Research outputs:

**Puncture of an import gasoline pipeline – spray effects may evaporate more fuel than a Buncefield-type tank overfill event**

This paper is concerned with evaporation of moderately volatile liquids, gasoline in particular, due to spray generation, liquid fragmentation and fountain effects following accidental puncture of a pressurized pipeline. Hazard analysis predicts that extensive evaporation will take place. The paper examines a typical fuel depot receiving gasoline from a ship at a nearby port via an above-ground pipeline. For comparative purposes, two types of accidental release during import are considered: 1) The receiving tank overflows in a worst-case Buncefield-type event (baseline). 2) The import pipeline is punctured and a jet of liquid discharges upwards. The paper examines pipeline import of three substances, hexane, octane and winter gasoline. Hazard analysis using the PHAST software suite indicates that the amount of fuel evaporated from the pipeline puncture scenarios greatly exceeds the amount evaporated in a tank overfill event for all three substances, gasoline in particular. Proper modelling of evaporation of wide-range multi-component mixtures such as gasoline is challenging however. PHAST’s simplified thermodynamic modelling of properties of mixtures may be a source of error. A PHAST-based stand-alone spray evaporation model with advanced thermodynamic capability is developed. Results indicate that PHAST does indeed overestimate evaporation of mixtures. Still, model output shows that evaporation following pipeline puncture may exceed the evaporation from a Buncefield-type tank overfill event by a factor of two or more. This finding is significant as evaporation from pipeline puncture scenarios appear largely overlooked in hazard analysis. The finding may lead to a fundamental re-appraisal of the hazard potential of fuel depots and pipelines.

**General information**

State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Department of Chemical and Biochemical Engineering, KT Consortium, PROSYS - Process and Systems Engineering Centre, COWI AS
Pages: 33–47
Publication date: 2019
Peer-reviewed: Yes
Hvidvaskning med rejsekort

Carbon dioxide – a potentially explosive smoldering silo fire suppressant
As counter-intuitive as it may sound, there are explosion hazards associated with releasing liquid carbon dioxide (CO₂) into environments where an ignitable atmosphere may exist. For instance when attempting to suppress a smouldering fire in a pellet silo. A recent paper by Dr Frank Huess Hedlund, Risk Expert at Danish engineering consultants Cowi and External Associate Professor at the Technical University of Denmark (DTU), explains why CO₂ is a safe inert purge gas but may be unsafe for inerting.

Carbon dioxide not suitable for extinguishment of smouldering silo fires: static electricity may cause silo explosion
Smouldering fires in wood pellet silos are not uncommon. The fires are often difficult to deal with and extinguishment is a lengthy process. Injection of inert gasses to prevent oxygen from reaching the smouldering fire zone and suppress
combustion is a new firefighting strategy. This article argues that injection of inert carbon dioxide into the silo headspace is unsafe. Carbon dioxide is generally available as a liquid under high pressure. When discharged, small particles of dry ice are formed. The rapid flow of particles can generate considerable amounts of static electricity, which can act as a source of ignition if ignitable pyrolysis gasses are present. This article discusses a serious wood pellet smouldering fire and silo explosion in Norway in 2010, which took place when firefighters discharged portable CO2 fire extinguishers into the headspace. The attempt to suppress the fire may have ignited pyrolysis gasses. The article examines selected guidelines, standards, popular wood pellet handbooks and other literature and argues that the electrostatic hazard is widely under-appreciated. In the past, major explosions have been attributed to electrostatic ignition of flammable vapours during the release of CO2 for fire prevention purposes. There is evidence to suggest that those early lessons learned have at least partly passed out of sight.

**General information**

State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Pages: 113–119
Publication date: 2018
Peer-reviewed: Yes

**Publication information**

Journal: Biomass & Bioenergy
Volume: 108
ISSN (Print): 0961-9534
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4 SJR 1.235 SNIP 1.436
Web of Science (2017): Impact factor 3.358
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.71 SJR 1.198 SNIP 1.385
Web of Science (2016): Impact factor 3.219
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.03 SJR 1.51 SNIP 1.596
Web of Science (2015): Impact factor 3.249
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.36 SJR 1.865 SNIP 1.964
Web of Science (2014): Impact factor 3.394
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.42 SJR 1.666 SNIP 1.811
Web of Science (2013): Impact factor 3.411
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.66 SJR 1.516 SNIP 1.754
Web of Science (2012): Impact factor 2.975
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 4.74 SJR 1.759 SNIP 2.296
Web of Science (2011): Impact factor 3.646
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Dangers of releasing CO₂ to fight fires in the cargo hold of seagoing bulk carriers

On seagoing general cargo vessels, the cargo is stored in bulk in the holds. Fire protection for cargo holds comprises detection and firefighting capability. Detection normally incorporates a smoke sampling system that continuously draws air from each cargo hold and passes it to a smoke detector cabinet. The fire can be fought by flooding the cargo hold with inert carbon dioxide. The carbon dioxide is stored in its liquid form at pressures in excess of 50 bar and kept in multiple vertical steel cylinders arranged in a battery. For firefighting to be effective, SOLAS regulations require that a large fraction (80-90 percent) of the gas is delivered to the space of the cargo hold over a few minutes. When discharged, the liquid carbon dioxide undergoes a change of phase to a mixture of gas and solid (“dry ice”). The sliding action of particles of dry ice can produce electrostatic discharges with sufficient energy to ignite flammable fuel/air mixtures. Because no vaporizer is present, considerable generation of static electricity is likely upon activation of the CO₂ extinguishment system and the large flow rate. Certain biological materials carried in bulk, in particular wood pellets, can self-ignite and burn as an oxygen-deficient smoldering fire. Such fires produce flammable pyrolysis gases that can travel, accumulate and enter the explosive range. If carbon dioxide is released at this stage, a gas explosion in the cargo hold may result. NFPA 12 on carbon dioxide extinguishing systems endorses the application of CO₂ to deep-seated fires involving solids subject to smoldering, but without identifying or alerting the reader to the potential presence of explosive pyrolysis gases. NFPA 12 appears to presume that electrostatic discharges will dissipate safety if metal nozzles are used and the entire system is grounded to earth. Lessons learned from past serious explosions appear to contraindicate this expectation. In conclusion, the application of carbon dioxide is excellent for extinguishing a fire with flames but unsuitable for quenching a deep-seated smoldering fire without flame. If detection of fire in a cargo hold is based merely on presence of smoke, not detection of fire with flames, an activation of the CO₂ system may lead to explosion.

General information

State: Published
Organisations: Department of Applied Mathematics and Computer Science , Dynamical Systems, Statistics and Data Analysis, Danish Maritime Accident Investigation Board (DMAIB)
Dangers of using CO₂ to quench wood pellet silo fires

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Industrial Fire Prevention, LLC
Contributors: Hedlund, F. H., Nichols, J.
Publication date: 2018

Publication information
Media of output: Canadian biomass
Year: 2018
Original language: English
Electronic versions:
URLs:
https://www.canadianbiomassmagazine.ca/pellets/hazards-of-using-co2-to-quench-silo-fires-6715

Bibliographical note
https://www.canadianbiomassmagazine.ca/pellets/hazards-of-using-co2-to-quench-silo-fires-6715
Last modified: 12/02/2018
Source: PublicationPreSubmission
Source-ID: 145756000
Research output: Communication › Net publication - Internet publication – Annual report year: 2018

Do Not Release Carbon Dioxide If Flammable Vapors Are Present – Static Electricity May Lead To Explosion

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Publication date: 2018

Publication information
Media of output: Sciencetrends.com
Year: 2018
Original language: English
Electronic versions:
Do_Not_Release_Carbon_Dioxide_If_Flammable_Vapors_Are_Present_Static_Electricity_May_Lead_To_Explosion_Science_Trends.pdf

Bibliographical note
Last modified: 06/04/2018
Source: PublicationPreSubmission
Source-ID: 145968616
Research output: Communication › Net publication - Internet publication – Annual report year: 2018
Fighting pellet silo fires

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Industrial Fire Prevention, LLC
Contributors: Hedlund, F. H., Nichols, J.
Pages: 9
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Pellet Mill Magazine
Volume: 8
Issue number: 1
Original language: English
Electronic versions:
2018_Fighting_pellet_silo_fires_Pellet_Mill_Magazine_8_1_9.pdf
Source: PublicationPreSubmission
Source-ID: 148956771
Research output: Research - peer-review › Journal article – Annual report year: 2018

Finanskrise

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Number of pages: 1
Pages: 15
Publication date: 2018
Peer-reviewed: Unknown

Publication information
Journal: Weekendavisen
Issue number: 36 - 7. september 2018
ISSN (Print): 0106-4142
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Electronic versions:
2018_09_WA_Finanskrise_Frank_Hedlund_preprint_003_.pdf
Research output: Communication › Contribution to newspaper - Comment/debate – Annual report year: 2018

Incomplete understanding of biogas chemical hazards – Serious gas poisoning accident while unloading food waste at biogas plant

At a biogas plant, a truck driver was overcome by toxic fumes while unloading food waste slurry collected at sites that operate a shredder and tank system. Trucks unload their cargo into a feedstock pit. While unloading, hydrogen sulfide, carbon dioxide and possibly other toxic gases were released. Ventilation systems were overwhelmed. The driver narrowly escaped death. Several would-be rescuers collapsed. Under marginally different conditions, this accident could have led to five fatalities. The case offers a rich account of the actions of fellow workers who with stubborn determination sought to extract the unconscious driver. Even after having collapsed themselves, been extracted and recovered, they re-entered the building - amazingly still without realizing the gas danger. The article argues that long retention time in the logistics chain may alter the hazard profile of food waste slurry. This emerging risk appears overlooked and under-studied. The case exposes insufficient attention to safety in the rapidly expanding biogas sector. The biogas plant was unprepared. The investigation was quick, superficial and woefully inadequate. Root causes were not identified. Broad information sharing is limited or non-existent.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Kuldioxid er uegnet til kvælning af glødebrande

