept that reproducibility of the test depends to a large extent on the skill and experience of the test inspector.

As we have seen, a large degree of standardisation may cause test conditions to become incompatible with field practice. On the other hand, a practically relevant test is more difficult to reproduce. Hence, two aspects have to be accommodated: on the one hand, a maximum level of reproducibility and on the other hand, the best possible imitation of criminal methods. Different methods can be applied to achieve this goal.

Learning from each other

So-called witness audits are one option. They may be carried out in-house or across different institutions. During a witness audit, an auditor and/or inspector carries out an audit or test while one or several other auditors or inspectors are watching. The inspectors learn from one another by watching and cross-checking, and during the subsequent debriefing (feedback session), they may explore where they see discrepancies and how they intend to make adjustments. It may also help to highlight pros and cons of certain test methods. Such audits are often carried out to ensure standardised in-house testing in an institute. The costs of witness audits are comparatively reasonable, and they require little preparation and/or organisation. Consent of the organisation audited is required however.

Round robin tests

So-called round robin tests are another option. The term "round robin" is also used in sports where it means that each contestant is matched in turn with every other contestant.

Round robin tests are also common in quality assurance where they are also called proficiency test; in German, the term "Ringversuch" has become established. The method is associated with external quality assurance. To be precise, the primary purpose of this test is to ascertain deviations rather than compliance, though the measurement results are used to draw the relevant conclusions on compliance.

Round robin tests in standards

DIN ISO 5725 on "Accuracy (trueness and precision) of measurement methods and results – Part 1: General principles and terms" defines a round robin test as "a test that explores the capabilities of every laboratory using a standardised measurement method and identical ma-

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terials." Hence, round robin tests would have the following characteristics:

- ❏ 1. Several laboratories are involved.
- ❏ 2. A standardised measurement method is applied.
- ❏ 3. Identical materials are examined.
- ❏ 4. The capabilities of every laboratory are to be explored.

The first characteristic of a round robin test is involvement of several laboratories. As opposed to witness audits which conduct one test only with several auditors watching, a round robin consists of several tests. This becomes evident from the definition which stipulates that the capabilities of every laboratory shall be explored. The head of the round robin selects the laboratories involved. The head may be a superordinate institution or a laboratory involved itself – in effect, as a first among equals. In case there are too many laboratories that want to participate, it is necessary to make a choice which should be as random as possible, thus corresponding to a statistical average. On no account should laboratories be selected only on the basis of their state-of-the-art equipment or left out because they are less familiar with the tests.

As the purpose of the standard is to evaluate the capabilities of a laboratory, standardised methods shall be applied or else there would be a risk of too many variables and unidentified correlations leading to the wrong conclusions. If the fourth characteristic would be changed and the purpose would be to explore the quality of a measurement method instead, of course, different methods would have to be applied. However, the uniform capabilities (within the specified requirements) of the laboratories involved would have had to be ascertained beforehand. Although this would not have been a round robin test in the spirit of the standard, the term round robin would still be used colloquially.

Attempt at manually breaking open a security container at the VdS laboratories

Item 3 is of special importance as this requirement cannot always be met. In the area of non-destructive testing, for instance, chemical analysis of a liquid, the test is organised in such a way that a sufficient quantity of a liquid is produced and bottled, and the laboratories participating may extract some liquid for their tests one by one using a standardised process (!). It is easy to see some fuzziness in this approach as well, and the true identity of the materials may be difficult to ascertain. In more simple terms: Was the liquid shaken or stirred properly?

If destructive tests are to be carried out on the materials, which is generally the case for lock cylinders and security containers, identity of materials cannot be absolutely guaranteed. In order to minimise deviations of individual products during the production process (as required) quality assurance processes such as Six Sigma or a quality management system in line with ISO 9001 must be in place. In that case, the general assumption is that all lock cylinders of a production series are approximately identical with a view to the properties to be tested.

The capabilities of a laboratory

The standard specifies the capabilities of a lab in the sense of its accuracy which consists of its trueness and precision (see figure on the top right).

Pursuant to DIN ISO 5725-1, Para. 3.7., accuracy refers to the "degree of approximation between a mean value obtained from a large series of test results and a specified reference." Trueness is generally indicated by a systematic deviation. Determination of trueness requires simultaneous or prior determination of precision.

Precision describes "the degree of mutual approximation between independent test results obtained under specified conditions" (DIN ISO 5725-1, Para. 3.12). Generally, precision is indicated by the degree of im-

precision of a series of measurements: the standard deviation of the measurement results is determined.

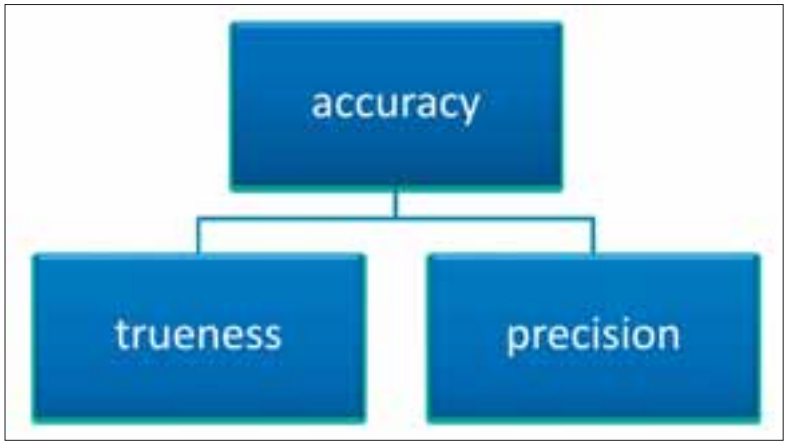
Round robin tests do not only provide columns of readings and statistical data; the results of a round robin often allow for conclusions on the applicability of a certain measurement method. In case the series of measurements show considerable variations – be it in one laboratory or in particular between different labs – this may be an indication for the measurement method to be insufficiently specified or standardised.

