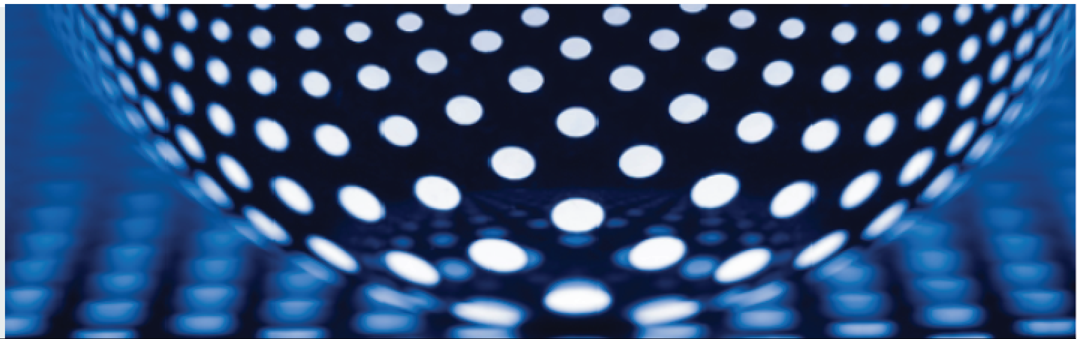

Process Safety News

Fall 2019 • Vol. No. 26 • Number 4

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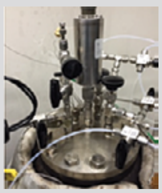
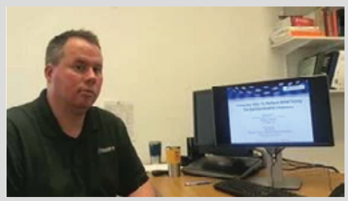


INTRODUCING! Fauske Emergency Relief System Tool (FERST) Software



Using VSP2 to Perform Relief Sizing On Epichlorohydrin Chemistry

Dust Explosions: Test Methods -Published in 'Methods in Chemical Process Safety'

Dr. Hans K. Fauske Recognized: 50 Years in AIChE

"The greatest strength of our Institute is members like you who come together to share their chemical engineering expertise and make the world a safer, more sustainable place," states June C. Wispelwey, Executive Director & CEO of AIChE in her cover letter to Dr. Hans K. Fauske.

Dr. Fauske has been an instrumental member of AIChE for 50 years, initiating and continuing to develop DIERS technology with key advancements in two-phase flow, vent sizing and relief system design in addition to trademark equipment such as the ARSST and VSP2.


The American Institute of Chemical Engineers
AIChE
The Global Home of Chemical Engineers
hereby certifies that
Hans K Fauske
*has been a member in good standing for **Fifty Years** and is hereby recognized for that achievement by the Institute.*
AIChE President, 2019
AIChE Since 1908
Issued 2019

"Hans K. Fauske Recognized: 50 Years in AICHE"

Letter From The President

Dear Customer,

According to Wikipedia, "**Safety culture** is the collection of the beliefs, perceptions and values that employees share in relation to risks within an organization, such as a workplace or community."

Here, at FAI, we live by a Safety First culture. Safety culture really boils down to *the ways* that safety issues are addressed in a workplace. Is it something your company talks about and occasionally trains on or does it permeate every action, meeting and communication? There's a huge difference.

The U.K. Health and Safety Commission developed one of the most commonly used definitions of safety culture: "The product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management. **Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures."**

You might enjoy reading ErgoPlus' list of "25 Signs You Have An Awesome Safety Culture". In number 14, for example, "Safety is the first item on the agenda of every meeting." We begin FAI meetings with a formal "Safety Brief". We share current events with relevant tie-ins, real life lab and office area examples along with daily reminders (such as extra salt needed in icy walkways on snowy days). Safety is engrained within our daily operating activities.

A true safety culture not only invites feedback without retribution or backlash, it demands it. Do you practice this?

We strive to be vigilant in providing all tools available within our organization and deliver nothing less to you.

Please let us know how we can help.

Best Regards,

John W. Fasnacht, President

Safer Scale-Up of Batch and Semi-Batch Reactions; Part 3
Applications of Adiabatic Calorimetry

NRC and CNSC Indicate Interesting Time For Industry Innovating Itself

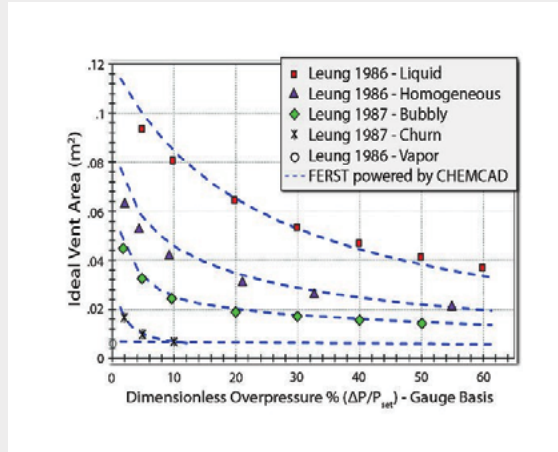
INTRODUCING Fauske Emergency Relief System Tool (FERST) Software!

