

Wuppertaler Sicherheitstag 2025

14. Sicherheitswissenschaftliches Forum und 17. VDSI-Forum NRW 2025

50 Jahre Sicherheitstechnik in der Bergischen Universität Wuppertal

Hybrid-Konferenz

Wuppertal, 18. September 2025



Foto: ASER, Wuppertal

Präsenz-Veranstaltungsort:

Campus Freudenberg, Hörsaalzentrum FZH, Rainer-Gruenter-Straße, 42119 Wuppertal

**VDSI – Verband für Sicherheit, Gesundheit
und Umweltschutz bei der Arbeit e.V.**

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Stefan Bracke
Ralf Pieper *Editors*

Safety Engineering

Fundamentals, Methods, Research
topics

 Springer

Programm

9:00 Begrüßung und Einführung

Prof. Dr. Stefan Bracke; Prof. Dr. Ralf Pieper,
Bergische Universität Wuppertal
Dipl.-Ing. Christoph Benning, Verband für Sicherheit,
Gesundheit und Umweltschutz bei der Arbeit (VDSI)

9:30 Grußworte

Prof. Dr. Birgitta Wolff, Rektorin der Bergischen
Universität Wuppertal
Prof. Dr. Eberhard Schmidt, Dekan der Fakultät für
Maschinenbau und Sicherheitstechnik
Ing., M.Sc. Ole Hans, Verein der Absolventen der
Sicherheitstechnik der BUW e.V. (VAS)

10:00 Technische Produkte in Deutschland und Japan: Innovation, Optimierung und Zuverlässigkeit

Prof. Dr. Stefan Bracke, Lehrstuhl für
Zuverlässigkeitstechnik und Risikoanalytik

10:20 Diskussion

10:30 – 10:50 Kaffeepause

10:50 Systemzuverlässigkeit im Zeitalter von Industrie 4.0: Herausforderungen und Innovationen

Prof. Dr. Antoine Tordeux, Lehrstuhl für
Verkehrssicherheit / Zuverlässigkeit

11:10 Diskussion

11:20 Perspektiven der Produktsicherheit und der Sicherheitstechnik in einer sich wandelnden Gesellschaft

Prof. Dr. Manuel Löwer, Lehrstuhl für
Produktsicherheit und Qualität

11:40 Diskussion

11:50 Arbeitswelt im Wandel

M.Sc. Marina Bier, Lehrstuhl für Arbeitssicherheit

12:10 Diskussion

12:20 – 13:20 Mittagspause

13:20 Chemische Sicherheit und Brandschutz als Grundlage für sichere und effektive Brandbekämpfung im Kontext der Sicherheitstechnik

Prof. Dr. Roland Goertz, Lehrstuhl für Chemische
Sicherheit und Abwehrender Brandschutz

13:40 Diskussion

13:50 Optimierungsalgorithmen zur Unterstützung passiver Sicherheitssysteme von Mobilitätssystemen

Prof. Dr. Axel Schumacher, Lehrstuhl für
Optimierung mechanischer Strukturen

14:10 Diskussion

14:20 – 14:40 Kaffeepause

14:40 Lernen von der (Verkehrs-)Psychologie – Die 4-E des Sicherheitsmanagements

Prof. Dr. Nicola Fricke, Lehrstuhl für
Soziotechnische Systeme

15:00 Diskussion

15:10 Sichere Produktion und Prozesse von reaktiven Pulvermaterialien in der additiven Fertigung

Dr. Zongwen Fu, Lehrstuhl Werkstoffe für
die Additive Fertigung

15:30 Diskussion

15:40 Abschluss und Ausblick auf das 15. Sicherheitswissenschaftliche Forum und 18. VDSI-Forum NRW 2026

16:00 Ende der Veranstaltung

Wuppertaler Sicherheitstag 2025

14. Sicherheitswissenschaftliches Forum und 17. VDSI Forum NRW

Am 18. September 2025 wird der Wuppertaler Sicherheitstag 2025 im Rahmen des 14. Sicherheitswissenschaftlichen Forums und 17. VDSI-Forums NRW als Hybrid-Konferenz durchgeführt.

Das Forum befasst sich jährlich mit einem aktuellen Fachthema und bietet VDSI-Mitgliedern und allen weiteren fachlich interessierten Personen die Möglichkeit, an einem überregionalen Wissens- und Erfahrungsaustausch teilzunehmen.