Example: Security containers

One of the main elements of tests on security containers is an attempt at breaking them open manually. In this process, so-called tool coefficients are attributed to the tools approved; in combination with the time the tool is used and a relevant base value, they are used to calculate so-called Resistance Units (RU), which in turn are the basis for classification of the relevant resistance grade. The objective is to open the container using the optimum combination of tools which means the combination that successfully opens the container with the least possible resistance units.

Round robin tests at EFSG

EFSG (European Fire and Security Group) is an association of prestigious European certification institutes with their associated test laboratories for the sectors of fire protection and security technology. Its members concluded additional product-related multilateral agreements for mutual recognition of test results and certifications, which helps manufacturers to avoid duplication of extensive tests in different countries and/or make them more efficient to serve as a basis for certification. The English term used for this process "one-stop-testing – multiple-certification" highlights these benefits. In order for test results to be mutually recognized, it is necessary that all members share the same interpretation of a standard and are able to conduct the test on a consistently high level. In order to align test methods and results, EFSG members conducted various tests in 2009 which could be considered as round robin tests; their purpose was to align the results of the different test institutes.

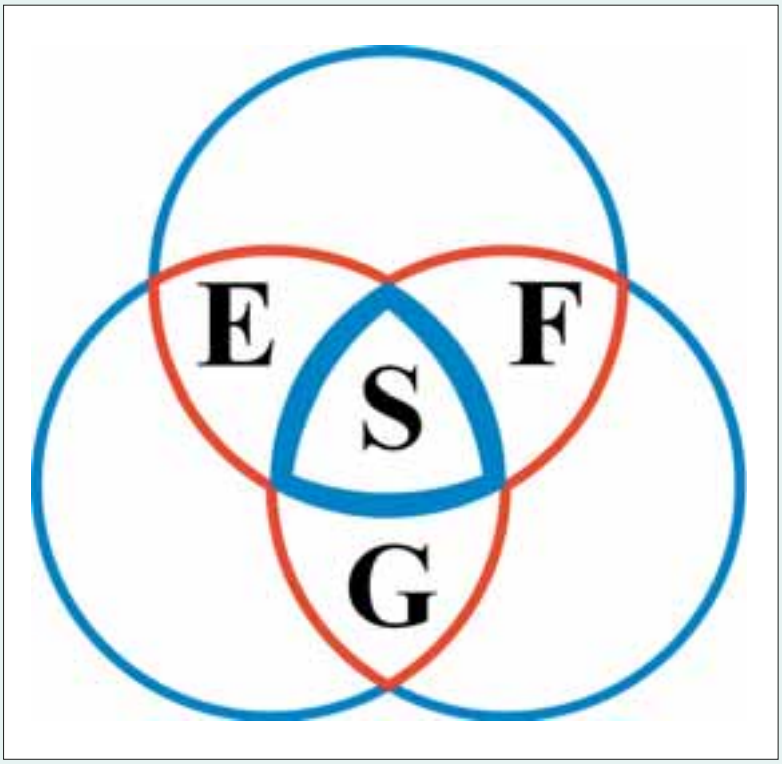


The accuracy of a laboratory consists of its trueness and precision

The test series basically consisted of two phases. For this purpose, standardized samples of stainless steel sheets were produced and sent to the members. During phase 1, the stainless steel sheets were cut with the cutting torches available at the relevant test institutes. They determined how much time was required to make a cut of a specified length in the sheet. Subsequently, they compiled and evaluated the results. Following that, all EFSG test institutes purchased identical cutting torches for phase 2 of the test series. Again, standardised samples of stainless steel sheets were produced and sent out. Now, the institutes had identical tools to cut the stainless steel sheets; again, they determined how long it took to make cuts of specified lengths.

These and similar measures are regularly carried out in the context of EFSG to ensure that even in case of manual and barely standardised tests, the levels of different institutes are harmonised to a maximum extent to make tests comparable.

This illustrates that selection of certified products should not only be based on the certification class declared but also the certification institute that tested it.



Logo of the European Fire and Security Group, EFSG

It's all over town – nobody at home, rob me!

Subscribing to Twitter, Facebook & Co increases risk of burglary

AUTHOR: DIPL.-WIRTSCHAFTSJURIST (FH) SEBASTIAN BROSE

"Just enjoying a cup of coffee before I'm off to the cinema with friends" – burglars also like to read comments like this

Publishing one's current whereabouts is becoming increasingly popular thanks to a growing use of mobile web-enabled telecommunication devices and the appeal of web-based social networks. Unfortunately, criminals are also making use of this source of information, significantly increasing the risk of burglaries, which has prompted UK insurance companies to raise premiums.

Following "Foursquare" and "Gowalla", Facebook, the social networking giant, has now launched its own localisation service called "Places". This function which will simply be called "Orte" in Germany is first available in the United States, though its launch on European platforms is only a matter of time. It works as follows:

Facebook users may update their profile with the latest details on their whereabouts through their mobile internet access. Members who do not have mobile access may be checked-in by a friend. This is a fast and straightforward way to determine the whereabouts of anybody. The objective of this function is to get an idea of which (digital) friend is close by at the moment. If a user finds e.g. that a friend is having a cup of coffee round the corner, he/she may go and see the friend – or go to another coffee shop. Moreover, it is possible to call up ratings or recommendations on the current location, such as e.g. restaurant or shopping information.

Checking-in or determining/transferring details on the current location can be done manually or automatically. Automatic tracking can be done by way of a GPS module built into the mobile phone, Blackberry®, PDA etc. It can also be done by way of charted WIFI networks. Moreover, the current position can be determined with the aid of the radio cell on the basis of signal strengths.

While "Foursquare" and "Gowalla" are systems that were established specifically for the sake of tracking users, Facebook is a classical networking site where users may build a network of friends from all over the world, now using the "Places" tracking service as an additional perk.