Fauske & Associates, LLC (FAI) has updated its emergency relief sizing tools with FERST software powered by CHEMCAD. FERST is the complete package combining the practical and easy-to-use interface and calculation methods from FAI's PrEVent™ (Practical Emergency Vent Sizing) software, the direct use of temperature rise rates from low-ϕ factor calorimetry data from FAI's VSDS (Vent Sizing Dynamic Simulation) software and the material property, thermodynamic.

By Technical Lead Benjamin C. Doup PhD and Chief Technology Officer Ken Kurko

Benefits Provided by FERST Powered by CHEMCAD:

GUI functionality improvements



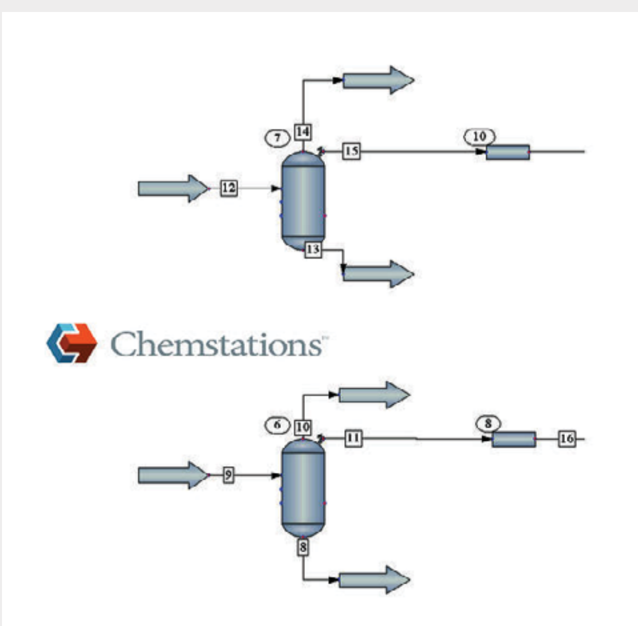
- File handling
- Report of results
- Customizable plotting capability
- Flow sheet schematic for dynamic simulations
+ Allows the user to visualize connections between vessels and piping.

Access to Chemstations technical support

- FAI will provide 2nd level support

Materials properties

- Maintain the ability to use user-specified material properties
- Each license comes with a license to the DIPPR database
- Access to pure component properties for 2557 components
- 40 different thermodynamic models
- Rigorous mixing models give bulk properties of mixtures



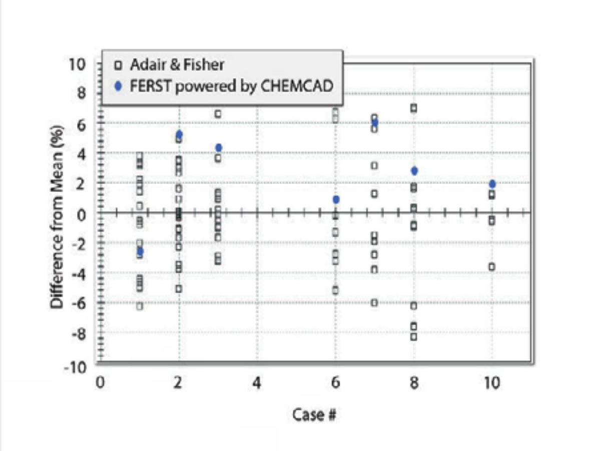
Design relief systems

- Leung-Omega and Fauske all-vapor/gas methods for:
  + Vapor (tempered) systems
  + Gassy (non-tempered) systems
  + Hybrid (tempered with gas generation) systems
  + Non-reactive fire exposure systems - Built in sanity check using the Fauske screening method.
  + Only need to input kinetic data correctly to perform an accurate check
- Leung-Omega method improvements

+ Omega definition options include:
- Leung's most recent definition
- ISO 4126-10
- CHEMCAD flash calculation
+ A single set of equations for vapor, hybrid, and gassy system mass flux calculations
+ Ability to calculate flow for all-liquid subcooled flow
- Fauske all-vapor/gas method improvements
+ Ability to modify the isentropic coefficient for mass flux calculations