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Pages: 16-19
Publication date: 2018
Peer-reviewed: Unknown

Publication information
Journal: Dansk Kemi
Volume: 99
Issue number: 1
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2007): Indexed yes
Web of Science (2004): Indexed yes
Original language: English
Electronic versions:
2018_01_DKemi_Kuldioxid_er_uegnet_til_kvaelning_af_gledebrande.pdf
Source: PublicationPreSubmission
Source-ID: 143939573
Research output: Communication » Journal article – Annual report year: 2018

Land-use planning risk estimates for a chemical industrial park in China - A longitudinal study

A chemical industrial park (CIP) can centralize the management of companies and facilitate mutual communication between different businesses. Due to these advantages, an increasing number of chemical companies are forced into CIP, especially in developing countries such as China. Thus, the land-use planning of CIP associated with safety becomes an important issue. To illustrate the importance of the continuous risk supervision and give more experiences to other similar changing CIP, we apply a simplified quantitative risk assessment procedure to estimate the risk to a Chinese chemical industrial park (19 x 10 km²) near a rather densely populated off-site region for the years 2014 and 2017. Estimated levels of individual risk and societal risk are compared with Chinese risk acceptance criteria for land-use planning. Off-site risk levels have increased significantly from 2014 to 2017. While off-site risk levels are still low and within the acceptable region, the study concludes that the authorities should review carefully and monitor the risk level in case of future development activities around and within the chemical industrial park, e.g. preserving a buffer zone should be considered. For future chemical park design, it is highly recommended to proactively include QRA analysis especially to deal with risk in an efficient way.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Department of Chemical and Biochemical Engineering, PROSYS - Process and Systems Engineering Centre,
Scopus rating (1999): SJR 0.213 SNIP 0.597
Original language: English
Keywords: Chemical industrial park, Major hazard potential, Quantitative risk assessment, Risk acceptance criteria, Land-use planning
DOI:
10.1002/prs.11972
Source: FindIt
Source-ID: 2419100281
Research output: Research - peer-review › Journal article – Annual report year: 2018

Säkerhetsutmaningar med väte som energibärare
Många spår att väte får en viktig roll i framtidens energisystem. Det är inte ofarligt eftersom luft-väteblandningar är ytterst lättantändliga och explosionsfarliga.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Pages: 23-26
Publication date: 2018
Peer-reviewed: No

Publication information
Journal: Kemivärlden Biotech med Kemisk Tidsskrift
Issue number: 4
ISSN (Print): 1650-0725
Original language: Swedish
Electronic versions:
2018_06_KB_V_te_s_kerhetsutmaningar.pdf
Source: PublicationPreSubmission
Source-ID: 151964126
Research output: Research › Journal article – Annual report year: 2018

Silo response and safety: The dangers of using carbon dioxide to quench silo fires
The dangers of using carbon dioxide to quench silo fires.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Industrial Fire Prevention, LLC
Contributors: Hedlund, F. H., Nichols, J.
Pages: 50-54
Publication date: 2018
Peer-reviewed: No

Publication information
Journal: Fire Fighting in Canada
Volume: 62
Issue number: 3
ISSN (Print): 0015-2595
Original language: English
Electronic versions:
2018_05_Dangers_CO2_Fire_Fighting_in_Canada_3p.pdf
Source: PublicationPreSubmission
Source-ID: 152013858
Research output: Research › Journal article – Annual report year: 2018

Silo response - The dangers of using carbon dioxide to quench silo fires

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Industrial Fire Prevention, LLC
Stort udslip af giftig gas ved aflæsning af madaffald (Major release of toxic gas while unloading food waste at biogas plant)

Svovlbrinte stinker, men dræber uden lugt
Svovlbrinte stinker, men dræber uden lugt

Den stank af rådne æg, som svovlbrinte har, forsvinder ved store mængder. Fra Danmark til Kina har man eksempler på, at mennesker er døde i gasulykker, helt uden at have 'lugtet lunten'.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Publication date: 2018

Publication information
Media of output: videnskab.dk
Year: 2018
Original language: English
URLs:
https://videnskab.dk/naturvidenskab/svovlbrinte-stinker-men-draeber-uden-lugt

Bibliographical note
https://videnskab.dk/naturvidenskab/svovlbrinte-stinker-men-draeber-uden-lugt
Last modified: 09/06/2018
Source: PublicationPreSubmission
Source-ID: 153016173
Research output: Communication › Net publication - Internet publication – Annual report year: 2018

Svovlsyres fortyndingsvarme

[Dansk sammendrag] Det er god latin, at syrer fortyndes ved at hælde syren i vand, aldrig omvendt. Der udvikles betydelige mængder varme, og kogning kan slyne syre og vand ud af beholderen. Selvom svovlsyre anvendes i enorme mængder, er det overraskende vanskeligt at finde data for fortyndingsvarmen. Det rådes der bod på med denne artikel

[English summary] Although sulfuric acid is one of the most fundamentally important heavy industrial chemicals and produced in very large quantities, there is little practical guidance in open sources on how to estimate the heat of dilution. This article provides a simple method to estimate the increase in temperature upon diluting sulfuric acid with water.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, Department of Chemical and Biochemical Engineering, PROSYS - Process and Systems Engineering Centre
Contributors: Hedlund, F. H., Frutiger, J., Sin, G.
Pages: 16-20
Publication date: 2018
Peer-reviewed: Unknown

Publication information
Un tanque de levadura excedente falla con consecuencias catastróficas
Un gran tanque de levadura excedente voló por los aires, y solo quedó la placa de base y el contenido del tanque. Aunque el tanque no había sido concebido para sobrepresión, se mantenía a "una sobrepresión muy ligera" para evitar la formación de espuma no deseada. La cervecería no conocía los riesgos relacionados con el aire comprimido.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H., Selig, R. S.
Pages: 76-79
Publication date: 2018
Peer-reviewed: No

Publication information
Journal: BRAUWELT En Español
Volume: 22
Issue number: May
ISSN (Print): 1619-537X
Original language: Spanish
Source: PublicationPreSubmission
Source-ID: 148654698
Research output: Research ▶ Journal article – Annual report year: 2018

Är sprängplattan vänd åt rätt håll?
Sprängplattor används för att skydda mot övertryck. Hur tillförlitliga de är beror helt och hållet på om sprängplattan är vänd åt rätt håll.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Pages: 22-23
Publication date: 2017
Peer-reviewed: No

Publication information
Journal: Kemivärlden Biotech med Kemisk Tidsskrift
Issue number: 3
ISSN (Print): 1650-0725
Original language: Swedish
Electronic versions: 2017_05_KB_Ar_sprangplattan_vand_at_ratt_hall.pdf
Source: PublicationPreSubmission
Source-ID: 152013174
Beskedent overtryk gav spektakulære følger
For at undertrykke generende opskumning blev en tank sat under et såkaldt "meget beskedent overtryk". Pludselig svigtede samlingen i bunden. Tanken nåede en højde på 30 m og faldt ned og knuste en varevogn. Uheldet viser, at et stort volumen af gas under lavt tryk indeholder en ikke uvæsentlig mængde energi.

Biomass accident investigations – missed opportunities for learning and accident prevention
The past decade has seen a major increase in the production of energy from biomass. The growth has been mirrored in an increase of serious biomass related accidents involving fires, gas explosions, combustible dust explosions and the release of toxic gasses. There are indications that the number of bioenergy related accidents is growing faster than the energy production. This paper argues that biomass accidents, if properly investigated and lessons shared widely, provide ample opportunities for improving general hazard awareness and safety performance of the biomass industry. The paper examines selected serious accidents involving biogas and wood pellets in Denmark and argues that such opportunities for learning were missed because accident investigations were superficial, follow-up incomplete and information sharing absent. In one particularly distressing case, a facility saw a repeat accident, this time with fatal outcome, still without any learning taking place. The paper presents some information on other biomass accidents in Denmark, mostly involving biogas from anaerobic digestion. Details are lacking however, precisely because the accidents were insufficiently investigated and results not communicated. The biomass industry needs to pay more attention to safety. Utmost care should be taken to avoid so-called mediashifting i.e. that the resolution of a problem within one domain, the environmental, creates a new problem in another, the workplace safety domain.
**Blygsamt övertryck fick spektakulära följer**
För att minska besvärande skumning sattes en tank under "mycket blygsamt" övertryck. Plötsligt brast botten. Tanken för 30 meter upp i luften, föll ned och krossade en varubil. Olyckan visar att en stor gasvolym under lågt tryck innehåller en väsentlig mängd energi.

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**Explosion i rötkammare med biogas**

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**Er sprængpladen vendt korrekt?**
Sprængplader anvendes til overtryksbeskyttelse. Pålideligheden er helt afhængig af, om sprængpladen er vendt rigtigt.