Veranstalter des diesjährigen Forums sind die Fakultät für Maschinenbau und Sicherheitstechnik der Bergischen Universität Wuppertal sowie die fünf VDSI-Regionen Bergisches Land, Düsseldorf, Köln, Ruhr-Niederrhein und Westfalen in Kooperation mit dem Institut für Arbeitsmedizin, Sicherheitstechnik und Ergonomie e.V. (ASER), Wuppertal.

Weitere Informationen unter: <https://suqr.uni-wuppertal.de/de/foren/>

Das Forum 2025 steht als Wuppertaler Sicherheitstag unter dem Motto:

50 Jahre Sicherheitstechnik in der Bergischen Universität Wuppertal

Seit 1975 besteht an der Bergischen Universität Wuppertal (BUW) der international erste universitäre Fachbereich mit interdisziplinärer sicherheitswissenschaftlicher Konzeption. Die Fachrichtung ist seit 2015 integraler Bestandteil der Fakultät für Maschinenbau und Sicherheitstechnik. Die fachliche Verknüpfung mit der ingenieurwissenschaftlichen Disziplin des Maschinenbaus war an der BUW bereits seit ihrer Gründung im Jahre 1972 gegeben.

Die ersten eingerichteten Fachgebiete des zunächst organisatorisch eigenständigen Fachbereichs „Sicherheitstechnik“ waren ab 1975 „Allgemeine Sicherheitstechnik“ sowie im weiteren Verlauf „Arbeitssicherheitstechnik/Ergonomie“, „Brandschutz“ und „Verkehrssicherheitstechnik“. Die in den darauffolgenden Jahrzehnten erfolgte Weiterentwicklung wird fachlich insbesondere durch die dazu gekommenen Lehrstühle „Arbeitswissenschaft“, „Bevölkerungsschutz“, „Chemische Sicherheit“, „Produktsicherheit und Qualität“, „Prozess- und Anlagensicherheit“, „Sicherheits- und Qualitätsrecht“, „Umweltsicherheit“ sowie „Zuverlässigkeitstechnik und Risikoanalytik“ dokumentiert. Daneben sind in der BUW mehrere Institute sowie „spin offs“ entstanden.

*Es handelt sich um eine Fortbildungsveranstaltung
im Sinne von § 5 (3) ASiG, die mit folgenden
VDSI-Weiterbildungspunkten bewertet wird:*



Wuppertaler Sicherheitstag 2025
14. Sicherheitswissenschaftliches Forum und 17. VDSI Forum NRW

50 Jahre Sicherheitstechnik
in der Bergischen Universität Wuppertal
- Präsentationsbeiträge (Abstracts) -

Die vollständigen Publikationen sind im Tagungsband enthalten:

Safety Engineering: Fundamentals, Methods, Research topics

(Eds.: Stefan Bracke, Ralf Pieper)

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The German and Japanese product development process and the usage phase of complex technical goods: Innovation, optimisation and reliability engineering

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²Meiji University, Department of Mechanical Engineering Informatics, Kanagawa, Japan

The industrialisation of Europe and Asia leads to the development of innovative and reliable technical complex products. Industrial nations like Germany and Japan were going separate ways to highly developed industrial nations. This leads to different goals and philosophy in terms of reliability and safety design regarding product, process development and the efficiency of the product in the use phase. This paper shows essential aspects of the differences in German and Japanese reliability and safety engineering. Base of operations is the fundamental difference of the realisation of the principles “innovation” versus “optimisation”: German products functionality contains often innovative solutions, Japanese products functionality shows often optimised solutions. These different designs are caused by different impacts: Historical impact, society and social interaction impact, education System and work environment impact and geographical and location impact. This leads to the different technical reliability and safety engineering solutions in engineering and product use in Germany and Japan. Finally, the findings are substantiated using the example of the long-distance train transport system in Japan and Germany.