Rate relief systems using a static approach

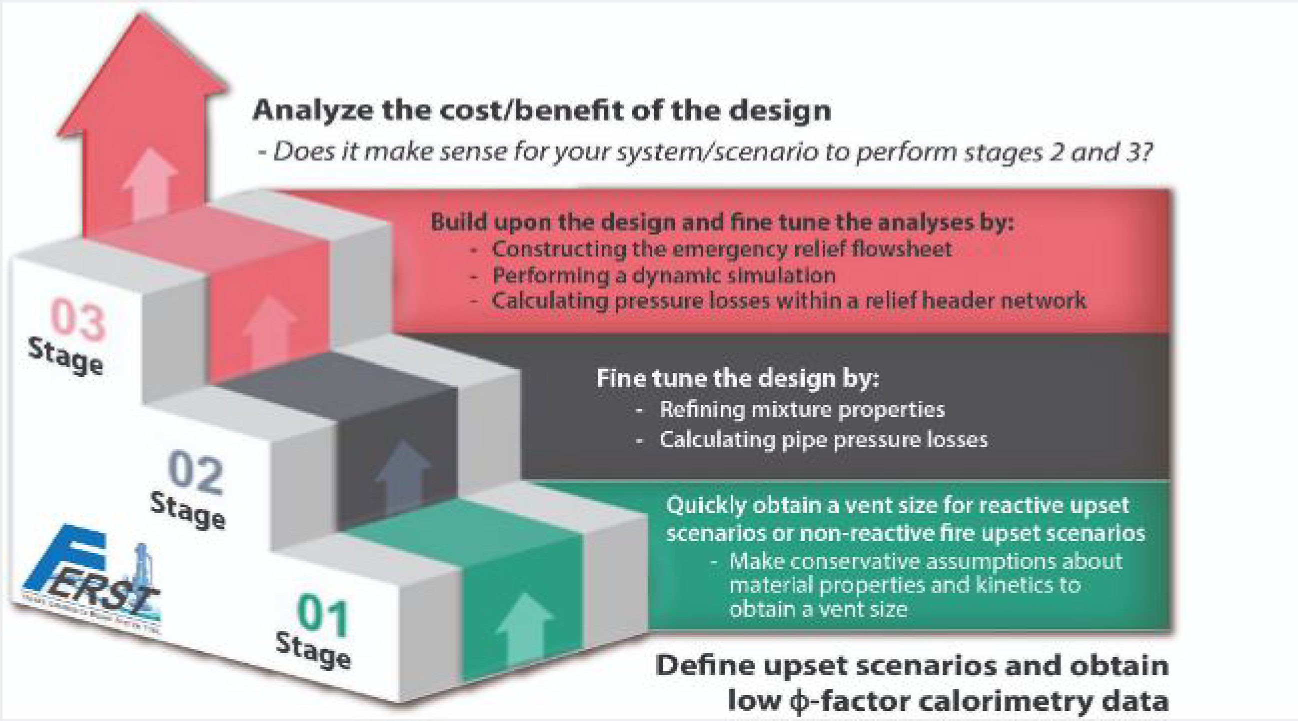
- Input vent area and calculate the expected peak pressure
- Leung-Omega method for:
+ Vapor (tempered) systems
+ Gassy (non-tempered) systems
+ Hybrid (tempered with gas generation) systems
+ Non-reactive fire exposure systems
- Pipe pressure loss evaluations for:
+ Inlet and outlet piping of relief valve and a single relief line



Rate relief systems using a dynamic approach

- Build typical CHEMCAD flow sheet using vessels, pipes, and nodes
- Model change in material properties as function of venting time
- Source terms
+ Read in low ϕ-factor adiabatic calorimetry
+ Zero-order kinetics
+ Non-reactive fire exposure
- Model multiple vessels venting simultaneously
- Pipe pressure loss evaluations for:
+ Inlet and outlet piping of relief valve, relief lines and headers

FERST Powered by CHEMCAD - A Staged Approach to ERS Design



Using VSP2 to Perform Relief Sizing on Epichlorohydrin Chemisty

Click Here For Video

Presented at a DIERS Users Group meeting in Germany "Using the VSP2™ to Perform Relief Sizing On Epichlorohydrin Chemistry" Gabe Wood, Manager of Thermal Hazards Testing & Consulting, Fauske & Associates, LLC (FAI) covers the hydrolysis of epicholorohydrin using the application of data with case studies for relief system design using the Vent Sizing Package 2 (VSP2). The vent sizing evaluations are also performed in accordance with ISO 4126-10.

A low thermal inertia apparatus simplifies and is necessary to obtain data for relief sizing. What was originally released as the DIERS bench-scale apparatus developed as part of the DIERS research program later became the Fauske VSP2. The VSP2 is an extremely important instrument for obtaining the data for relief sizing. A number of universities have the VSP2 or the Advanced Reactive System Screening Tool (ARSST™). Both are low thermal inertia calorimeters developed by FAI.