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**Bibliographical note**
Artiklen er tidligere trykket i Dansk Kemi 97, nr. 5, 2016

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**General information**
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Pages: 21-23
Publication date: 2017
Peer-reviewed: Yes

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**Publication information**
Journal: Kemivärlden Biotech med Kemisk Tidsskrift
Issue number: 2
ISSN (Print): 1650-0725
Original language: English
Electronic versions: 2017_04_KB_Blygsamt_vertryck.pdf
Source: PublicationPreSubmission
Source-ID: 131996622
Research output: Research - peer-review » Article in proceedings – Annual report year: 2017

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**Publication information**
Journal: Kemi
Volume: 77
Issue number: 1
ISSN (Print): 0023-1983
Ratings:
  - ISI indexed (2013): ISI indexed no
  - ISI indexed (2012): ISI indexed no
  - ISI indexed (2011): ISI indexed no
Original language: Danish

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**Publication information**
Source: PublicationPreSubmission
Source-ID: 130116495
Research output: Communication » Journal article – Annual report year: 2017
Fighting Smoldering Fires in Silos – A Cautionary Note on Using Carbon Dioxide to Inert
This communication seeks to draw attention to the hazards of releasing liquid carbon dioxide into environments where an ignitable atmosphere may exist. Static discharges have sufficient energy to ignite flammable vapors and an internal explosion may result when fighting smoldering fires using this approach.

A recent article in Biomass and Bioenergy examines an explosion in a Norwegian wood pellet silo when attempting to suppress a smoldering fire with CO₂. The article argues that the electrostatic hazard of CO₂ is widely under-appreciated and incidents like this are avoidable.

Risici ved midlertidige oplag af farligt gods.

[English summary] Following a major fireworks accident in Seest (2004), the statutory order implementing the EU Seveso directive in Denmark was enlarged in 2005 to cover also temporary storage of dangerous substances at transportation hubs such as marine terminals and railway yards. The rationale is quite sensible – the risk posed to nearby communities can be permanent even though the individual cargo is present temporarily only. The enlargement of order was ill conceived however, and implementation of the new measures has been troubled, in particular because transportation companies only have information on dangerous goods as provided in ADR/RID/IMO transportation documents, and the nature of this information is incompatible with the Seveso legislation’s definition of dangerous substances. The paper provides a critical commentary on the rule-making and subsequent consultation processes and examines the dismal implementation status 12 years later (2017).
Sikring af risikovirksomheder
Nu skal risikovirksomheder udføre en sårbarhedsvurdering. Det er en følge af regeringens terrorhandlingsplan. En vejledning har netop været i høring.

Svigt af inertgas purge medførte eksplosion i beholder

Tank für Überschusshefe versagt – mit katastrophalen Folgen

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H., Selig, R. S.
Pages: 229-232
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Brauwelt
Volume: 157
Issue number: 8-9
ISSN (Print): 0724-696X
Original language: German
Research output: Research - peer-review › Journal article – Annual report year: 2017

剩余酵母罐出现故障-灾难性的后果
建议慎重：一个盛放剩余酵母的大罐子飞向空中，只剩下底板和罐子中的内容物质。虽然罐子不是针对过压设计的，但它也处于“非常低的过压”下，以防止过多的泡沫。啤酒厂不清楚压缩空气的危害，本文描述的事故应该告诉人们，如果原本针对大气压力设计的罐子改用在轻微过压环境中，必须特别谨慎。

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H., Selig, R. S.
Pages: 9-11
Publication date: 2017
Peer-reviewed: Yes

Publication information
Beskedent overtryk gav spektakulære følger

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H.
Pages: 20-22
Publication date: 2016
Peer-reviewed: Unknown

Publication Information
Journal: Dansk Kemi
Volume: 97
Issue number: 4
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2007): Indexed yes
Web of Science (2004): Indexed yes
Original language: Danish
Electronic versions:
Beskedent_overtryk_gav_spektakulaere_foelger.pdf
URLs:

Bibliographical note
Source: PublicationPreSubmission
Source-ID: 123429792
Research output: Communication › Journal article – Annual report year: 2016

Er sprængpladen vendt korrekt?

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H.
Pages: 41-42
Publication date: 2016
Peer-reviewed: No

Publication Information
Journal: Dansk Kemi
Volume: 97
Issue number: 5
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Fatal Accidents During Marine Transport of Wood Pellets Due to Off-gassing – Experiences from Denmark

The atmosphere in unventilated wood pellet storage confinements, such as the cargo hold of marine vessels transporting pellets in solid bulk, can be severely oxygen deficient and contain deadly concentrations of harmful gasses, of which the most feared is the poisonous and odour-less carbon monoxide. The hazard has been known for over a decade and has been responsible for many accidents. We examine three fatal accidents on marine vessels in or near Danish waters and argue that they share strikingly similar aetiologies, if not repetitive patterns. It is generally recognized that accidents should be thoroughly investigated and lessons learned shared widely in order to minimize the number of times the same lessons have to be learned. The three Danish cases suggest that this learning process is deeply troubled for the solid biomass segment. The International Maritime Organization IMO/SOLAS has recently revised its guidance on entering enclosed spaces aboard ships in response to the ongoing problem of confined space incidents. We argue that the interpretation of the concept of an "enclosed space" is of utmost importance because accidents take place in rooms that are not considered enclosed by the crew.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS, Danish Maritime Accident Investigation Board (DMAIB)
Contributors: Hedlund, F. H., Jarleivson Hilduberg, Ø.
Pages: 73-97
Publication date: 2016

Host publication information
Title of host publication: Biomass Volume Estimation and Valorization for Energy
Publisher: InTechOpen
Editor: Tumuluru, J. S.
Keywords: Wood pellets, Off-gassing, Confined space, Accident investigation
Electronic versions:
Fatal_Accidents_During_Marine_Transport_of_Wood_Pellets_Due_to_Off_Gassing_Experiences_from_Denmark.pdf
DOIs: 10.5772/66334.
Source: PublicationPreSubmission
Source-ID: 127189116
Research output: Research › peer-review › Book chapter – Annual report year: 2016

Har tanken et svagt tag?

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H., Eisfeld Linde, B.
Pages: 20-21
Publication date: 2016
Peer-reviewed: No

Publication information
Journal: Dansk Kemi
Volume: 97
Large Steel Tank Fails and Rockets to Height of 30 meters - Rupture Disc Installed Incorrectly

At a brewery, the base plate-to-shell weld seam of a 90-m³ vertical cylindrical steel tank failed catastrophically. The 4 ton tank “took off” like a rocket leaving its contents behind, and landed on a van, crushing it. The top of the tank reached a height of 30 m. The internal overpressure responsible for the failure was an estimated 60 kPa. A rupture disc rated at <50 kPa provided overpressure protection and thus prevented the tank from being covered by the European Pressure Equipment Directive. This safeguard failed and it was later discovered that the rupture disc had been installed upside down. The organizational root cause of this incident may be a fundamental lack of appreciation of the hazards of large volumes of low-pressure compressed air or gas. A contributing factor may be that the standard piping and instrumentation diagram (P&ID) symbol for a rupture disc may confuse and lead to incorrect installation. Compressed air systems are ubiquitous. The medium is not toxic or flammable. Such systems however, when operated at "slight overpressure" can store a great deal of energy and thus constitute a hazard that ought to be addressed by safety managers.
GOOD REASON FOR CAUTION
A large surplus yeast tank shot into the air leaving the floor plate and the contents behind. Although not designed for overpressure, the tank was kept at “very slight overpressure” to suppress nuisance foaming. The brewery was unaware of the hazards of compressed air. The accident described in this article serves to illustrate that care should be taken if a tank originally designed for atmospheric pressure is modified to operate at slight overpressure.
Syrebrist och ambulansfärd av tårta

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H.
Pages: 24-26
Publication date: 2016
Peer-reviewed: No

Publication information
Journal: Kemivärlden Biotech med Kemisk Tidsskrift
Volume: 4
Issue number: June
ISSN (Print): 1650-0725
Original language: Swedish
Electronic versions:
Syrebrist_och_ambulansf_rd_av_t_rta.pdf

Bibliographical note
Source: PublicationPreSubmission
Source-ID: 125621890
Research output: Research › Journal article – Annual report year: 2016

Eksplosion i rådnetank med biogas

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 28-33
Publication date: 2015
Peer-reviewed: No

Publication information
Journal: HVAC Magasinet
Volume: 51
Issue number: 8
ISSN (Print): 1603-6913
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
2015_08_HVAC_Eksplosion_i_r_dnetank_med_biogas.pdf
URLs:
http://ipaper.ipapercms.dk/TechMedia/HVACMagasinet/

Bibliographical note
Source: PublicationPreSubmission
Source-ID: 125621890
Research output: Research › Journal article – Annual report year: 2015

Eksplosion i saltmine
Explosion of lithium-thionyl-chloride battery due to presence of lithium nitride

An explosion of a lithium–thionyl-chloride (Li–SOCl₂) battery during production (assembly) leads to serious worker injury. The accident cell batch had been in a dry-air intermediate storage room for months before being readied with thionyl chloride electrolyte. Metallic lithium can react with atmospheric nitrogen to produce lithium nitride. Nodules of lithium nitride were found to be present on the lithium foil in other cells of the accident batch. The investigation attributed the explosion to the formation of porous lithium nitride during intermediate storage and a violent exothermal decomposition with the SOCl₂–LiAlCl₄ electrolyte triggered by welding. The literature is silent on hazards of explosion of Li–SOCl₂ cells associated with the presence of lithium nitride. The silence is intriguing. Possible causes may be that such explosions are very rare, that explosions go unpublished precisely as this case initially did, or a combination of the two.
Kraftig eksplosion efter sammenblanding af salpetersyre og 2-propanol
Når kuldioxid koster liv

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, COWI AS
Contributors: Hedlund, F. H.
Pages: 12-13
Publication date: 2015
Peer-reviewed: No