"Big brother is watching you"

However, Facebook's "Places" service is only the most recent and prominent tip of the iceberg. Status information may also be published on

micro-blogging services such as Twitter or the various VZ communities in Germany like StudiVZ, MeinVZ etc. Moreover, "friendticker" has become the German counterpart to Gowalla and Foursquare.

A posted picture of a sunny beach in the Caribbean or a blog comment like "Off for two weeks now. Sunny regards from the Canary Islands!" may easily attract the wrong people. Announcing that you are going to watch soccer with friends just round the corner from you is a detail which may not only be interesting to friends. What makes matters worse is the fact that it is not exactly difficult to find out the user's address. Moreover, many mobile phones and cameras feature a built-in GPS receiver that saves the geo-coordinates of the place where a photo or video has been shot in its meta data.

In case these files are posted online, automatic data evaluation becomes a piece of cake. The time stamp on the photo makes it possible to determine how long ago it was taken. The geo-coordinates help to determine where the photo or video has been shot and how far that is from the apartment or house.

Please rob me!

Meanwhile, a new internet service has become established which has the peculiar name "pleaserobme.com"; it matches seemingly harmless comments from Twitter with the coordinates from Foursquare among others and marks currently uninhabited places on an interactive map. This prompted insurance companies in the UK to charge a ten per cent mark-up on household contents insurance premiums from users of the relevant social networks.

Though "pleaserobme.com" has now been discontinued, it does not mean that the risk has been averted. The most recent attempt by Facebook underlines the graveness of these tendencies.

No social networking then?

Despite all risks, subscription to social networks also bears a number of benefits. Nobody needs to unsubscribe. What matters though, is to think about what kind of information should be posted, how and when to post it and most importantly who should have access to it.

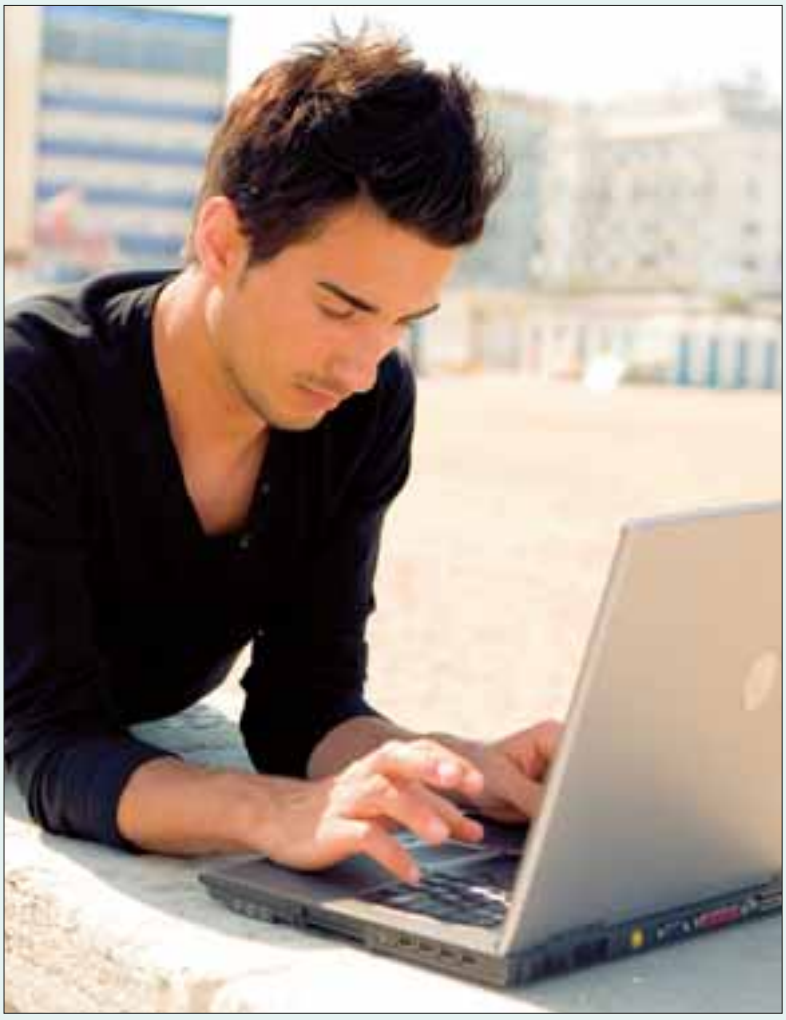
Using an alias can often make a difference. It is also important to select your "digital friends" carefully and not accept invitations to subscribe from persons unknown too easily. The old rule of not providing information on your whereabouts and the duration of absence on your letterbox or answering machine is still valid; it simply needs to be applied to the new means of communication.

Holiday pictures should only be made accessible to genuine friends whom you would also send a postcard or – better yet – posted to the relevant people after the trip. So-called location-based services that show and/or send information on your location should be deactivated.

There is also a silver lining ...

The temptations of social networking may sometimes help to solve crimes as demonstrated recently by an unlucky burglar in West Virginia. He had broken into his victim's house during the day when nobody was home and taken two diamond rings. However, a computer that was still on had tempted him to log onto Facebook and quickly look for friends instead of doing a runner with his loot immediately.

When he finally left, he forgot to sign off. The occupant who returned later did not only notice the missing rings but also the unfamiliar profile on Facebook which was still open on her computer. It did not take long to identify and arrest the alleged burglar.