System Reliability Engineering in the Age of Industry 4.0: Challenges and Innovations

**Isabelle Müller¹, Zikai Zhang¹, Antoine Tordeux¹, Jannis Pietruschka²,
Stefan Bracke², Tim M. Julitz³, Nadine Schlüter³, Manuel Löwer³ and
Nicola Fricke⁴**

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In the era of Industry 4.0, system reliability engineering faces both challenges and opportunities. On the one hand, the complexity of cyber-physical systems, the integration of novel numerical technologies, and the handling of large amounts of data pose new difficulties for ensuring system reliability. On the other hand, innovations such as AI-driven prognostics, digital twins, and IoT-enabled systems enable the implementation of new methodologies that are transforming reliability engineering. Condition-based monitoring and predictive maintenance are examples of key advancements, leveraging real-time sensor data collection and AI to predict and prevent equipment failures. These approaches reduce failures and downtime, lower costs, and extend equipment lifespan and sustainability. However, it also brings challenges such as data management, integrating complexity, and the need for fast and accurate models and algorithms. Overall, the convergence of advanced technologies in Industry 4.0 requires a rethinking of reliability tasks, emphasising adaptability and real-time data processing. In this chapter, we propose to review recent innovations in the field, related methods and applications, as well as challenges and barriers that remain to be explored. In the red lane, we focus on smart manufacturing and automotive engineering applications with sensor-based monitoring and driver assistance systems.

Perspectives of Product Quality and Safety Engineering in a Changing Society

Manuel Löwer¹ and Nadine Schlüter¹

¹Department Product Safety and Quality Engineering, University Wuppertal,
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In times of social change, from Industry 4.0 to an Industry 5.0 and Society 5.0, the topics of product quality and safety are also strongly influenced. While the implementation of networked production and the Internet of Things through to the Internet of Production continues to progress, scientists from all disciplines are researching issues and solutions that a globally networked society poses. The following article is intended to provide an overview of where we currently stand from Industry 4.0 to Industry 5.0 and Society 5.0 and how this affects the various aspects of product quality and safety. Three different perspectives are taken into consideration. From an abstract meta-level point of view on technologies and industries, followed by a more concrete example of changes in companies. Eventually, the question of how a person's individually perceived safety with regard to a product can be captured.

Working environment under construction

**Anke Kahl¹, Marina Bier¹, Florian Hafner¹, Nina Hanning¹, Magnus Nauth¹
and Julia Waldorf¹**

¹Chair of occupational safety, University of Wuppertal, Gaußstraße 20, 42119 Wuppertal, Germany

Contemporary occupational health and safety that is accepted in science and practice acts directly as a technology companion. In addition to technical and technological innovations and changes, such as the introduction of new assistance systems, artificial intelligence in smart practical and communication tools, greater market saturation with sensor and laser technologies, and the introduction of new technologies in the course of decarbonization, social changes are also drivers or obstacles to occupational health and safety, which must be implemented at an early stage in the sense of a high level of protection. The targeted recruitment and support of older employees, the increased access of people with a migrant background to the labour market and the flexibilisation of work, e.g. through mobile forms of work, are selected examples of this. In addition, climate change and social climate protection measures pose special challenges for occupational health and safety. The Chair of Occupational Safety and Health at the University of Wuppertal actively deals with selected fields of design of the above-mentioned changes and challenges in teaching, research and policy consulting. Interdisciplinary approaches to solutions, with close technical and methodological links, e.g. to civil protection and fire protection, but also to education and communication sciences or stakeholder in the circular economy, are required in order to develop practical design concepts.

Chemical Safety and Fire Defence as the Basis for Safe and Effective Fire Service Response in the Context of Safety Engineering

Julia Backhaus¹, Monique Glockmann¹, Philipp Haffner¹, Martina Henseleit¹, Katja Klicker¹, Katja Müller¹, Marie-Claire Ockfen¹, Daniel Schmitz¹, Bianca Wegener¹ and Roland Goertz¹

¹University of Wuppertal, Chair of Chemical Safety and Fire Defence, Germany

Li-ion batteries play a significant role in all areas of life. Their thermal decomposition caused by overcharging, along with the associated mechanisms and intervention options, is being studied intensively. The composition of the venting gases is of major importance. These gases contain not only toxic and corrosive components but also hydrogen and other flammable gases, meaning that thermal runaway may pose an explosion risk within the surrounding area. PVC and other chlorinated polymers remain widely used. Their thermal decomposition is often associated with concerns about the potential formation of highly toxic substances, such as chlorinated dioxins and furans. Therefore, investigating the thermal decomposition process, characterizing the resulting products, and elucidating the reaction mechanisms are essential to understanding when special caution is required after a fire. Organophosphorus flame retardants are highly popular and widely used. New generations, such as DOPO derivatives, allow for straightforward production and a wide range of products. However, the thermal decomposition, along with its mechanisms and products, remains largely unexplored. Phosphorus-containing organic compounds can be extremely hazardous even in small quantities, particularly affecting the human body and nervous system. Numerous laboratory experiments and quantum chemical calculations are providing new insights into this area.