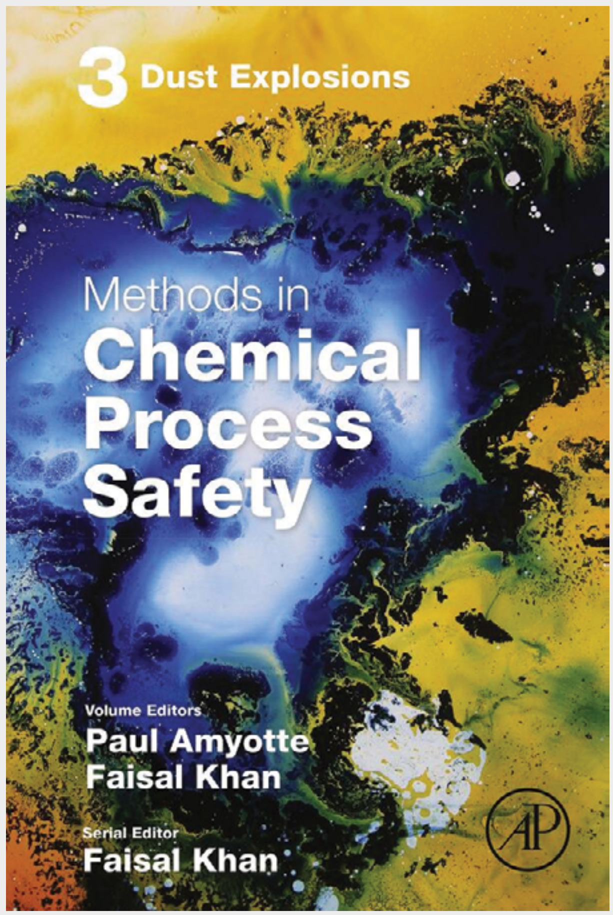
The VSP2 utilizes established DIERS technology to identify and quantify process safety hazards so they can be prevented or accommodated by process design. Adiabatic data obtained with the VSP can be used to characterize reactive chemical systems and consequences that could occur due to process upset conditions. The ARSST enables users to quickly obtain reliable adiabatic data which can be used for a variety of safety applications including characterization of material compatibility and thermal stability. Test data include adiabatic rates of temperature and pressure change which, due to the low thermal inertia, can be directly applied to process scale to determine relief vent sizes, quench tank designs and other relief system design parameters related to process safety management.

If you are interested in learning more about relief system design, register for FAI University's course. Unlike other emergency vent sizing courses, this curriculum highlights simplified calculation methods capable of giving safe - but not overly conservative - relief system designs, with an emphasis on reactive chemistries and the role of two-phase flow.

Dust Explosions: Test Methods - Published in 'Methods in Chemical Process Safety'

In Paul Amyotte and Faisal Khan's newest, Vol.3 *Methods of Chemical Process Safety: Dust Explosions* published by Elsevier Academic Press, Dr. Ashok Ghose Dastidar contributes "Dust Explosions: Test Methods".

Per the book's preface, "Dust explosions are an ever-present threat wherever bulk powders are handled in the chemical process and other industries. They can be prevented, and their consequences mitigated, only by adopting an approach based on the principles of process safety.



This book is the third volume of the Methods in Chemical Process Safety book series. The book series intends to be a one-stop resource for both academic researchers and professional practitioners. It aims to publish the fundamentals of process safety science and leading state-of-the-art advances occurring in the field, while maintaining a practical approach for their application to industry. An international editorial board and authorship ensures that the book series depicts the latest research developments from around the globe. Each volume covers fully commissioned methods across the fields of process safety, risk assessment and management, and loss prevention.

The third volume tackles the dust explosion problem in a sequential manner over nine chapters covering: (i) an overview of the general field and the book organization, (ii) scientific and engineering fundamentals, (iii) illustrative examples and case histories, (iv) testing methods for acquisition of explosibility data, (v) dust hazard analyses conducted to identify the hazards of combustible powders,

(vi) assessment of the probabilistic and consequence impact aspects of dust explosion risk, (vii) typical safety measures for dust explosion risk reduction, (viii) global regulations, standards, and guidelines, and (ix) explosion risks presented by nontraditional fuels including hybrid mixtures of flammable gas and combustible dust, as well as dusts that are non-spherical in shape, nano-scale in size, or present in additive manufacturing processes."