Community announcements about holidays may have unpleasant repercussions: criminals are looking for out of office postings and make immediate use of their chances

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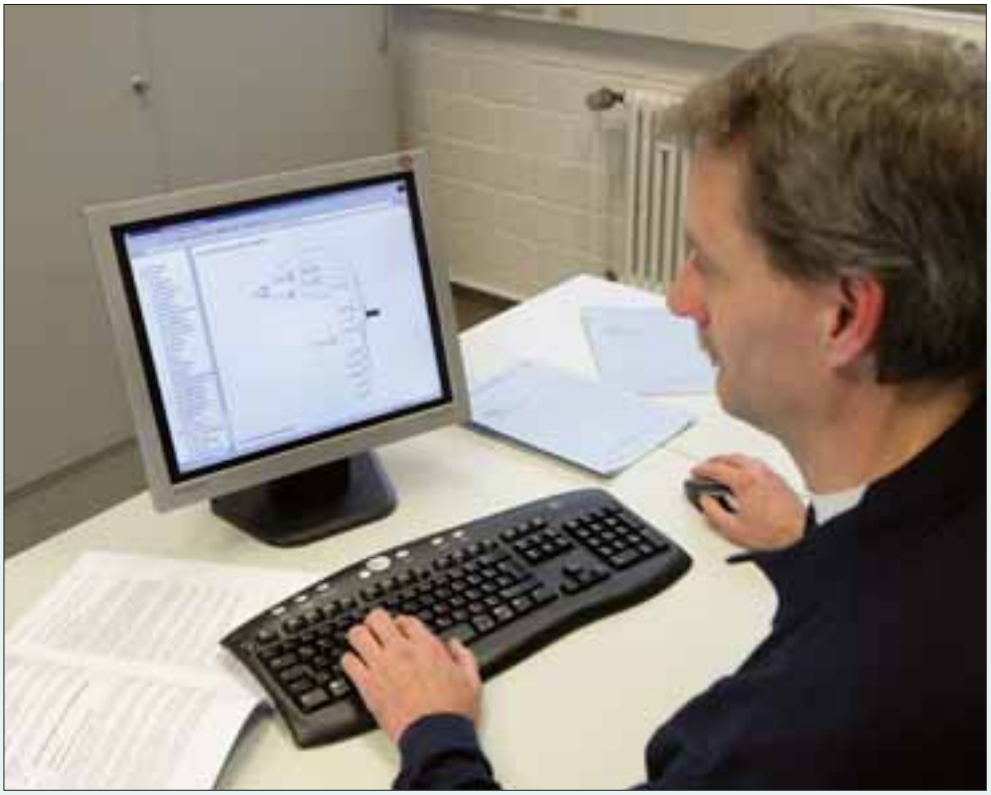
Improving fail safety

Software review of alarm system equipment

AUTHOR: DIPL.-ING. GUNNAR BELLINGEN



Software review at VdS laboratories

Software determines function of devices

The function of current alarm system equipment is predominantly managed by the software built into these devices. Standardised components and circuits that could also be used as controls for industrial applications or modern digital control systems are being installed more and more frequently. Consequently, the split of development activities is also changing. Thus, hardware development now accounts for less than 50 % of R&D, while the software share is growing continuously.

Another reason for the large share of software development is the technological functional diversity that is made possible by software application.

Detectors with extended detection functions, alarm verification through optimised and complex algorithms as well as transmission of additional information to alarm and fault signal receiving instruments, also through the Internet, are but a few examples.

As a result of the increasing number of functions managed by software, probability of software failures is increasing disproportionately. To ensure availability of reliably functioning devices with validated software, all devices that are supposed to receive VdS approval and are controlled by software shall be subjected to a software review.

Trouble shooting

First, it is necessary to highlight the fact that software does actually not cause any errors. It works just the way it has been specified by the programmer. Any deviations are not possible. A genuine software fault, e.g. a typing error in the source code would be detected by the compiler during the software compiling process. The software would not be executable.

The errors that occur during operation are so-called run-time errors that can be attributed to various causes. The most common example is dividing a number by zero, which is an insoluble problem for processors and most people. This kind of error has to be anticipated by the programmer to prevent the software from crashing and the device from failure.

Avoiding run-time errors by way of simulation or testing is only possible to a limited extent since even a comparatively small programme is able to create an almost infinite number of functional and operational statuses. Hence, run-time errors cannot be avoided entirely, but they can be contained in a targeted manner and – in case they occur – retained effectively.

The most important instrument to prevent run-time errors is documentation of the entire software with all modules, interfaces with input and output parameters, objects as well as the entire programme hierarchy. Even though programmers do not particularly like it, programming predominantly means documenting since only fully documented software can be updated and fine-tuned. In particular when the original software engineer is no longer available.

Software compiling

The documentation shall include a description of the hardware on which the programme is installed and which long-term effects it can have on the hardware. As mentioned earlier, the programme has to be compiled before it can be installed on the respective hardware. In doing so, commands of the programming language used are translated into instructions understandable for the microprocessor installed. At the same time, the programme syntax is checked along with the programmed interfaces to modules and/or functions. Since the software has to be regularly revised for compiling, it is necessary to document the version of the compiler used for compiling the programme to be tested. Modifications to the compiler might lead to changes in commands, commands no longer being available or responding differently in comparison with previous versions.

The documentation shall also include a log of memory contents. Interim results of the microprocessor (run-time data) must not be written into the memory reserved for system data; reserved memory must also be available for programme data.