Fluorinated surfactants (PFAS) have exceptional properties and were historically effective in aqueous film-forming foam (AFFF) for liquid fire suppression. However, PFAS are environmentally persistent, bioaccumulative, and toxic. Through an extensive statistical study and complex laboratory experiments, 523 chemicals were clustered based on their physicochemical properties and evaluated for extinguishing or sealing with foam. In no instance was AFFF found necessary. During real fire training, firefighters wearing breathing apparatus are exposed to fire by-products such as carcinogenic benzene. A study was carried out to investigate whether a significant concentration of benzene can be detected in the whole blood of trainees and instructors after real fire training. Initial results show no blood levels of benzol.

To protect lives and property and minimize damage in fires and emergency situations, the fire department must arrive promptly with sufficient personnel and appropriate equipment. To meet this challenge, new system-theoretical approaches are being pursued and tested. Geographic Information Systems (GIS) and statistical methods, such as cluster analysis, play a key role, with the additional aim of harmonizing resource planning for fire services, emergency medical services, and disaster response.

Optimization algorithms for supporting passive safety engineering of mobility systems

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¹University of Wuppertal, Chair for Optimization of Mechanical Structures, Gaußstraße 20, 42119 Wuppertal, Germany

Mathematical and semi-mathematical optimization methods are presented, which improve the lightweight structure of crash-relevant components of mobility systems. This is about the fulfillment of all requirements from laws or consumer protection tests. The article is a compilation of relevant methods for optimization that can be used to support the development process of complex mechanical systems. To evaluate the designs, crash simulations based on the finite elements are used in all presented methods. Topology optimization is mainly shown. So it's about the optimization of the location and arrangement of structural elements and material. Methods for the efficient determination of necessary sensitivities are also presented. The article is intended to show the variety of different options for improving passive safety. The quality and performance of the used finite element simulation models are considered, especially for the presented methods using model reduction procedures and automatic generated sub-models.

Learning from (traffic) psychology – The 4-E of safety management

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Safety issues are a common challenge in organizations. While occupational health and safety developed a lot of methods and measures to improve safety standards in companies, psychology also developed approaches regarding safety management. One of these approaches – the 4E – is used in traffic psychology in order to increase the safety within the traffic environment. Translating this approach to a general safety perspective means that 1) enforcement, 2) education, 3) encouragement and 4) engineering measures are all used in a concerted way as a safety management strategy. Finally, the paper summarizes open research gaps which are the systematic investigation of the effects of the concerted introduction of the E's as well as possible further expansions of the concept based on the topic of safety culture.

Safe Production and Processing of Reactive Powder Materials in Additive Manufacturing

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Additive manufacturing (AM) has established itself as a revolutionary technology that makes it possible to create complex components directly from digital models. For industrial high-tech applications, reactive powder materials such as titanium and aluminum are commonly used, though their fine particle form can pose risks of fire and explosion. The key considerations and conditions for the production (atomization) and metallurgical processing of such powder materials using AM techniques are presented, taking into account both safe working environments and the preservation of high material quality. Additionally, aspects of sustainability are discussed, which are of great importance for the development of ecological material cycles. Best practice examples are presented as the part of work flows recommended for both research labs and production environments. Critical work steps are highlighted and rules to be taken into account are explained. In addition, current challenges and strategies with regard to sustainability are discussed.

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**Methods for analyzing reliability engineering:
Probabilistics and Accelerated Testing in early phases
of product emergence process**

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The product emergence process of a product is significantly influenced by its reliability, which in turn determines both customer satisfaction and operating costs. It is therefore evident that reliability engineering plays a pivotal role in the development and optimization of products. This paper presents the application of reliability engineering methods using three representative case studies based on real test data, which have been enhanced by simulation. The data presented here originates from fatigue tests of shape memory actuators. In order to facilitate comprehension, an initial presentation will be made of the fundamentals of the shape memory effect, together with an account of the nature of shape memory actuators and the procedures employed in their testing. The initial case study entails an examination of the failure behavior exhibited by three distinct test channels of a test rig. The application of descriptive statistics (boxplots) and significance tests (Kruskal-Wallis test with Conover post-hoc analysis) enables the identification and interpretation of differences in the failure behavior of the channels. The second case study focuses on accelerated testing. The determination of suitable acceleration levels is achieved through the analysis of different load levels. The investigation is conducted using the two-parameter Weibull distribution, including the calculation of confidence intervals for the model parameters and the determination of acceleration factors. In the third case study, a Sudden Death test is conducted in which candidate data is extrapolated using the Johnson rank correction in order to make reliable statements about the service life distribution. The methods presented illustrate the practical advantages of reliability engineering approaches in the analysis and optimization of system reliability, and offer valuable insights for product development and testing.