Publication information
Journal: Kjemi
Volume: 75
Issue number: 1
ISSN (Print): 0023-1983
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
URLs:
http://www.kjemidigital.no/magasiner/kjemi-1-2015/ (Link to article at www.kjemidigital.no)

Bibliographical note
Source: PublicationPreSubmission
Source-ID: 112137241
Research output: Research › Journal article – Annual report year: 2015

Eksplosion i rådnetank med biogas

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 12-15
Publication date: 2014
Erfaringer frem for ansvar.: Vi får ingen lærlige svar uden at stille de rigtige spørgsmål: Hvordan og hvorfor

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 33
Publication date: 2014
Peer-reviewed: No

Explosiv överraskning för bryggeri
Bör man känna till att vissa alkoholhaltiga rengöringsmedel som blandas med salpetersyra kan ge upphov till raketbränsle. På ett dansk bryggeri hade man ingen aning.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 29-30
Publication date: 2014
Peer-reviewed: No
Inherent hazards, poor reporting and limited learning in the solid biomass energy sector: A case study of a wheel loader igniting wood dust, leading to fatal explosion at wood pellet manufacturer

Large loaders are commonly used when handling solid biomass fuels. A preventable accident took place in 2010, where the malfunction of a front-end wheel loader led to a dust explosion which killed the driver and destroyed the building. The case offers an opportunity to examine the hazards of solid biomass, the accident investigation and any learning that subsequently took place.

The paper argues that learning opportunities were missed repeatedly. Significant root causes were not identified; principles of inherent safety in design were ignored; the hazardous area classification was based on flawed reasoning; the ATEX assessment was inadequate as it dealt only with electrical installations, ignoring work operations; and powered industrial trucks had not been recognized as a source of ignition. Perhaps most importantly, guidelines for hazardous area classification for combustible dust are insufficiently developed and give ample room for potentially erroneous subjective individual judgment. It is a contributing factor that combustible dust, although with great hazard potential, is not classified as a dangerous substance. Accidents therefore fall outside the scope of systems designed to disseminate lessons learned and prevent future accidents.

More attention to safety is needed for the renewable energy and environmentally friendly biomass pellet industry also to become sustainable from a worker safety perspective.
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.42 SJR 1.666 SNIP 1.811
Web of Science (2013): Impact factor 3.411
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.66 SJR 1.516 SNIP 1.754
Web of Science (2012): Impact factor 2.975
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 4.74 SJR 1.759 SNIP 2.296
Web of Science (2011): Impact factor 3.646
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.914 SNIP 2.251
Web of Science (2010): Impact factor 3.84
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.728 SNIP 2.183
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.614 SNIP 2.137
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.361 SNIP 1.825
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.268 SNIP 1.991
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.214 SNIP 1.401
Scopus rating (2004): SJR 1.027 SNIP 1.665
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.659 SNIP 1.378
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.396 SNIP 0.775
Scopus rating (2001): SJR 0.455 SNIP 1.048
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.447 SNIP 0.958
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.429 SNIP 1.064
Original language: English
Keywords: Biomass, Wood pellets, Powered industrial truck, Dust explosion, ATEX hazardous area classification, Learning from past accidents
Electronic versions:
Inherent_hazards1.pdf
DOIs:
10.1016/j.biombioe.2014.03.039
Source: dtu
Source-ID: u::11006
Research output: Research - peer-review › Journal article – Annual report year: 2014

Kraftig eksplosion efter sammenblanding af salpetersyre og 2-propanol

General information
**Kronik: 30 år efter Bhopal overser vi stadig budskabet**

**General information**
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Number of pages: 1
Publication date: 2014
Peer-reviewed: No

**Publication information**
Journal: Ingenioeren
ISSN (Print): 0105-6220
Ratings:
- ISI indexed (2013): ISI indexed no
- ISI indexed (2012): ISI indexed no
- ISI indexed (2011): ISI indexed no
- Web of Science (2007): Indexed yes
- Web of Science (2004): Indexed yes
Original language: Danish
Electronic versions:
- 2014_12_Ing_Kronik_30_r_efter_Bhopal_overser_vi_stadig_budskabet.pdf
Source: PublicationPreSubmission
Source-ID: 99895648
Research output: Research → Journal article – Annual report year: 2014

**Bibliographical note**
Publiceret online 2. dec. 2014

**Kronik: Mystiske julebrande i Moirans-en-Montagne**

**General information**
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Number of pages: 3
Publication date: 2014
Peer-reviewed: Unknown
Kronik: Sammenstyrtet motorvejsbro – igen.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Number of pages: 1
Publication date: 2014
Peer-reviewed: No

Publication information
Journal: Ingenioeren
ISSN (Print): 0105-6220
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
Sammenstyrtet_motorvejsbro igen_Denne_gang m_vitage ved l_re.pdf
URLs:

Bibliographical note
Online kronik, publiceret 29. sep. 2014, kl. 09:04
Source: PublicationPreSubmission
Source-ID: 103224988
Research output: Research › Journal article – Annual report year: 2014

Leder: Spildte muligheder koster liv

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 4
Publication date: 2014
Peer-reviewed: No

Publication information
Journal: Dansk Kemi
Volume: 95
Issue number: 11
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
LNG safety – an emerging and ignored issue in the climate change debate

**General information**
- State: Published
- Organisations: Department of Applied Mathematics and Computer Science, COWI AS
- Contributors: Hedlund, F. H.
- Number of pages: 1
- Publication date: 2014
- Peer-reviewed: Unknown

**Publication information**
- Journal: European Safety and Reliability Association Newsletter
- Issue number: September
- Original language: English
- Electronic versions:
  - LNG_safety_an_emerging_and_ignored_issue_in_the_climate_change_debate_ESRA_Newsletter_Sept_2014_p2.pdf
- Source: PublicationPreSubmission
- Source-ID: 104132624
- Research output: Communication – Journal article – Annual report year: 2014

Solid Biomass Climate Change Interventions Examined in a Context of Inherent Safety, Media Shifting and Emerging Risks

This paper examines recent evidence from Denmark and abroad regarding climate change projects that aim to reduce global carbon dioxide emissions by converting coal-fired thermal power plants to solid biomass fuel. The paper argues that projects appear to be pursued narrow-mindedly with insufficient attention paid to safety and points to evidence of media shifting - that the 'resolution' of a problem within the environmental domain creates a new problem in the workplace safety domain. From the perspective of inherent safety the paper argues that the conversion is a step in the wrong direction as a low risk fuel is substituted for a less safe one. Because of rapid scale-up and handling of unprecedented quantities, solid biomass qualify as an emerging risk for which proper control strategies have yet to be developed. The paper finally argues that the tendency to prioritize environmental benefits over safety concerns seems to run deep and not confined to the realm of only solid biomass. Danish environmental ambitions are very high and the costs to society of introducing solid biomass fuels are breathtaking. In this setting, the general failure to address safety risks appears particularly disheartening.

**General information**
- State: Published
- Organisations: Department of Applied Mathematics and Computer Science, COWI AS, Combustible Dust Policy Institute
- Contributors: Hedlund, F. H., Astad, J.
- Pages: 1410-1427
- Publication date: 2014
- Peer-reviewed: Yes

**Publication information**
- Journal: Human and Ecological Risk Assessment
- Volume: 21
- Issue number: 5
- ISSN (Print): 1080-7039
- Ratings:
  - BFI (2018): BFI-level 1
  - Web of Science (2018): Indexed yes
  - BFI (2017): BFI-level 1
Støveksplosion ødelægger dansk træpillefabrik - igen


The relationship between the implementation of voluntary Five-Star occupational health and safety management system and the incidence of fatal and permanently disabling injury

This paper examines two properties of the South African NOSA 5-Star System, a voluntary occupational health and safety (OHS) management system. The first property is the association between system implementation and final OHS outcomes...
measured as incidence rates of fatal and permanently disabling injury. The second is the association between the Star audit rating and rates of serious occupational injury.

Although there are many uncertainties involved the paper argues that companies committed to the NOSA system experienced fewer fatal and permanently disabling injuries than the general manufacturing sector. The paper also examines an inverse correlation between the Star rating and the injury incidence rate. It is concluded that the Star rating is a sound although imperfect predictor of injury rates. The fact that auditing is an entirely voluntary activity likely distorts the Star rating to some extent. It is speculated that some (unsafe) companies may abandon or pause auditing if they experience too many injuries. There is also some evidence to suggest that companies with poor safety attitudes are able to successfully deceive auditors.

The paper suggests that voluntary OHS audit systems are embedded in structural problems that set limits to what they can reasonably be expected to accomplish. The fundamental issues are about naivety and the intrinsic viability of self-regulation. In a broader view however, the adoption of such systems might well be endorsed by policymakers because of their positive impact on OHS. It is clear though, that such systems cannot substitute authority enforcement activities.