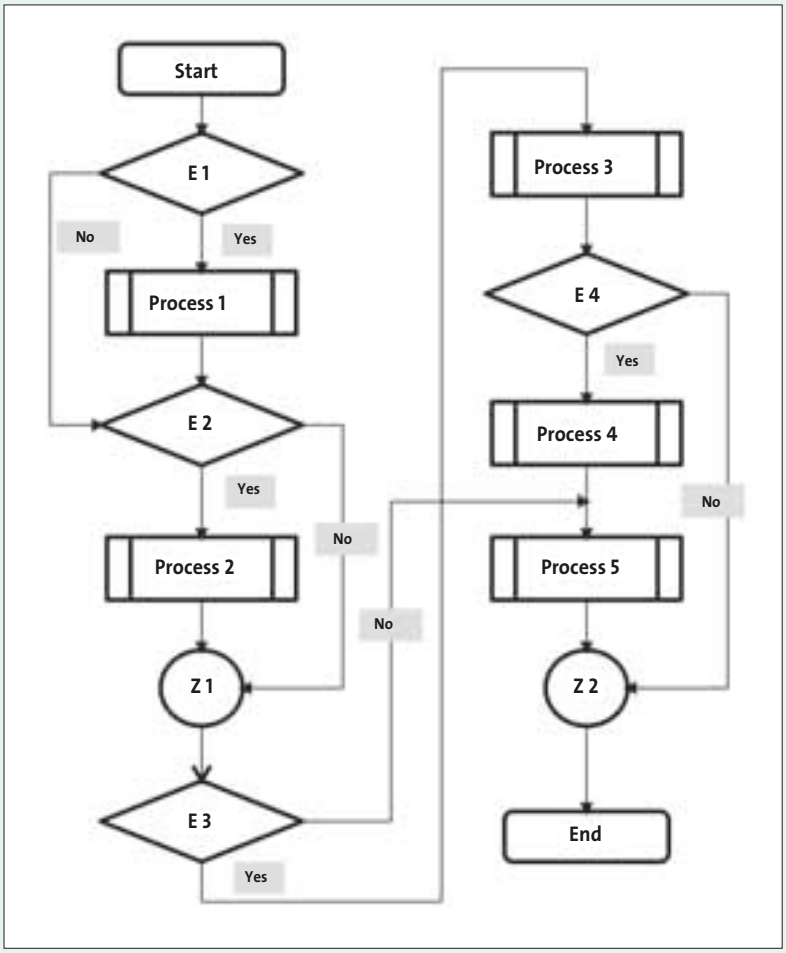
Deadlock prevention and interface plausibility

Other methods to avoid run-time errors are deadlock prevention and interface plausibility. In the latter case, data transferred by software interfaces to a software module, for instance, are checked for plausibility prior to transmission or return. That is to say, the data type (string, number, byte etc.) and the content (domain) need to be checked. In case the data contains figures that could compromise computer operation, appropriate routines in the programme need to ensure adequate correction.

Deadlock prevention is required for application of loops or other recursive or iterative programme elements. The purpose is to prevent occurrence of an infinite loop in the programme which might happen during division by 0 as mentioned at the outset. In case the possibility of an infinite loop cannot be ruled out, application of a watchdog is recommended; it needs to be repeatedly triggered by certain trigger points set in the programme. In case the programme freezes and does not trigger the watchdog, it causes the device to reset or it interferes with the programme in such a way that smooth operation is possible again. However, if smooth operation is not possible, this must be indicated by the device itself or by an appropriate system error in the central monitoring system.

Additional requirements have been laid down for devices whose failure would cause an entire system to fail and/or obstruct alarm transmission to emergency services. In both cases, monitoring of computer operation is required. The monitoring mechanism detects any problems in computer operation and tries to solve them or generates a fault alarm. This can be done by the watchdog mentioned earlier whose design could be built into the hardware.

Control and indicating equipment has to comply with yet another re-



Example of a software review flow chart

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quirement: monitoring of memory content. Memories that contain system-related data are checked automatically, at least once every hour. Manufacturers also need to validate this function in their documentation.

Application of SIL standard for software review

Another instrument for software review is provided by SIL standard EN 61508. These complex and rather costly test methods shall be applied when no other standards or regulations are available for assessing the safety of electronic, electrical and programable electronic systems. However, European standards to some extent even harmonized standards and national regulations are available for equipment of alarm systems; they also cover security of software installed. Therefore, application of the above standard is not necessary and not recommended either.

VdS Schadenverhütung requires software review for all devices that use software to be approved. They are either required by the relevant product standard, e.g. EN 54-X series or VdS Guidelines VdS 2203: 2003 – Software, Anforderungen und Prüfmethoden (Software – requirements and review methods) if the product standard does not include software requirements. As a result, VdS approval is different from many other standards where testing of the most important functional element is not required. Moreover, vendors of approved devices are required to inform VdS Schadenverhütung of any changes to the software. Once the advice or amendment by the vendor has been screened, VdS decides whether repeated review of the software documentation is required or whether the main programme operation remains unchanged and does not have to be reviewed again.

The software review does not provide any conclusions as to the proper functioning of a device. Functioning of a device could be derived from the software documentation with great difficulty, if at all; the documentation does not help to judge the environmental behaviour of a device (EMC, climate etc.). These requirements can only be validated by a technical laboratory test in the relevant specialist department.

Conclusion

Software reviews on alarm system components are more necessary than ever as the function of almost every electronic device is controlled by software. This increases the possibility of a programming error causing severe system failure to a disproportionate extent; it can only be mitigated by appropriate methods.

Reviewing software documentation and screening the source code in relevant parts of the programme are able to verify whether the vendor applies these methods, thus maximising fail safety of a device.

Resistance-induced short circuits pose serious problems

Fires caused by short circuits, contact problems and inadequate planning

AUTHOR: DIPL.-ING. HERBERT SCHMOLKE

1 Are short circuits in electrical systems able to cause fire?

Most people would probably answer yes based on their gut feeling. Of course, short circuits pose a threat! Do we not hear about fires caused by short circuits often enough? Isn't this question superfluous?

However, at a closer look and with sufficient expert knowledge, the answer is no longer that obvious. Provided a specialist company has installed a system in line with the relevant technical requirements, a short circuit as such does not constitute a serious danger. Every electric circuit in a building is protected by a so-called (automatic) circuit breaker that cuts out overcurrent in a split second. Consequently, a fire is not likely to be caused.

So we can establish that common short circuits in cable and line systems as well as electrical equipment actually constitute an ideal scenario from the perspective of preventing fire loss since the circuit breaker systems would immediately trip (provided the installation has been done correctly).

What makes electricity so dangerous? After all, statistical studies on this topic confirm that approx. one third of all fires are caused by an electrical system and/or the electric equipment.