Dr. Ashok Ghose Dastidar, Vice President, Dust & Flammability Testing and Consulting Services, Fauske & Associates, LLC and Fellow Engineer, Westinghouse Electric Company provides Chapter Four - "Dust Explosions: Test Methods" for which he outlines:

- Material identification
- Sample identification and characterization
- Reactive as a cloud (deflagration)
- Go/no go explosibility screening
- Reactive as a pile or layer (combustion)
- Burning behavior
- Burn rate screening
- Deflagration testing
- Explosion severity (P_{max} and K_{St})
- Minimum explosible concentration (MEC)
- Minimum ignition energy (MIE)
- Minimum autoignition temperature of a dust cloud (MIT)
- Limiting oxygen concentration (LOC)
- Combustion testing
- Burn rate test
- Layer ignition temperature (LIT)
- Auto ignition screening (Grewer)
- Hot storage screening
- Exothermic decomposition screening
- Smoldering gas evolution (Lütolf)
- Concluding remarks

Illustrations and graphics depict the methodology and equipment used to determine def-lagration characterization. How do you determine "Overdriving" vs. "Underdriving". What are the advantages and disadvantages of one test method compared to another? What differences do materials present in testing results? What combination of tests is best to mitigate design flaws?

These findings, together with other dust industry expert contributions such as dust explosions overview, fundamentals, serious concerns, hazard identification, risk assessment, safety measures, regulations, standards and guidelines and emerging or unique scenarios are all explored extensively in this important volume.

For more information and to purchase the book: https://www.elsevier.com/books/dust-explosions/amyotte/978-0-12-817550-7

If you are interested in learning whether or not your dust is combustible, use this flowchart to help you decide.

Is My Dust Combustible?

Safer Scale-Up of Batch and Semi-Batch Reactions; Part 3 Applications of Adiabatic Calorimetry

Richard Kwasny, Ph.D., Senior Consulting Engineer and Gabe Wood, Manager Thermal Hazards Testing & Consulting

Background

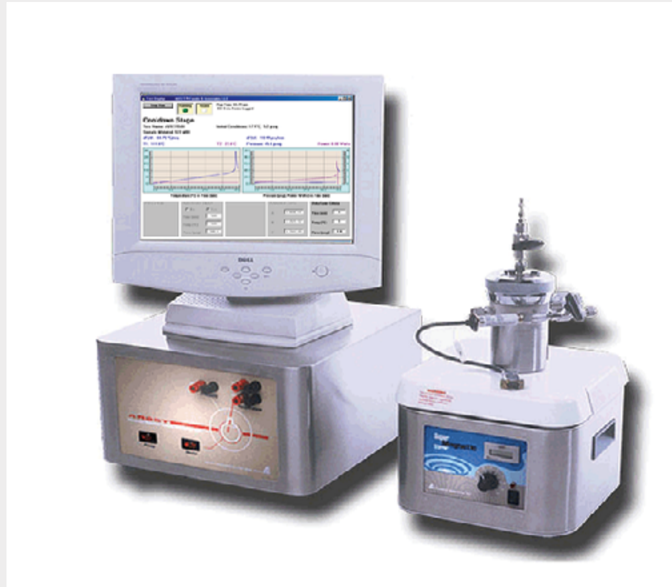
From a process safety perspective, we can use stirred-reaction calorimetry to measure the heat of a reaction and calculate the adiabatic temperature rise for an exothermic reaction, assuming there are no heat losses to the environment. The rise in batch temperature can be derived from the experimental data using $\Delta T_{ad} = \Delta H_r / Cp_{,s}$ where the adiabatic temperature rise is ΔT_{ad}, the heat of the reaction is ΔH_r and the specific heat of the reaction mass, $Cp_{,s}$.

The adiabatic temperature rise provides for a thermodynamic estimate that if cooling were lost, we could predict the maximum temperature of the synthetic reaction (MTSR) using the relationship MTSR = $T_{OP} + \Delta T_{ad}$, where T_{OP} is the temperature of the process.

However, this approach needs to be refined using the tempering effect of the batch solvent(s), incorporating the real change in heat capacity with increasing temperature, and accounting for any thermal instability from the reaction mixture at elevated temperature under adiabatic conditions. This type of worst-case-scenario, where the batch heats exponentially, and cooling is a linear function, is commonly referred to as a thermal runaway reaction. In many situations, we know the thermal properties of the desired reaction, but we are not aware of process safety hazards associated with the adverse reaction in terms of reaction kinetics, temperature/pressure rates, and the production of fixed gases and the corresponding maximum temperature/pressure.

Adiabatic Calorimeters

The first lab-scale attempt to study the adverse reaction using adiabatic calorimetry was the Accelerating Rate Calorimeter (ARC™). It was successful in identifying decomposition reactions that were driven by the kinetics of the reaction during a long-hold time under isothermal conditions or at elevated temperatures. However, the test data were obtained with a Φ factor much greater than one; and resulted in an estimated adiabatic temperature rise rather than actual scale-up conditions due to the significant amount of heat which was absorbed by the test cell.