**General information**

State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Pages: 94–103
Publication date: 2014
Peer-reviewed: Yes

**Publication Information**

Journal: Safety Science
Volume: 63
ISSN (Print): 0925-7535
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.22 SJR 1.113 SNIP 2.004
Web of Science (2017): Impact factor 2.835
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.81 SJR 1.097 SNIP 1.99
Web of Science (2016): Impact factor 2.246
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.73 SJR 0.969 SNIP 1.932
Web of Science (2015): Impact factor 2.157
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.69 SJR 0.973 SNIP 2.264
Web of Science (2014): Impact factor 1.831
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.25 SJR 0.847 SNIP 2.195
Web of Science (2013): Impact factor 1.672
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.04 SJR 0.883 SNIP 1.911
Web of Science (2012): Impact factor 1.359
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2 SJR 0.817 SNIP 1.728
Violent explosion after inadvertent mixing of nitric acid and isopropanol – Review 15 years later finds basic accident data corrupted, no evidence of broad learning

At a brewery in 1997, an operator confused filling nozzles for two commonly used acid cleaning agents and transferred nitric acid into a tank with P3, a proprietary phosphoric acid based cleaner that also contained 5–15% isopropanol. 10–15 min later the mixture exploded violently. The stainless steel tank disintegrated with such force that fragments lodged in walls of concrete. The explosion ravaged the cellar, destroyed equipment, blew out a masonry wall and released large amounts of nitrous oxide fumes. Likely, 62% nitric acid (CAS 7697-37-2) and isopropanol (2-propanol, CAS 67-63-0) reacted to produce isopropyl nitrate (nitric acid 1-methylethyl ester, CAS 1712-64-7), a rocket propellant. It is argued that the accident has broad learning potential because of the widespread usage of the two chemicals across industries, the innocent nature of the human error and the severity of the consequence.

A review 15 years later of lessons learned finds that information dissemination has followed a tradition of informal meetings in small industry sector associations but impact is unclear. There is no useful mention of the accident in open sources. Although the Danish Working Environment Authority took the brewery to court for negligence, they did not report or investigate the accident, or attempt to disseminate information available to them. Today, the general literature is silent on the explosion hazards of mixing the two chemicals.

The paper argues that without institutional support, learning opportunities are missed and broader cross-sector learning is limited or non-existent.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Danish Emergency Management Agency, COWI AS
Contributors: Hedlund, F. H., Folmer Nielsen, M., Hagen Mikkelsen, S., Kragh, E. K.
Pages: 255-261
Publication date: 2014
Violent explosion at fireworks depot. Two years after the 2004 Seest accident in Denmark, the accident repeated itself in the UK, Festival Fireworks, Marlie Farm, East Sussex, 2006 explosion. Emergency responders were badly prepared and had insufficient knowledge of earlier mass explosion accidents in fireworks depots/containers. Miss Fortuna played an important role in the Danish accident, not so in the UK. Multiple investigations were carried out in Denmark. Nevertheless, the quality of the single UK investigation of the Marlie Farm accident released three years later exceeds all the Danish investigations combined.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 12-15
Publication date: 2014
Peer-reviewed: No

Publication information
Journal: Dansk Kemi
Volume: 95
Issue number: 11
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2007): Indexed yes
Web of Science (2004): Indexed yes
Original language: Danish
Electronic versions:
2014_11b_DKemi_11_12_15_Marlie_Farm.pdf
Source: PublicationPreSubmission
Source-ID: 101358790
Research output: Research - peer-review - Journal article – Annual report year: 2014

Voldsom eksplosion på fyrværkerivirksomhed
To år efter Seest gentog ulykken sig i England. Container eksploderede og dræbte to brandfolk.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, COWI AS
Contributors: Hedlund, F. H.
Pages: 32-33
Publication date: 2014
Peer-reviewed: No

Publication information
Journal: Brandvaesen
Texas' laissez faire-mentalitet giver stof til eftertanke: Kronik

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Number of pages: 1
Pages: 17
Publication date: 14 Jun 2013
Peer-reviewed: Unknown

Publication information
Journal: Ingeniøren
ISSN (Print): 0105-6220
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
2013_Ing_Kronik_Texas_laissez_faire_mentalitet_giver_stof_til_eftertanke_preprint.pdf
URLs:
http://ing.dk/artikel/kronik-texas-laissez-faire-mentalitet-giver-stof-til-effetranke-159563

Bibliographical note
1. sektion.
Source: dtu
Source-ID: u::7697
Research output: Communication › Journal article – Annual report year: 2013

Glemt DDR-katastrofe viser faren ved transport af kuldioxid

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Pages: 18-19
Publication date: 7 Jun 2013
Peer-reviewed: Unknown

Publication information
Journal: Ingeniøren
ISSN (Print): 0105-6220
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Challenges in risk assessment Insidious erosion of safety margins over time

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Publication date: 2013
Media of output: PowerPoint

Event information
Event: 2nd International Safety Conference in the North Sea Offshore Authorities Forum (NSOAF)
Location: Aberdeen, United Kingdom
Electronic versions:
Presentation_on_NSOAF_safety_conference_2010_dtu_orbit.pdf
Research output: Research › Sound/Visual production (digital) – Annual report year: 2013

Emerging risks from fires and explosions in solid biofuels - some evidence from Denmark

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Publication date: 2013
Media of output: PowerPoint

Event information
Event: 5th iNTeg-Risk Conference
Location: Stuttgart, Germany
Electronic versions:
Hedlund_Stuttgart_rev1
Research output: Research - peer-review › 2D/3D (physical products) – Annual report year: 2013

Når kuldioxid koster liv

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Pages: 12-16
Publication date: 2013
Peer-reviewed: No

Publication information
Journal: Dansk Kemi
Volume: 94
Issue number: 10
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2007): Indexed yes
Web of Science (2004): Indexed yes
Original language: Danish
Electronic versions:
prod21381229318161.DKemi_2013_Hedlund_N_r_kuldioxid_koster_liv.pdf
Past explosive outbursts of entrapped carbon dioxide in salt mines provide a new perspective on the hazards of carbon dioxide

This paper reports on a source of past carbon dioxide accidents which so far has only been sporadically mentioned in the literature. Violent and highly destructive outbursts of hundreds of tons of CO2 occurred regularly, if not routinely, in the now closed salt mines of the former DDR. The Menzengraben mine experienced an extreme outburst in 1953, possibly involving a several thousand tons of carbon dioxide. This source of accidents fills an important gap in the available carbon dioxide accident history and may provide a unique empirical perspective on the hazards of handling very large amounts of CO2.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Pages: 763-769
Publication date: 2013

Recorded fatal and permanently disabling injuries in South African manufacturing industry - Overview, analysis and reflection

Studies on occupational accident statistics in South Africa are few and far between, the most recent paper on the manufacturing sector was published in 1990. Accidents in South Africa are recorded in two systems: Exhaustive information is available from the insurance system under the Workmen’s Compensation Commissioner (WCC) but to access it on a timely basis is difficult. The legislative system under the Department of Labour (DOL) provides coarse but timely recordings. Interpretation is not simple however; both systems have seen changes to reporting formats and inclusion criteria over time, which hinder trend analysis. Also, the recordings of the two systems are not comparable due to major scope differences. This paper examines the relationship between the recordings in the two systems. Juxtaposing data from both systems the recordings of fatal accidents are found to be in agreement, somewhat less so for permanently disabling accidents/incidents. The paper examines if effects of the popular practice of replacing permanent workers with contract workers is visible in the WCC statistics – firm conclusions cannot be drawn however, due to data shortcomings. Data inaccuracies are reviewed and it is argued that WCC registrations may comprise industries outside the Standard Industrial Classification (SIC) scheme for manufacturing. The quality of accident reporting in official publications began to deteriorate by mid-1990s. The largest problem, however, is that reporting has come to a standstill, by mid-2012 the most recent WCC statistical publication covers 1999.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science
Contributors: Hedlund, F. H.
Pages: 149–159
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Safety Science
Volume: 55
ISSN (Print): 0925-7535
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.22 SJR 1.113 SNIP 2.004
Web of Science (2017): Impact factor 2.835
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.81 SJR 1.097 SNIP 1.99
Web of Science (2016): Impact factor 2.246
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.73 SJR 0.969 SNIP 1.932
Web of Science (2015): Impact factor 2.157
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.69 SJR 0.973 SNIP 2.264
Web of Science (2014): Impact factor 1.831
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.25 SJR 0.847 SNIP 2.195
Web of Science (2013): Impact factor 1.672
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.04 SJR 0.883 SNIP 1.911
Web of Science (2012): Impact factor 1.359
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2 SJR 0.817 SNIP 1.728
Web of Science (2011): Impact factor 1.402
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 0.781 SNIP 1.844
Web of Science (2010): Impact factor 1.637
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 0.693 SNIP 1.541
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.751 SNIP 1.435
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.484 SNIP 1.614
Scopus rating (2006): SJR 0.627 SNIP 1.274
Scopus rating (2005): SJR 0.369 SNIP 1.176
Scopus rating (2004): SJR 0.423 SNIP 0.878
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.401 SNIP 1.087
Scopus rating (2002): SJR 0.26 SNIP 0.907
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.443 SNIP 0.714
Scopus rating (2000): SJR 0.445 SNIP 0.603
Web of Science (2000): Indexed yes

The paper examines recent evidence from Denmark and abroad with climate change projects that aim to reduce global carbon dioxide emissions by converting coal fired thermal power plants to solid biomass fuel. The paper argues that projects appear to be pursued narrow-mindedly with insufficient attention paid to safety and points to evidence of media-shifting—that the ‘resolution’ of a problem within the environmental domain creates a new problem in the workplace safety domain. The paper argues that biomass pellets qualify as an emerging risk for which proper control strategies have yet to be developed.

Do provisions to advance chemical facility safety also advance chemical facility security? - An analysis of possible synergies

The European Commission has launched a study on the applicability of existing chemical industry safety provisions to enhancing security of chemical facilities covering the situation in 18 EU Member States. This paper reports some preliminary analytical findings regarding the extent to which existing provisions that have been put into existence to advance safety objectives due to synergy effects could be expected advance security objectives as well.
The paper provides a conceptual definition of safety and security and presents a framework of their essential components. Key differences are presented. A safety framework is examined with the intent to identify security elements potentially covered. Vice versa, a security framework is examined with the intent to identify safety elements potentially covered. It is concluded that synergies are largely absent at the preventive level. Synergies exist at the mitigation level. At the strategic policy level, synergies are obvious.