In effect, the danger does not emanate from short circuits caused by energised components which come into contact with one another or the housing of electrical equipment. The fault current generated is often sufficient for the connected circuit breaker. However, if the fault current generated has to overcome additional resistances and is not sufficient, this may cause more severe problems. The cause may be a transition resistance at the fault location such as e.g. paint or coating. Or the faulty contact is brought about inside the electrical equipment, which to some extent causes the fault current to flow over the effective resistance inside the equipment. There are manifold options to reduce the fault current. Even an electric arc which, from a fire protection point of view, is dangerous and occurs frequently in electrical systems represents a resistance that contains the fault current. However, the lower the fault current, the more difficult it is to capture it and consequently cut it out.

1.1 Resistance-induced short circuits

Unfortunately, a so-called resistance-induced fault or short circuit current frequently occurs in the field as described above. Therefore, there have been ample examples of electrical installations causing a fire. Two aspects have to be considered in this context:

a) The fault current is often too low to prompt the circuit breaker to trip fast enough.

b) On the other hand, a considerable thermal load is generated at the fault location which may easily cause an open or smoldering fire.

The tripping requirements for the circuit breaker are laid down in the standards. However, these standards only refer to the "mere short circuit" as mentioned earlier, which is to say that our electrical systems are protected against it. The standards barely contain any reference to resistance-induced short circuits. They are to be avoided by way of safe installation and functioning electric equipment. There is an additional requirement for trade and industry stipulating that electrical systems shall be subjected to periodical testing. There is no such requirement for private homes though.

Of course, it should also be possible to cut out currents that exceed the rated normal current only slightly, e.g. in case of permanent overload when too many devices are connected to a multiple socket supplied by a fixed socket. However, there are limits to this kind of protection:

a) The principle of conventional circuit breaker is the higher the current the faster the trip. This means that highly dangerous fault currents which for some unknown reason might not be very high are cut out too late. In the worst case, it may take several seconds or even minutes.

b) In case of currents ranging around 45 % of the rated normal current, safe trip cannot be guaranteed. There is no trip within a specified time. Potentially dangerous

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currents may run for hours without being cut out.

Examples:
A circuit breaker with a nominal current of 16 A cannot cut out currents between 16 A to 23 A sufficiently safely. This means, for instance, that fault currents of 20 A could convert power of 4,600 Watt (4.6 kW) to heat without the circuit breaker cutting out fast enough.

Note: Tests have shown that power of 60 W (under extremely unfortunate circumstances even less) may be the cause of a fire.

2 How to cope with the problem of resistance-induced short circuits

Of course, there is no silver bullet that would lead us to believe in 100 % certainty. There is no such thing. However, there are three factors that could help reduce the risk considerably:

2.1 Do not use defective or "age-worn" equipment

"Who goes to the danger comes to it", says a german proverb. A defective device always poses a threat as all safety requirements envisaged by a manufacturer are compromised. It does not matter whether there are holes or cracks in the housing of a device, a defective power cord, where the leads inside the plastic-sheathed cable are already sticking out or a defective plug. Often, users try to find a makeshift solution, mending the defective part with masking tape, plasters or wires. However, this almost provokes potential dangers.

2.2 Leave work on electrical systems to competent experts

Often, electro-technical amateurs tend to boast: "I can do that. That is no big deal. I don't need a string puller for that."

The extensive training to become a skilled electrician focuses to a large extent on raising trainees' awareness of certain problems. Such knowledge is not as if born to the manner. Moreover, humans have no radar for electrical energy. It is already too late once we can feel it. The dangers posed by electrical energy are manifold and are described in an extensive set of regulations (VDE standards). Whoever claims that he/she can handle everything without any training is naïve and also negligent.

For any work that involves modifications to an electrical system, for instance, installing new sockets or new light outlets, a specialist company must be contracted.

Moreover, this is also required by Article 13 of the low voltage supply regulation (Niederspannungsanschlussverordnung (NAV)). This regulation forms the basis of virtually every power supply contract. Users of electrical energy commit to contracting a specialist company for any work of this kind.

2.3 Designing a residual current device

Residual current devices (RCD) are not able to capture every fault current. They only register and cut out those fault currents that flow through the earth conductor. A resistance-induced short circuit that is generated by e.g. energised components inside the device would therefore not be registered. As there is a release in the entire supply line, which in case of many devices is connected to their housing, it is highly likely that a fault which generates fault current would either immediately or sooner or later also affect the earth conductor.

An RCD monitors the circuit constantly including all electrical appliances powered by the circuit. The latest VDE standards require such release systems for almost all electrical circuits that feature sockets. However, it is important to make sure that one release system does not protect all or too many circuits; otherwise the high standards for ensuring power supply might be compromised.

However, the requirement of installing an RCD in circuits with sockets only applies to new electrical systems. VDE standards do not imply that it is necessary to upgrade old systems. The general recommendation is therefore to retrofit old systems on a voluntary basis. In doing so, consideration should be given to other electrical circuits that do not supply any sockets; they could also be protected by such a release.

The following summary may be concluded:

❏ Circuit breaker protect cables and lines pursuant to VDE standards against high overcurrents (fault and/or short circuit or overload currents).

❏ An RCD provides protection against insulation defects that generate power by way of resistance-induced faults.

3 Transition resistances – another problem

No electrical system works without connections. Electrical power in a circuit has to run through several connections – for instance, the transition at the blade contact of an HRC fuse, threaded joints, crimp connections, terminal clamping points with or without screws or soldered joints. All these connections represent potential fire hazards because the homogeneous structure of the copper conductor is interrupted by them – a contact resistance is generated. Only by limiting this contact resistance can the danger of overheating be prevented.

If terminal clamps are not selected properly or if mistakes are made during assembly, operation may lead to high thermal loads that often cause adverse changes to the clamps and may have dangerous effects.

Experiments on clamps causing the conductor to become loose were able to establish temperatures of several hundred degrees even before a potential electric arc was formed. Often, colour changes on the devices are indications of such processes (Figure 1).

These colour changes should be shown to an expert immediately or prompt us to have the appliance replaced. In general, this colour change indicates that the necessary electrical properties can no longer be guaranteed.