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The Φ-factor, or thermal inertia, can be calculated using $\Phi = 1 + (M_v * Cp_{,v})/(M_s * Cp_{,s})$, where M_v and M_s are the masses of the test cell and sample, respectively; $Cp_{,v}$ and $Cp_{,s}$ are the corresponding specific heat of the test cell and the sample.

Fauske & Associates, LLC developed low Φ-factor agitated adiabatic calorimeters, which did not require any assumptions, and the adverse reaction was allowed to proceed adiabatically in an unhindered manner. The Advanced Reactive System Screening Tool (ARSST™) and Vent Sizing Package 2 (VSP2™) adiabatic calorimeters allowed for direct scale-up of the calorimetric temperature/pressure data allowing for the measurement of the actual adiabatic temperature rise as opposed to a theoretical calculation requiring several assumptions. These instruments can also be used to simulate various runaway scenarios, and the temperature and pressure rise rate data can easily be used to perform emergency relief sizing using the Design Institute for Emergency Relief Systems (DIERS) methodology.

Practical Applications of ARSST and VSP2 Test Data

These devices can be used to characterize the hazardous properties, tempering, and flow regimes of adverse chemical reactions, fire scenarios, and worst-case scenarios in terms of thermal runaways and thermal decompositions under adiabatic conditions. Once the adverse reaction is characterized, it is possible to apply DIERS methodology to design engineering controls in terms of adequately sized emergency venting, thereby making the process safer in the event of an unwanted process deviation, e.g., loss of cooling.

Solid powders containing carbonate functional groups are often dried as part of the normal work-up process. Drying these types of organic substrates can suddenly result in decarboxylation resulting in significant pressure and pressure generation rates due to large volumes of evolved carbon dioxide and water during the endothermic decomposition. The resulting off-gas and vapor can be initiated by exceeding the recommended isothermal drying time or raising the internal temperature of the dryer without knowledge of the consequences; both of which depend upon the kinetics of the decomposition reaction. Understanding the decomposition kinetics and time limits can better allow for proper dryer engineering controls, e.g., vent relief or use of a dryer with an adequate maximum allowable working pressure, etc.

A key advantage of using the ARSST or VSP2 is that the testing can be conducted in a batch or semi-batch mode with agitation as needed. Therefore, a test can be designed to study the adverse reaction(s) under real process conditions. Then the data can be used to determine and design the proper pressure relief needed using DIERS technology.

In summary, low Φ-factor adiabatic testing data can be used to determine:

- Onset temperature, adiabatic temperature rise, and heat of reaction for exothermic events,
- Moles of non-condensable gas generated by the reaction,
- Thermal runaway data, used for DIERS relief sizing,
- Identification of venting behavior (gassy, tempered, and hybrid),
- Determination of flow regime (two-phase or single-phase), and
- Kinetic data, e.g., Time to Maximum Rate (TMR) or Temperature of No Return (TNR).

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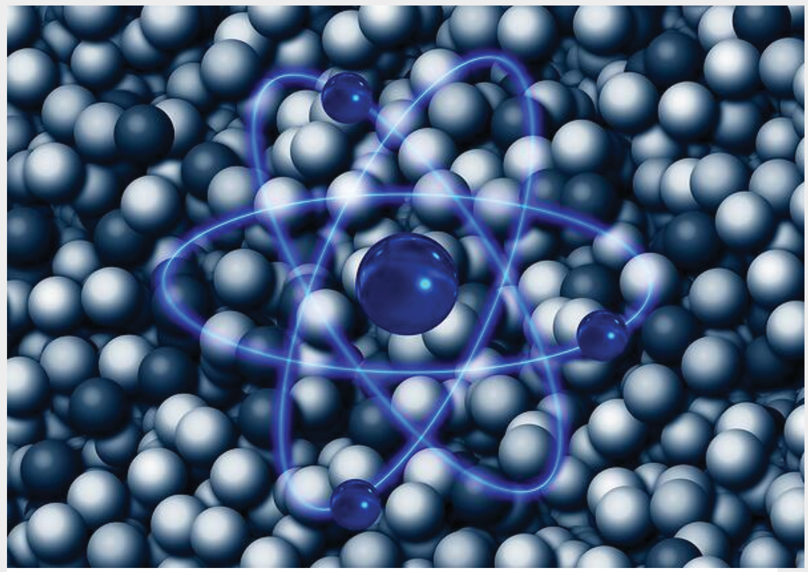
NRC and CNSC Indicate Interesting Time For Industry Innovating Itself

Per the Nuclear Regulatory Commission's August 15th's announcement, "NRC and CNSC Sign Historic Memorandum to Enhance Technical Reviews of Advanced/Small Modular Reactor Technologies":



The U.S. Nuclear Regulatory Commission and the Canadian Nuclear Safety Commission today signed a historic Memorandum of Cooperation for both agencies to increase regulatory effectiveness through collaborative work on the technical reviews of advanced reactor and small modular reactor technologies.