The security of chemical facilities is important. First, facilities with large inventories of toxic materials could be attractive targets for terrorists. The concern is sabotage causing an intentional release that could endanger neighbouring populated areas. Second, facilities where high-risk chemicals are present could present opportunities for theft. The concern is that relatively small amounts of highly toxic chemicals could be taken to another location selected for higher impact.

The Directive on European Critical Infrastructures (ECI Directive) addresses facility security but does not cover the chemical sector. Chemical facility safety at EU level is addressed by way of the Seveso-II Directive. Preliminary estimates by the chemical industry suggest that perhaps 80% of the existing safety measures under Seveso-II would also be instrumental in terms of raising security. Synergies of this magnitude would imply little need for additional chemical facility legislation.

This paper finds no support for the idea that strong synergies exist at chemical facility level.

**Fire in hot asphalt cargo hold, spontaneous ignition during unloading**

While unloading hot asphalt from a marine tanker, a fire broke out in the cargo hold. The likely cause was ingress of air caused by the unloading operation and subsequent ignition of asphalt deposits in the headspace due to the presence of pyrophoric iron sulphide compounds. The fire suddenly intensified while personnel were contemplating their options, but it responded well to a foam attack when the decision eventually was taken.
Susse Winther interviews Frank Hedlund in: [Når katastrofen rammer] /When disaster strikes: Hurricane Katrina
Striking a balance between, on the one hand, the need for centralization of the disaster emergency response, and on the other hand, the ability to achieve a flexible and improvised response, that uses scarce resources in an optimal manner – a flexibility which by nature requires decentralization.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis
Contributors: Hedlund, F. H.
Pages: 14-17
Publication date: 2012
Peer-reviewed: Unknown

Publication information
Journal: Fagmagasinet Samtænkning
Original language: English
Keywords: Disaster, Response, Resilience
Electronic versions: 2012_Samt_nkning_N_r_katastrofen_rammer_002_.pdf
Research output: Communication – Journal article – Annual report year: 2012

The extreme carbon dioxide outburst at the Menzengraben potash mine 7 July 1953
Carbon dioxide is an asphyxiant and an irritant gas. An extreme outburst of carbon dioxide took place 7 July 1953 in a potash mine in the former East Germany. During 25 min, a large amount of CO2 was blown out of the mine shaft with great force. It was wind still and concentrated CO2 accumulated in a valley leading to multiple asphyxiation casualties. Based on a review of concentration–response relationships, the location of victims, and other information, it is concluded that concentrations of 10–30% carbon dioxide may have occurred 450 m from the point of release for at least 45 min. It is concluded that 1100–3900 tonnes of CO2 were blown out of the mine shaft, possibly with intensities around 4 tonnes/s. It is also concluded that the large majority of the gas escaped as a near-vertical high-velocity jet with only little loss of momentum due to impingement. The release was modelled using PHAST. Output from the model is inconsistent with the asphyxiation harm observed. The high-momentum release is predicted to disperse safely and never reach the ground. Carbon dioxide capture and storage (CCS) schemes will involve handling and transportation of unprecedented quantities of CO2. Case histories to date include sudden releases of CO2 of up to 50 tonnes only, far too small to provide a suitable empirical perspective on predicted hazard distances for CCS projects. The 1953 outburst contributes to filling this gap.

General information
State: Published
Organisations: Mathematical Statistics, Department of Informatics and Mathematical Modeling
Contributors: Hedlund, F. H.
Pages: 537-553
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Safety Science
Volume: 50
Issue number: 3
ISSN (Print): 0925-7535
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.22 SJR 1.113 SNIP 2.004
Web of Science (2017): Impact factor 2.835
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.81 SJR 1.097 SNIP 1.99
Web of Science (2016): Impact factor 2.246
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.73 SJR 0.969 SNIP 1.932
Web of Science (2015): Impact factor 2.157
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.69 SJR 0.973 SNIP 2.264
Web of Science (2014): Impact factor 1.831
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.25 SJR 0.847 SNIP 2.195
Web of Science (2013): Impact factor 1.672
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.04 SJR 0.883 SNIP 1.911
Web of Science (2012): Impact factor 1.359
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2 SJR 0.817 SNIP 1.728
Web of Science (2011): Impact factor 1.402
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 0.781 SNIP 1.844
Web of Science (2010): Impact factor 1.637
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 0.693 SNIP 1.541
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.751 SNIP 1.435
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.484 SNIP 1.614
Scopus rating (2006): SJR 0.627 SNIP 1.274
Scopus rating (2005): SJR 0.369 SNIP 1.176
Scopus rating (2004): SJR 0.423 SNIP 0.878
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.401 SNIP 1.087
Scopus rating (2002): SJR 0.26 SNIP 0.907
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.443 SNIP 0.714
Scopus rating (2000): SJR 0.445 SNIP 0.603
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.321 SNIP 0.588
Original language: English
Keywords: Jet dispersion modelling, Carbon dioxide accident, Asphyxiation fatality, Toxicology
Electronic versions:
Menzen_53_submit_to_Orbit_.pdf
DOIs:
10.1016/j.ssci.2011.10.004

Bibliographical note
Source: orbit
Vision: Brint som energibærer? - sikkerhedsmæssige udfordringer

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Mathematical Statistics, Production and Service Management, Department of Management Engineering
Contributors: Hedlund, F. H., Markert, F.
Pages: 15-17
Publication date: 2012
Peer-reviewed: Unknown

Publication information
Journal: Dansk Kemi
Volume: 93
Issue number: 6-7
ISSN (Print): 0011-6335
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2007): Indexed yes
Web of Science (2004): Indexed yes
Original language: Danish
Electronic versions:
2012_DKemi_Vision_Brint_som_energibærer_sikkerhedsmæssige_udfordringer.pdf

Vision: Brint som energibærer? – sikkerhedsmæssige udfordringer

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Mathematical Statistics, Production and Service Management, Department of Management Engineering
Contributors: Hedlund, F. H., Markert, F.
Pages: 76-80
Publication date: 2012
Peer-reviewed: Unknown

Publication information
Journal: H V A C Magasinet
Volume: 2012
Issue number: 11
ISSN (Print): 1603-6913
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
URLs:
http://techmedia.swiflet.com/tm/hvac/73/1/
Source: dtu
Source-ID: u::5391

Dødsmart effektivisering

General information
State: Published
Organisations: Mathematical Statistics, Department of Informatics and Mathematical Modeling
Cleaner Production and Workplace Health and Safety: A combined approach. A case study from South Africa

Environmental goals may be pursued narrow-mindedly with no attention paid to the workplace. This book examines combined approaches in cleaner production projects. It explores two main avenues. First, integration into the project specification. The planning tools in use by assistance agencies are examined and it is argued that a dilemma of rigour or relevance exists. Small companies are relevant to target but do not meet rigorous support criteria. Large companies need no help, but are attractive due to low project risk. Second, integration of activities at company level. For large companies, integration of management systems is an option. A study on the South African Nosa 5-Star system refutes earlier criticism of dismal performance of top-down systems. It is argued that integration at this level is viable. For small companies, less formalistic approaches are required. ILO's network concept WISE was introduced to a Waste Minimization Club. It is argued that cost-savings arguments are too simplistic. They ignore both scarcity of managerial attention and opportunity costs, and cannot explain the behaviour of small companies.

General information
State: Published
Organisations: Mathematical Statistics, Department of Informatics and Mathematical Modeling
Contributors: Hedlund, F. H.
Number of pages: 316
Publication date: 2011

Ekstrem eksplosion af benzindampe - igen, igen
I de senere år har der været fl ere tilfælde, hvor antændelse af benzindampe i det fri har medført en detonation, der har forårsaget omfattende overtryksskader. Faren kunne have været erkendt langt tidligere, hvis tidligere uheld var blevet efterforsket ordentligt.

General information
State: Published
Organisations: Mathematical Statistics, Department of Informatics and Mathematical Modeling
Contributors: Hedlund, F. H.
Pages: 18-21
Publication date: 2011
Peer-reviewed: No
Worst case-scenarier opstår for ofte

General information
State: Published
Organisations: Mathematical Statistics, Department of Informatics and Mathematical Modeling
Contributors: Hedlund, F. H.
Publication date: 2011
Peer-reviewed: No

Publication information
Journal: Ingenioeren
Volume: 24. marts
ISSN (Print): 0105-6220
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
URLs:
http://ing.dk/artikel/117649-worst-case-scenarier-opstaar-for-ofte

Bibliographical note
Kronik.
Source: orbit
Source-ID: 314151
Research output: Research › Journal article – Annual report year: 2011

Institutional support of learning from accidents: some obstacles to getting a useful community-wide database in the EU

General information
State: Published
Organisations: Mathematical Statistics, Department of Informatics and Mathematical Modeling, Risø National Laboratory for Sustainable Energy
Contributors: Hedlund, F. H., Andersen, H. B.
Publication date: 2006
Peer-reviewed: No
Electronic versions:
904.pdf
Source: orbit
Source-ID: 314987
Research output: Research › Paper – Annual report year: 2006
Bombastiske initiativer løser ikke risikoproblemet

General information
State: Published
Organisations: COWI AS
Contributors: Hedlund, F. H., Kragh, E.
Publication date: 21 Nov 2004
Peer-reviewed: Unknown

Publication information
Journal: Ingenioeren
ISSN (Print): 0105-6220
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
Bombastiske_initiativer_loser_ikke_risikoproblemet.pdf
URLs:
http://ing.dk/artikel/bombastiske-initiativer-loser-ikke-risikoproblemet-59448
Source: PublicationPreSubmission
Source-ID: 92849256
Research output: Communication › Contribution to newspaper - Newspaper article – Annual report year: 2004

Atomterror - Risikoen er faldet efter den kolde krig

General information
State: Published
Organisations: Technical University of Denmark
Contributors: Hedlund, F. H.
Publication date: 4 Nov 2004
Peer-reviewed: Unknown

Publication information
Journal: Ingeniøren
Volume: 47
Issue number: 1
ISSN (Print): 0105-6220
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
URLs:
http://ing.dk/artikel/risikoen-er-faldet-efter-den-kolde-krig-59445
Source: dtu
Source-ID: u::9512
Research output: Communication › Journal article – Annual report year: 2004

Bhopal-katastrofen skyldtes et fatalt ledelsesmæssigt svigt

General information
State: Published
Organisations: COWI AS
Contributors: Hedlund, F. H.
Pages: 4
Publication date: 2004
Peer-reviewed: Unknown

Publication information
Journal: Ingenioeren
Volume: 50
Participation or rule - Which approach could have the better short term prospects of improving the working environment in South Africa?