It is a fact that terminal clamp points that are installed improperly have commonly become known to cause fires (Figure 2).

4 Fire hazards resulting from the wrong cut backs

As a result of cost pressure, a certain room occupancy is specified, while only the minimum of electrical installations required is considered. For cost reasons, people often haggle about every socket.

In case occupancy changes later either to be extended or the occupant changes furniture, there can be a shortage of sockets. In such cases, occupants tend to solve the problem by way of makeshift installations. However, such a makeshift often represents a fire hazard. Extension cables and multiple sockets should not replace a fixed installation. In such cases, the architect should consult an electrical engineer to find flexible solutions.

There is another danger caused by too low a number of sockets and electrical circuits that supply sockets: it is not only the number of sockets that is challenged for cost reasons during the planning stage of a building, but also the number of electrical circuits. This number of circuits is to a large extent aligned to the number of exit lines from circuit breaker systems in the distributing panel to the various connections, light outlets and sockets in the building. If cut backs are made here, even a sufficient number of sockets is no use.

Users of electrical energy do not know the number of electrical circuits and are not able to assess the hazard posed by too few circuits. In case they need more sockets, the number can simply be increased, as mentioned earlier, by using extension cables with multiple sockets that could power additional electrical appliances.

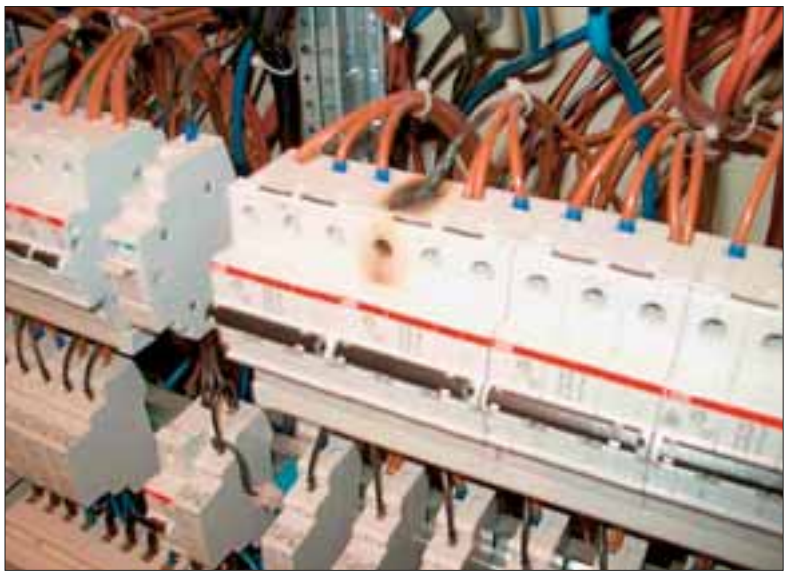

Figure 1: Charring on a clamp of a residual current device in a distribution panel

The feeder to the socket in the wall into which the extension has been plugged has to conduct the sum of all currents of a circuit though. This is what users are unaware of as they consider the socket they are using as the source of power.

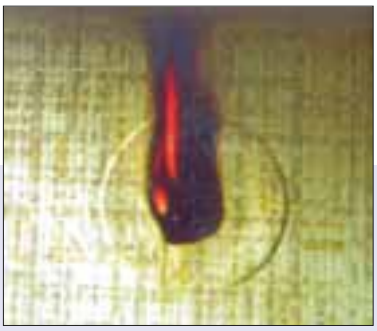

Figure 2: A defective clamp may spark an open flame in a split second – as in this example: a flush branch box

However, even two high-powered devices may overload a power line commonly used in electrical installations – and basically in a way that the circuit breaker connected in series detects the overload way too late (see chapter 1.1. of this article). Of course, this is extremely dangerous.

Whoever is stint on the number of sockets and electrical circuits during the planning of a building almost automatically plans potential fire hazards – that's the name of the game. In case of extensions to or modifications of the electrical system, a larger number of circuits should seriously be considered.

Figure 3: In case of shortage of sockets occupants tend to solve the problem by way of makeshift installations which often represents a fire hazard

News ... News ... News ...

International VdS Expert Conference on Fire Extinguishing Systems

On 8 and 9 Dec 2010, VdS hosted the international expert conference on "Fire Extinguishing Systems" for the seventh time in Cologne bringing together experts from all over the world to address topical issues of fire protection and to provide insight into specific national and international problems and their solutions.

The diversified programme was supplemented by a trade exhibition where the Bundesverband Technischer Brandschutz (bvfa) and some 20 international exhibitors presented the most recent developments in extinguishing technology and were available for questions and discussions.

More than 200 participants had accepted the invitation; 30 % of them came from abroad – from Switzerland, Austria, the Netherlands, Belgium, Sweden, Slovenia and Ukraine, even Brazil and India – in total, 15 different nationalities.

The key-note speakers from Germany and abroad represented different sectors such as the insurance business, industry or fire protection organisations. 16 presenters explained protection concepts for interesting applications world-wide as well as current developments in engineering, standardisation and applications of water and gas extinguishing as well as oxygen reduction systems.

The Cologne conference was well attended with more than 200 participants

The first day focused on current developments in water extinguishing systems. Highlights of the presentations include the following:

❏ Regulations on sprinkler systems: an updated version of VdS Guidelines on Planning and Installation of Sprinkler Systems VdS CEA 4001 was published at the time of the conference. Marco Weiler from VdS outlined the amendments and improvements.

❏ Foam extinguishants: the so-called PFOS Regulation of December 2006 which is a European environmental protection regulation restricts production and application of PFOS, a substance contained in foam extinguishants for fire-fighting, among others. The most important elements with a view to fire extinguishing systems are transition periods for application of foam extinguishants currently containing this substance and AFFF foam extinguishants as an alternative that does not contain PFOS and is therefore not subject to this Regulation. Dr. Matthias Prall from Fabrik chemische Präparate von Dr. R. Sthamer GmbH & CoKG elaborated on foam extinguishants currently available, their application and the most recent legislation.