The memorandum represents a uniquely important step in both countries' strong commitment to a more effective, efficient, and timely analysis of next-generation technologies, and both agencies' safety and security mission. The NRC and CNSC are building on the joint Memorandum of Understanding signed in August 2017, accelerating efforts to realize innovation in the review of advanced reactor and small modular reactor technology concepts.

"Today's signing of this memorandum further shapes our commitment to open and transformative thinking with our Canadian partners, enhancing our willingness to work together on matters of advanced nuclear power safety developments while increasing regulatory effectiveness," said NRC Chairman Kristine L. Svinicki. "Advanced technologies are emerging at a rapid pace, demanding that regulators keep in step with modernization initiatives and the technologies of the future."

"Globally, interest and advances in small modular and advanced reactors are growing rapidly. The CNSC and the U.S. NRC are working together as regulatory leaders to ensure the development and deployment of these innovative technologies are done safely and efficiently," said CNSC President and Chief Executive Officer Rumina Velshi. "The signing of this memorandum further strengthens our long-standing history of collaboration with our U.S. counterparts and ensures the effectiveness and efficiency of our regulatory oversight for the future."

The MOC is the first of its kind between the U.S. and Canadian regulators on matters involving nuclear power development. Svinicki and Velshi announced in June that the two agencies would begin exploring enhanced bilateral cooperation through joint regulatory reviews of developing nuclear technologies, to include advanced reactors and small modular reactors.

According to the MOC, both the NRC and CNSC will work under the previously established steering committee to immediately begin developing the infrastructure needed to share and evaluate cooperative opportunities and best practices in the analysis of advanced reactor and small modular reactor designs. The MOC underscores the readiness of the U.S. NRC and CNSC to increase collaboration and facilitate joint technical reviews of advanced reactor and small modular reactor designs to ensure safety and support each agency's regulatory decisions."

Per Dr. Wison Luangdilok, Senior Consulting Engineer for Fauske & Associates LLC, "Nuclear energy faces an uncertain future in the United States as the fuel is beset by fierce competition from natural gas and renewable energy in many markets as well as a failure to deliver new nuclear plant construction projects on time and on budget. The signing of this historic memorandum between the US NRC and CNSC indicates that it is an interesting time for the industry that is innovating itself with advanced technology that is presumably safe, simple and competitive."

Stay up to date on the latest in nuclear news and insights by subscribing to our Nuclear Technical Bulletin below.

SUBSCRIBE TO OUR NUCLEAR TECHNICAL BULLETIN

FAI Chemical Process and Nuclear Perspective From Intern Alex Kaffka (Interview, Part 2)

Intern Alex Kaffka interviewed by Elizabeth Raines

-What are three skills you find useful for having a successful internship?

1. A positive attitude. As cliché as this sounds, I always had to remind myself why I was here. I walked into this internship knowing that I was here to learn and improve my sills as an engineer. I knew that I was going to be challenged, and I just had to remind myself that the people that I was working with were here to help me.
2. Time management. A moment that I wasn't working was a moment that I got closer to deadlines. This summer, I managed my time by scheduling my work throughout the day. I did this to ensure that I was giving each project that I had been working on ample time to finish before their submissions. This made me feel much more productive.

3. Asking questions. I found that it made little sense to hide if I had a lack of understanding of a topic, so asking questions was a great skill to hone. The people here at FAI are so welcoming to questioning, and I am very thankful that they took the time to work with me to ensure that I understood the material that I was working with.

-How would you describe what FAI does?

FAI assists companies in analyzing potentially hazardous conditions that may occur during operations. The ways that FAI can help these companies varies from creating computer models of their industrial procedures, to identifying the properties of substances used within their procedures.

-What types of tools (instruments, programs, methodologies) have you been exposed to while at FAI?

I had known of Mathcad prior to my internship, however my experience was little compared to what I had gained this summer at FAI. I was taught some of the more practical applications of Mathcad, and I'll undoubtedly be taking my experience with the program with me to my classes and career. I enjoyed my time spent learning about FATE, a truly unique program with so many applications. I really do wish we had something like it at Iowa.

I learned a lot during my project on Adiabatic Isochoric Complete Combustion (AICC). During that project, I learned a great deal about Jacobian matrices and the Newton method for solving multiple equations at once.

A few of the tools that I had utilized for testing during this summer I had used at the University of Iowa, including the ARSST calorimeter, as well as the Hartmann Tube in the dust lab. However, the training that I received here at FAI was much more extensive. I feel much more experienced with these pieces of equipment now, however my background from Iowa was very helpful in learning the proper procedures for testing.

-In your perspective, what are some useful applications for ___ (FATE, ARSST Testing, Mathcad problem solving, Vortex Suppression, etc.)?