During the apartheid era, industrial relations in South Africa were highly adversarial. The large black unions were basically mass protest organisations campaigning against white political power and the general climate was not conducive towards the creation of participatory structures at the workplace level. On the contrary, shop stewards were nurtured in the skills of confrontation and disruption. This paper argues that barriers to workplace participatory structures sown under apartheid will disappear only slowly and that this will negatively influence the prospects of such structures to be a vehicle for improvements in the working environment - at least in the short term. On the other hand, this paper argues, recent developments in the South African labour market are increasingly conducive towards the use of rules (or procedures) in the workplace. Companies increasingly produce and adhere to standard operating procedures (SOPs) a part of ISO quality management certification schemes. Furthermore, because of low levels of formal skills of the workforce, recent legislation requires employers to spend a certain percentage of the wage sum on skills upgrading. A likely consequence is that companies will standardise tasks by means of SOPs, train employees to follow the SOPs and then issue compliance certificates. The Scandinavian countries have a tradition of consensus, participation and reliance on local activities to advance the working environment. The paper does not seek to decry this participation-based approach or question the value of it, but rather point to certain limitations and difficulties if a similar approach is transferred to other countries, for example as part of development assistance programmes.
Workshop 411 - Frank Hedlund, Hvad spærer opklaring

Related event
Arbejdsmiljøkonferencen AM:2017
27/11/2017 → 28/11/2017
Nyborg, Denmark
Activity: Talks and presentations › Conference presentations

Security at chemical facilities – overview of different regulatory approaches taken in EU Member States
Period: 2 Nov 2017
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science
Dynamical Systems
Statistics and Data Analysis

Description
It is a European Union policy goal to enhance high-risk chemical facility security. This presentation presents some results of a study carried out for the European Commission, DG Home Affairs. The study aimed to provide an overview of existing provisions and measures that help to enhance security at chemical facilities. These provisions and measures may for instance have their background in safety legislation or non-regulatory initiatives implemented by industry or in specific legislative provisions targeting security aspects implemented by individual Member States. This presentation briefly reviews: 1) the concept of a high-risk chemical facility; 2) the analytical framework developed to identify security elements relevant for a chemical facility; and 3) possible synergies, the extent to which safety measures...
can be expected also to improve security. The study found that Member States have taken three distinct regulatory approaches: 1) folding security into Seveso safety legislation; 2) enlarging the scope of existing national security provisions; and 3) encouraging partnerships with industry associations to promote voluntary initiatives such as the security addendum to the Responsible Care programme. Denmark has recently taken the first approach, adding security to Seveso (III) safety reporting. The presentation briefly reviews some of the resulting challenges.

Degree of recognition: International

Documents:

SRA Nordic Chapter 2017

Related event

02/11/2017 → 03/11/2017
Espoo, Finland
Activity: Talks and presentations › Conference presentations

Tidligere uheld på biogas- og renseanlæg, herunder danske
Period: 18 Nov 2016
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science
Dynamical Systems
Statistics and Data Analysis

Related event

SEVESO-direktivet og sikkerhedsdokumenter til biogasanlæg
18/11/2016 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

Sikkerhed, sikring og sikkerhedskultur
Period: 14 Dec 2015
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science
Dynamical Systems
Statistics and Data Analysis

Description
Fællesarrangement mellem IDA – SAM (selskab for arbejdsmiljø) og IDA – RISK (selskab for risikovurdering)
Ingeniørhuset, København
Sikkerhed, sikring og sikkerhedskultur,
Indlæg om sikkerhed og sikring, herunder præsentation af resultater fra opgave for EU kommissionen om sikring af Seveso anlæg.
Documents:
Frank Hedlund IDA sikkerhed, sikring

Related event

Sikkerhed, sikring og sikkerhedskultur
14/12/2015 → 14/12/2015
Denmark
Activity: Talks and presentations › Conference presentations

1st Nordic Chapter Risk Conference
Period: 16 Nov 2015
Frank Huess Hedlund (Speaker)
Failure to learn after accidents – the lamentable situation in Denmark

1st Nordic Chapter Risk Conference

Related event

1st Nordic Chapter Risk Conference: The Future of Risk Analysis in the Nordic Countries
16/11/2015 → 17/11/2015
Lund, Sweden
Activity: Talks and presentations › Conference presentations

Failure to learn after accidents – the lamentable situation in Denmark
Period: 16 Nov 2015
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science
Statistics and Data Analysis

Description
Learning from own – and better, other people’s – past accidents and misfortune is an ancient accident prevention strategy. The benefits of such learning are obvious. What is not so obvious, however, is how to make this seemingly simple and straightforward idea work in practice. This presentation presents evidence in support of the view that such learning processes appear to be impeded, dysfunctional or entirely absent in Denmark. Two Danish accident cases in which major learning opportunities were foregone will be presented. The first case relates to a wood pellet facility, a sustainable renewable energy project, which experienced a devastating dust explosion. The accident was insufficiently investigated and root cause issues relating to principles of inherent safety were not identified. As a result, a repeat explosion took place eight years later. The case offers a text book example of the truism that if accidents are not investigated, and root causes not identified, accidents recur. The second case (not presented). In both cases, significant sector-relevant learning opportunities were foregone. Indeed, the cases have slipped into oblivion. There is no useful information in open sources that could potentially prevent repeat occurrences elsewhere. Learning is absent.

Documents:
Hedlund - Lamentable situation DK

Related event

DI's arbejdsmiljøkonference 2015
Period: 10 Mar 2015
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science
Statistics and Data Analysis

Links:
http://di.dk/diuddannelse/Konferencer/Pages/DIsarbejdsmiljoekonference20151216-9723.aspx

Related event

DI's arbejdsmiljøkonference 2015
10/03/2015 → …
Odense, Denmark
Activity: Talks and presentations › Conference presentations

KPI'ør og strategisk arbejdsmiljøarbejde
Period: 24 Feb 2015
Frank Huess Hedlund (Speaker)
Mysterious fires in Moirans-en-Montagne checkmated the town's crisis management team: Theme: Crisis management
Period: 22 Oct 2014
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science

Occupational health and safety management audit systems – developments, challenges and perspectives
Period: 10 Sep 2014
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science
Degree of recognition: International
Documents:
NOSHCON 2014 Draft Programme
Links:
http://www.noshcon.co.za/

Past explosive outbursts of entrapped carbon dioxide in salt mines provide a new perspective on the hazards of carbon dioxide.
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science

Description
ABSTRACT: This paper reports on a source of past carbon dioxide accidents which so far has only been sporadically mentioned in the literature. Violent and highly destructive outbursts of hundreds of tons of CO2 occurred regularly, if not routinely, in the now closed salt mines of the former DDR. The Menzengraben mine experienced an extreme outburst in 1953, possibly involving a several thousand tons of carbon dioxide. This source of accidents fills an important gap in the available carbon dioxide accident history and may provide a unique empirical perspective on the hazards of handling very large amounts of CO2

**Period:** 27 Aug 2013 → 29 Aug 2013  
**Frank Huess Hedlund (Speaker)**  
Department of Applied Mathematics and Computer Science

**Description**

ABSTRACT: The paper examines recent evidence from Denmark and abroad with climate change projects that aim to reduce global carbon dioxide emissions by converting coal fired thermal power plants to solid biomass fuel. The paper argues that projects appear to be pursued narrow-mindedly with insufficient attention paid to safety and points to evidence of media-shifting - that the 'resolution' of a problem within the environmental domain creates a new problem in the workplace safety domain. The paper argues that biomass pellets qualify as an emerging risk for which proper control strategies have yet to be developed.

co-author: John Astad, Combustible Dust Institute, USA

**Related event**

**4th International Conference on Risk Analysis and Crisis Response: Intelligent Systems and Decision Making for Risk Analysis and Crisis Response**  
27/08/2013 → 29/08/2013  
Istanbul, Turkey  
Activity: Talks and presentations › Conference presentations

**Emerging risks from fires and explosions in solid biofuels - some evidence from Denmark: COWI/DTU**

**Period:** 21 May 2013  
**Frank Huess Hedlund (Speaker)**  
Department of Applied Mathematics and Computer Science

Documents:

Hedlund_Stuttgart_rev1.pdf

**Related event**

**5th iNTeg-Risk Conference: Risk Screening - Horizon 2020: From iNTeg-Risk to the E2R2 - European Emerging Risk Radar**  
21/05/2013 → 22/05/2013  
Stuttgart, Germany  
Activity: Talks and presentations › Conference presentations

**Do provisions to advance chemical facility safety also advance chemical facility security?: An analysis of possible synergies**

**Period:** 8 Nov 2012 → 9 Nov 2012  
**Frank Huess Hedlund (Invited speaker)**  
Department of Informatics and Mathematical Modeling  
Mathematical Statistics

**Description**

More than 200 participants from 54 countries attended the event, which was organised by Poland and the OPCW in cooperation with the G8 Global Partnership and international partners.