❏ Sprinkler systems are safety-related systems that in case of a fire still need to work reliably even after decades on stand-by. However, sprinkler systems are also subject to ageing. Defects that compromise the functioning of components are detected during periodical testing or maintenance. This also applies to defects of the piping or the sprinklers proper to the extent that they are visible from outside, including e.g. defects on alarm valves, pumps or outside corrosion on piping. Defects that cannot be detected from outside, however, pose a far greater problem. They include in particular damage to piping and/or defects that compromise the sprinklers' functioning. In order to identify such defects caused by ageing, systems are subjected to special inspections after 12.5 respectively 25 years of operation. Jochen Krumb from VdS reported on the findings from more than a decade of testing (see also the article on p. 20).

The afternoon focused on interesting applications for fire extinguishing systems. Examples include the following:

❏ Water mist systems are most commonly applied for the protection of trains. Dr. Markus Müller from Wagner Schweiz AG presented the protection concept and tests for the Munich underground system.

❏ In the context of a holistic fire protection concept for an integrated iron and steel works in Brazil, different fire extinguishing technologies have been applied. Klaus Andrzejak from ThyssenKrupp Steel Europe AG and Anderson Queiroz from ThyssenKrupp CSA Siderurgica do Atlantico presented the concept and the risks covered by fire extinguishing systems. In order to ensure the necessary quality, functionality and reliability of the fire suppression systems, their planning and installation had to be based on the strictest Brazilian and international standards and guidelines – for instance, the basis for the gas extinguishing system were VdS Guidelines in combination with Brazilian standards. Moreover, the engineers used only components certified by independent international certification institutes such as VdS, FM or UL.

❏ In the context of DIN18230-1, fire extinguishing systems may be applied for protection of partial areas in the future. Jörg Wilms-Vahrenhorst from VdS explained the pos-

sible applications and their limitations in line with DIN 18230-1.

A joint dinner in the famous banqueting hall of Cologne's Gürzenich concluded day one of the conference.

Day two of the expert conference was under the sign of fire protection with extinguishing gases covering the following topics, among others:

❏ Aside from CO_2, a multitude of different extinguishing gases are being applied. In his presentation, Dr. Carlos Pérez from LPG Tecnicas en Extincion de Incendios explained differences and common features of inert gases and chemical extinguishing gases, their possible applications and limitations; moreover, he presented the most important aspects to be considered when selecting an extinguishing gas to protect a certain individual risk (see also the article on pages 16-20).

❏ Recently, there have been increased reports on interferences with hard drives caused by gas extinguishing systems. Jan Witte reported on the findings and research compiled by bvfa (Bundesverband Technischer Brandschutz e.V.) regarding possible causes and corrective actions.

❏ The need for pressure relief of rooms protected by gas extinguishing systems is undisputed. Alan Elder from Tyco Fire Suppression & Building Products presented a study conducted in the UK on the calculation of over and under pressure venting that will also serve as a basis for future improvement of standards and regulations.

Finally, two presentations on oxygen reduction systems concluded the conference. Oxygen reduction systems constantly reduce the oxygen content in a room to be protected to a level low enough to prevent ignition of combustible materials. VdS Guidelines 3527 specify the requirements for planning and installation in detail.

❏ Jürgen Schreiber from Daimler AG described a user's experience with an oxygen reduction system applied to protect an automated warehouse for small parts. Some special aspects had to be considered during the planning as well as operation to ensure effective fire suppression. Moreover, industrial safety aspects also needed to be considered.

❏ Dr. med. Peter Angerer presented the results of a recent research project of the German employer's liability insurance association on health aspects of working in oxygen-reduced atmosphere. From a medical perspective, entering rooms with an oxygen-reduced atmosphere between 13 or 15 vol % is acceptable under certain conditions (occupational health check-up, limited stay, only minor physical work). The results of the study will be incorporated into the relevant regulations on personal protection in the context of oxygen reduction systems.

German and English were the working languages at the international expert conference, simultaneous translation was provided. All presentations were published in the bilingual conference documentation which can also be obtained from the VdS publishing house, order number VdS 3642 (Contact: verlag@vds.de).

VdS Conference on Fire Protection in Warsaw

After successful conferences on fire protection organised by VdS Schadenverhütung in Prague, Warsaw, Bratislava and Bucharest over the past few years, there are now plans for another conference in Europe:

On 28 September 2011, a VdS expert conference on "Fire Protection Systems" will be held at Hotel Lord in Warsaw, Poland. The conference will be supported by CNBOP, the Polish Centre for fire protection research and development.

On the eve of the conference, that is, on 27 September 2011, there will be a get-together, where participants will already have a chance to visit the parallel trade exhibition.

Key-note speakers represent the insurance business, industry and fire protection organisations; they will report on sprinkler and gas extinguishing systems as well as smoke and heat exhaust ventilation systems.

Technical regulations on different fire suppression systems applied internationally will be covered as well as practical applications and approval and certification processes. Of course, some presentations will also address the current status of fire protection systems in Poland. The conference will be wrapped up by a presentation on the application of gas extinguishing systems in the context of the protection concept for Warsaw stadium.

The expert conference is therefore an important platform for operators of extinguishing systems, insurance companies, regulators, installers/manufacturers as well as planning engineers.

The conference's working languages will be Polish and English with simultaneous translation. All presentations will be included in a bilingual conference documentation.

Further information on the conference and its programme can be found on our website at:
www.vds.de
or send us an email at:
fachtagung@vds.de.

Preview

INTERNATIONAL s+s report

No. 2 October 2011

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Hosted by_ National Emergency Management Agency · DAEGU METROPOLITAN CITY

Organized by_ KFI Korea Fire Equipment Inspection Corporation · kotra Korea Trade-Investment Promotion Agency · EXCO DAEGU EXHIBITION & CONVENTION CENTER

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