Methods for analyzing reliability engineering: AI-based Production Capability regarding Product Lifetime Reliability

Georgios Ioannou¹, Jannis Pietruschka¹, Saeideh Pourghasemian¹ and Stefan Bracke¹

¹Chair of Reliability Engineering and Risk Analytics, University of Wuppertal, Gaußstraße 20, 42119 Wuppertal, Germany

Via the RAPEX rapid alert system for dangerous non-food products, a recall of biodegradable cutlery was initiated in 2024 due to a risk of injury from fragments breaking during use. The failure of such a safety-critical feature can be due to, for example, a design fault or a manufacturing defect. In the era of Industry 4.0, reliability engineering methods are increasingly being characterised and expanded by the application possibilities of artificial intelligence. Particularly within the product development process, opportunities arise to ensure product reliability for safety- and function-critical components. Especially for safety-critical features, it is essential to prove a consistent process capability, which can be achieved through inline inspection as a full inspection process. In this study, images of wooden forks were captured under constant boundary conditions in a test rig set up in a lab. These images serve as a training dataset for machine learning analysis, showing defects in the manufacturing process that could lead to user injury in application. Each fork image was analyzed for defects using Convolutional neural networks (CNNs). For the determination of an appropriate model, a comprehensive parameter study is performed. The approach of optimizing the algorithm results and identifying a reliable and reproducible CNN model is presented in detail. The evaluation of the results shows that the found model can detect the defective forks with an accuracy of 81.16%. Under these conditions, a transfer to real operation at an evaluation speed of 4.3 ms per object is possible to a certain extent.

Modelling Vehicle and Pedestrian Collective Dynamics: Challenges and Advancements

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In our urbanised societies, the management and regulation of traffic and pedestrian flows is of considerable interest for public safety, economic development, and the conservation of the environment. However, modelling and controlling the collective dynamics of vehicles and pedestrians raises several challenges. Not only are the individual entities self-propelled and hard to describe, but their complex nonlinear physical and social interactions make the multi-agent problem of crowd flow and traffic even more involved. In this chapter, we purport to review the suitability and limitations of classical modelling approaches through four examples of collective behaviour: stop-and-go waves in traffic flow, lane formation, long-term avoidance behaviour, and load balancing in pedestrian dynamics. While stop-and-go dynamics and lane formation can both be addressed by basic reactive models (at least to some extent), the latter two require anticipation and/or coordination at the level of the group. The results highlight the limitations of classical force-based models, but also the need for long-term anticipation mechanisms and multiscale modelling approaches. In response, we review new developments and modelling concepts.

Development of microstructured high performance materials based on finite element simulations

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Microstructured materials, engineered with precise architectures at the microscale, exhibit unique properties and performance characteristics that extend beyond their chemical composition. Inspired by natural materials, these materials leverage advanced manufacturing techniques such as 3D printing to achieve complex geometries that enhance mechanical, thermal, optical, and electrical properties. Applications span aerospace, biomedical, electronics, and energy industries, where they provide lightweight, durable, and multifunctional solutions. Microstructured materials also promote sustainability by optimizing material usage and efficiency.

How can the understanding of droplet movement contribute to the safety in mechanical engineering?

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Component malfunctions caused by corrosion or the penetration of fluids in electronic components, are responsible for a huge economic loss. This damage is often caused by minimal amounts of liquid that can enter components due to various effects, e.g. flow or vibration. Particularly due to the increasing complexity of components and the increased use of electronic components, the damage will increase significantly in the coming years if no targeted measures are taken. Despite the clear effects of water penetration, it is often unclear how this occurs. Due to complex flow conditions combined with superimposed vibrations and movements of the parts, it is difficult to predict the movement of droplets. In this paper, the basics of the movement of droplets under the influence of various forces are examined and the criteria for the onset of droplet movement are described in detail. Both numerical and experimental methods are presented.