Documents:

Synergy, safety, security

Links:
Related event

International Meeting on Chemical Safety and Security
08/11/2012 → 09/11/2012
Tarnów, Poland
Activity: Talks and presentations › Conference presentations

Hvad har vi lært af ulykkerne?
Period: 12 Oct 2012
Frank Huess Hedlund (Lecturer)
Department of Applied Mathematics and Computer Science

Description
IDA, RISK - Selskab for risikovurdering. The Danish Society of Engineers, IDA

Related event

Seminar i RISK: Risikostyring som værktøj: Hvad har vi lært, og hvordan kommer vi videre?
23/10/2012 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Risikoanalyse og worst-case scenarier
Period: 30 Sep 2012
Frank Huess Hedlund (Lecturer)
Department of Applied Mathematics and Computer Science

Description
Oplæg på DTU masteruddannelse i miljø- og arbejdsmiljøledelse

Related external organisation

Technical University of Denmark
Kgs. Lyngby, Denmark
Activity: Other

Katastrofer, worst case - hvorfor sker de? Er det en blind plet fra evolutionens side? Hvad kan vi gøre?
Period: 29 Aug 2012
Frank Huess Hedlund (Lecturer)
Department of Applied Mathematics and Computer Science

Links:
http://www.mssm.dk/side/program-og-pr%C3%A6sentationer-2012

Related event

Maritim Sikkerhed, Sundhed og Miljø (2012)
29/08/2012 → 31/08/2012
Nyborg, Denmark
Activity: Talks and presentations › Conference presentations

Når planlægningen fejler
Period: 19 Apr 2012
Frank Huess Hedlund (Lecturer)
Department of Applied Mathematics and Computer Science
Documents:
Program
Related event

Kompetenceudviklingsdage på Kastellet (4-2012): TEMA - netværk og uhåndgribelige risici
18/04/2012 → 19/04/2012
København, Denmark
Activity: Talks and presentations › Conference presentations

Risikoanalyse og worst-case scenarier
Period: 27 Aug 2011
Frank Huess Hedlund (Speaker)
Department of Applied Mathematics and Computer Science

Description
Oplæg på DTU masteruddannelse i miljø- og arbejdsmiljøledelse

Related external organisation

Technical University of Denmark
Kgs. Lyngby, Denmark
Activity: Other

Hvordan kan vi undgå worst-case?
Period: 10 May 2011
Frank Huess Hedlund (Lecturer)
Department of Applied Mathematics and Computer Science

Related event

Hvordan kan vi undgå worst-case?
10/05/2011 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Challenges in risk assessment - Insidious erosion of safety margins over time
Period: 23 Nov 2010
Frank Huess Hedlund (Invited speaker)
Department of Applied Mathematics and Computer Science
Documents:
Presentation_NSOAF_safety_conference_2010.pdf

Related event

2nd International Safety Conference in the North Sea Offshore Authorities Forum (NSOAF)
Aberdeen, United Kingdom
Activity: Talks and presentations › Conference presentations

Press clippings:

Ekspert_ Forebyggelse af arbejdssulykker kræver ordentlig udredning
Frank Huess Hedlund
26/01/2017

Subject
Myndighederne bør have mere fokus på at opklare og lære af dødsulykker frem for straf og ansvar, mener risikoekspert.
Department of Applied Mathematics and Computer Science , Dynamical Systems, Statistics and Data Analysis

Media contribution (1)

Ekspert_ Forebyggelse af arbejdssulykker kræver ordentlig udredning
Safety expert doubtful if root causes will be identified after Fredericia fire
Frank Huess Hedlund
05/02/2016

Description
Major fire in palm oil tank, possibly initiated by explosion of solution of urea ammonium nitrate, although many details are vague at this point in time

Subject
http://ing.dk/artikel/sikkerhedsekspert-tror-ikke-paa-opklaring-af-branden-i-fredericia-182045
Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis

Media contribution (1)

Safety expert doubtful if root causes will be identified after Fredericia fire
05/02/2016
Ingeniøren, Print
Frank Huess Hedlund
Department of Applied Mathematics and Computer Science, Dynamical Systems, Statistics and Data Analysis

Press/Media: Press / Media

Owners of wood pellet stoves risk carbon monoxide poisoning in poorly ventilated pellet storage rooms
Frank Huess Hedlund
03/05/2015

Subject
Nordjyske Stiftstidende, Søndag 3. maj 2015, Erhverv s38
Department of Applied Mathematics and Computer Science

Media contribution (1)

Owners of wood pellet stoves risk carbon monoxide poisoning in poorly ventilated pellet storage rooms
03/05/2015
Nordjyske Stiftstidende, Print
Frank Huess Hedlund
Department of Applied Mathematics and Computer Science
Private households with wood pellet stoves face risk of carbon monoxide poisoning
Frank Huess Hedlund
29/04/2015
Department of Applied Mathematics and Computer Science

Media contribution (1)

Private households with wood pellet stoves face risk of carbon monoxide poisoning
29/04/2015
Ingeniøren, Print
http://ing.dk/artikel/ejere-af-pillefyr-risikerer-kulilteforgiftning-fra-traepillelagre-175790
Frank Huess Hedlund
Department of Applied Mathematics and Computer Science
Press/Media: Press / Media

30 år efter giftudslip lider Bhopal stadig
Frank Huess Hedlund
04/12/2014

Subject
Politiken 4 dec 2014, 1. sektion, side 2, notis om 30-årsdagen for Bhopal ulykken
Department of Applied Mathematics and Computer Science

Media contribution (1)

30 år efter giftudslip lider Bhopal stadig
04/12/2014
Politiken, Print
Frank Huess Hedlund
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Press/Media: Press / Media

Risiko-ekspert: Vi ignorerer eksplosionsfaren fra træpille-støv
Frank Huess Hedlund
10/03/2014
Department of Applied Mathematics and Computer Science

Media contribution (1)

Risiko-ekspert: Vi ignorerer eksplosionsfaren fra træpille-støv
10/03/2014
Ugeavisen Ingeniøren, Print
http://ing.dk/artikel/risko-ekspert-vi-ignorerer-eksplosionsfaren-fra-traepille-stoev-166499
Frank Huess Hedlund
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Press/Media: Press / Media

Zum Glück blieb bereits 1953 die große Katastrophe aus
Frank Huess Hedlund
17/04/2013
Department of Applied Mathematics and Computer Science

Media contribution (1)

Zum Glück blieb bereits 1953 die große Katastrophe aus
17/04/2013
Freis Wort (Südthüringen.de), Print
Link to article.
Frank Huess Hedlund
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Striking a balance between, on the one hand, the need for centralization of the disaster emergency response, and on the other hand, the ability to achieve a flexible and improvised response, that uses scarce resources in an optimal manner – a flexibility which by nature requires decentralization.

When disaster strikes. On the balance between centralization of disaster response – and decentralization – the flexibility and improvisation, the ability to cope, a precondition for fast local decision making.

The disaster response to the 2005 Katrina hurricane is an example of how large federal agencies with massive resources apparently were paralyzed in rigid bureaucracy, whereas smaller and more flexible organizations were better able to adapt (cope) and utilize their limited resources in a highly efficient manner. Improvisation requires trust. If people are fearful, the start to "go by the book". Or as John Tierney from the New York Times said: "Going (down) by the book".

Relation outputs:
Susse Winther interviews Frank Hedlund in: [Når katastrofen rammer] /When disaster strikes: Hurricane Katrina
Worst case happens too often
21/05/2011
Nyhedsmagasinet Ingeniøren, Print
http://ing.dk/artikel/riskoeksperter-det-vaerst-taenkelige-sker-hyppigt-119320
Frank Huess Hedlund
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Press/Media: Press / Media

Gas rail tank cars are bombs on wheels
Frank Huess Hedlund
25/09/2009

Description
Liquefied petroleum gasses
Department of Applied Mathematics and Computer Science

Media contribution (1)

Gas rail tank cars are bombs on wheels
25/09/2009
Nyhedsmagasinet Ingeniøren, Print
The Engineer
http://ing.dk/artikel/gasvogne-pa-jernbanen-er-trillende-bomber-102663
Frank Huess Hedlund
Department of Applied Mathematics and Computer Science
Press/Media: Press / Media

Poor levels of safety for rail tank cars - Gas explosion could take place in Denmark
Frank Huess Hedlund
31/07/2009

Description
Liquified petroleum gasses
Department of Applied Mathematics and Computer Science

Media contribution (1)

Poor levels of safety for rail tank cars - Gas explosion could take place in Denmark
31/07/2009
Nyhedsmagasinet Ingeniøren, Print
http://ing.dk/artikel/elendig-tog-sikkerhed-gasekspllosion-kan-ogsaa-ske-i-danmark-99854
Frank Huess Hedlund
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Press/Media: Press / Media