Contribution of Materials Technology to Achieving Sustainability Goals

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The challenge of current climate change requires strategies for sustainable consumption, prioritizing products produced with minimal resource use and CO₂-emissions. Shifting from a linear to a circular economy is essential, utilizing strategies such as repurposing, repairing, remanufacturing, and recycling. Successful implementation requires thoughtful product design and a comprehensive understanding of materials and manufacturing processes. With the focus on the material, this article uses selected examples to show different strategies to manufacture products with low use of resources and CO₂-emission. The examples are questions from successfully implemented research projects. For example, by adapting the alloy design, the material properties could be improved, and the product usage phase could be extended. Other examples focus on reducing critical and cost-intensive elements to minimize costs and delivery dependencies. Further examples deal with the repurpose approach or the joining of steel-aluminum connections to produce a hybrid multi-material mix to manufacture high-strength and lightweight structures for the automotive sector.

Dustiness of Powders – Characterization, Causes, Change

Eberhard Schmidt¹

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The property of a powder to release fine particles from the bulk under certain stresses can be called dustiness. The release of dust into the surrounding air is usually undesirable for several reasons. On the one hand, it is associated with risks to the environment, fire protection and the health of employees in production or application. On the other hand, it can be associated with a loss of valuable materials. The dustiness can be measured qualitatively and often also quantitatively using various methods described below. These differ mostly in the way the powders are stressed. The dustiness is always determined by both the powder properties and the type of stress; it is not an intrinsic property. This is also clear from the treatment of the subject in standards and directives. And it is reflected in the treatment of dustiness in science and research. Several examples of completed and ongoing work are presented.

**One-dimensional View of the Structural Changes in the Filtering Layer
during the Clogging-phase of Filter Media –
A New Approach to a Holistic View of the Filtration Process**

Qian Zhang¹

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Due to the discrepancy between the previous theoretical description of the filtration process and the actual structural changes in the filter layer, a new holistic approach to describing the filtration process is introduced, which is based on an analytical description of the structural changes of the filter packing. This article presents some new aspects for the description of filtration processes that result from this new approach. Here, a new specific one-dimensional spatial distribution function for newly deposited particles in the filter packing during the filtration process is introduced to describe the deposition profile of newly deposited particles of any filtration process in dimensionless form. While the initial deposition profile is determined by the filtration conditions and the filter medium together, the final deposition profile is independent of the given filter medium and a function determined by the given filtration conditions. During the clogging phase, the one-dimensional deposition profile gradually takes on its final form. The systematic change in the one-dimensional deposition profile during a continuous filtration process can be evaluated using a correlation analysis to describe the kinetics of this dynamic process.

Challenges in Fire Spread Modeling – From Bench Scale up to Wildfire Scale

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Safety Engineering is a broad field with significant societal impact. Within this discipline, fire safety engineering plays a critical role, frequently utilizing fire simulations across diverse scenarios and scales—from small laboratory settings to large-scale wildfire modeling. This chapter addresses key challenges in fire spread modeling through selected simulation examples, including pyrolysis, radiative heat transfer, and a burning tree, each illustrating specific challenges that substantially affect the accuracy of fire spread simulations. Additionally, the chapter introduces a potential approach for managing uncertainties in Computational Fluid Dynamics models using Polynomial Chaos Expansion, applied here to a compartment fire scenario. This chapter is not intended as an exhaustive review of the topic; rather, it aims to underscore the need for further research in the field of fire spread modeling.

Early Exit of the Baby Boomer Generation in Germany – Findings from the lidA-Study

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This article examines the employment perspective of older workers in Germany (prospectively). It considers the reasons for leaving employment among those who take early retirement, or those who receive a disability pension (retrospectively). The data is taken from the 4th wave of the representative lidA-Study in 2022/2023 (www.lida-studie.de). The results indicate that most of the baby boomer generation (born in 1959 and 1965) would like to retire early, long before reaching their official retirement age and long before the point in time at which they believed they could continue working. At the same time, a small portion of the subsequent generation (those born in 1971), seems to be preparing themselves for a somewhat longer working life. The reasons for the preferred early retirement are mainly related to a desire for self-determination in life, followed by stressful work and health problems. In all three birth cohorts, there is a widespread willingness to remain in employment longer than currently desired under certain circumstances—particularly if individuals were given more influence over how their work is organised. The retrospective survey data shows that the desire for self-determination also dominates the reasons for early retirement of those who have already left the workforce. In contrast, for those who have transitioned to a disability pension, demanding work is the primary factor in addition to health problems. A key conclusion is that if politics and economy want to keep older employees in the workforce for longer, they must find ways to make them want to work longer. This cannot be achieved without a fundamental consideration of working conditions.

**Meeting future challenges in the world of work:
Ergonomic strategies, methods and tools to attract skilled talent and
create sustainable, productive and industry-leading environments**

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In an era of rapid change, organizations must adopt advanced ergonomic strategies to attract skilled talent and foster sustainable, industry-leading environments. The growing importance of ergonomics highlights the necessity of adhering to established meta-methodological design approaches, while continuing to prioritize fundamental research in areas such as anthropometry and human performance. Networks like KomNet are redefining service and knowledge management by efficiently addressing initial inquiries, guiding users to develop tailored solutions for the specific challenges of their organizations. In sectors like the event industry, targeted research ensures the availability of skilled talent, addressing unique occupational demands. BDS-Instrument exemplifies a holistic approach, seamlessly blending ergonomics with operational goals. Meanwhile, modern ICT tools raise critical questions around ethics and privacy, emphasizing the need for responsible technology deployment. Interactive learning and training, grounded in validated ergonomic methods, enhance research and education, providing added value for students and supporting their professional development. These concrete examples demonstrate how to meet the future challenges of work, ensuring productivity, innovation, and human well-being in a dynamic global landscape.

Security and Resilience: Protection of Infrastructures

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In today's dynamic and uncertain security landscape, protecting critical infrastructures has become increasingly important. These backbone systems provide essential services and goods to modern society, yet are also vulnerable to intentional disruption, leading to significant interruptions in service delivery. We argue, that an integrated approach that combines security and resilience is necessary for holistic protection of critical infrastructures, in particular because security and resilience have complementary goals: security aims at minimizing the probability of successful attacks, while resilience concepts focus on enabling systems to cope effectively with resulting interruptions. Aiming at the assessment of measure effectiveness, we propose a risk-based framework that brings together a model for both, vulnerability to physical attacks and potential cascading consequences. Both models use distributed parameters to reflect uncertainties, e.g. regarding the effectiveness of countermeasures. Applying this approach to a simple case study, we show that equivalent measure combinations can be found within both domains, although the contributions to risk mitigation are varying in different scenarios. In the analysis, we highlight the paramount importance of considering uncertainties when selecting security and resilience measures and emphasize the need for efficiency analysis (cost-benefit assessments) to find optimal or appropriate solutions, especially in the context of limited budgets. We conclude that the proposed framework is flexible and can serve as a starting point for further research and application.

Notizen

Sicherheitswissenschaftliches Kolloquium

Zielsetzung & Inhalte

Das Sicherheitswissenschaftliche Kolloquium wird seit dem Frühjahr 2004 vom *Fachgebiet Sicherheitstechnik / Sicherheits- und Qualitätsrecht* der Bergischen Universität Wuppertal in Kooperation mit dem *Institut für Arbeitsmedizin, Sicherheitstechnik und Ergonomie e.V. (ASER)* veranstaltet und beschäftigt sich mit den im Wandel befindlichen Rahmenbedingungen für Sicherheit und Gesundheit.

Für Studierende, Lehrende und externe Interessenten besteht die Möglichkeit, mit fachlich ausgewiesenen Referentinnen und Referenten neueste Entwicklungen auf den Gebieten der Sicherheit, der Arbeits- und Lebensbedingungen sowie der Qualität der Arbeit zu diskutieren. Es werden Beispiele und Anregungen für die Umsetzung im betrieblichen Alltag aufgezeigt.

Behandelt werden u.a. Fragen der Rechtsetzung und Rechtsanwendung (Sicherheitsrecht, Arbeits- und Sozialrecht, Wirtschaftsrecht).

Einbezogen werden Aspekte der betrieblichen und überbetrieblichen Sicherheits- und Gesundheitsorganisation sowie das betriebliche Compliance. Schließlich wird der Stand der arbeitswissenschaftlichen sowie arbeitswirtschaftlichen Erkenntnisse und Methoden zur menschengerechten Gestaltung der Arbeit, auch unter dem Aspekt der Fachkräftesicherung, zur Diskussion gestellt.

Veranstalter



Informationen

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