The ARSST calorimeter is a useful tool in reaction hazard identification, in order to determine the pressure and temperature buildup during a runaway reaction, as well as determining whether a non-condensable gas, vapor, or a hybrid of the two are formed during a reaction within the vessel. FATE proved to be extremely convenient in modeling heat transfer and gas release scenarios in a rather easy to modify fashion. The Mathcad code that I used showed how powerful the language is at solving systems of equations.

-What do you like about the chemical or nuclear industry?

My favorite subject has been chemistry ever since high school. I have always enjoyed learning more about how we can utilize reactions on a larger scale, and to predict what outcomes may occur. Having taken the opportunity to be an intern at Fauske, I have acquired a huge amount of experience collaborating with other engineers on projects. This has given me a lot of new perspective on how to be a successful chemical engineer. Having gained experience with Fauske, I have gathered a great interest in working in the nuclear industry as well. My focus area in school is with energy and the environment, and so learning more about nuclear energy is fascinating to me.

-Do you have any advice for incoming freshman or people interested in interning?

Take the opportunity to learn about where your degree can apply. Find the coursework that you resonate with, and use that to direct yourself into a line of work. As a freshman, I was unsure about where I wanted to end up after I received my degree. I took the opportunity to go to job fairs and talk with companies about what a chemical engineer would be accomplishing by working with them. After my Chemical Process Safety course at Iowa and speaking with people from Fauske, I found a great interest in the chemical process safety field. Find work that suits you!

-What have you found useful about programs like Mathcad?

Mathcad has been a huge part of my internship, and I am grateful for the time that I spent learning how to utilize it. It is amazing for calculating systems of equations, especially when performing more complex calculations. I was taught how to utilize Jacobian matrices and the Newton method for solving several variables at once, and that is a skill that I plan on taking back to school with me.

NFPA 652 - An Introduction to Dust Hazard Analysis - Special Course at Aerodyne!

NFPA 652

– An Introduction to Dust Hazard Analysis

Special Presentation at Aerodyne Environmental

October 29 - 30, 2019

Aerodyne Environmental Offices
17387 Munn Road
Chagrin Falls, OH 44023

Course Description

Day 1 — ***Time: 8 am - 4:30 pm*** — ***CEU's: 0.7***

This course will ensure all participants are aware of important issues associated with NFPA 652 and describe how this standard interacts with other relevant NFPA codes and guidelines. A special emphasis will be placed on explaining the requirements for a Dust Hazard Analysis (DHA) and an overview of the methodologies that can be employed to perform a DHA. The course will also include a logical approach to characterizing a powder's hazardous dust properties, as well as a description of various techniques used to control and/or avoid dust explosions in a safe and compliant manner.

Scheduled Agenda

- Introduction
- Overview of NFPA 652
- Fundamentals of Dust Explosions
- Introduction to DHA methodology
- Mock DHA on a Small Blending Operation

Outcomes

- Protection Options
- Daily Learning Assessment
- Questions and Answers
- Course Evaluation Instruction

Day 2 — ***Time: 8 am - 4:30 pm*** — ***CEU's: 0.7***

Advanced DHA Workshop

The Advanced DHA Workshop will focus on how to organize, lead, and implement the DHA study. This will include how to utilize appropriate test methods to determine potential dust hazards; as well as how to apply appropriate mitigation techniques to prevent or control combustible dust hazards. During the workshop, participants will have the opportunity to apply DHA methodologies to realistic combustible dust scenarios.

Special Aerodyne Environmental Pricing

Two Day Course: $895

Fauske & Associates, LLC is accredited by the International Association for Continuing Education and Training (IACET) and is authorized to issue the IACET CEU

To register, please contact: FAIUniversity@fauske.com, or (630) 323-8750

Please direct instructor or course related questions to Ashok G. Dastidar - dastidar@fauske.com

www.fauske.com **www.dustcollectorhq.com**

UPCOMING EVENTS IN 2019

Visit with representatives from Fauske & Associates, LLC at these tradeshows and conferences in 2019:

- **Relief Systems Design Course**
  - *October 16-18, Burr Ridge (Chicago), IL*

- **NFPA 652– An Introduction to Dust Hazard Analysis - Special Course at Aerodyne!**
  - *October 29-30, 2019*

- **2019 China Process Safety Conference**
  - *October 31 - November 1, 2019*

- **2019 AIChE Annual Meeting**
  - *November 10-15, 2019, Orlando, FL*

- **2020 Indiana Safety and Health Conference & Expo**
  - *February 24 – 26, Indianapolis, IN*

- **Ohio Safety Congress & Expo**
  - *March 11-13, 2020, Columbus, Ohio*

- **International Powder & Bulk Solids 2020**
  - *April 28-30, 2020, Indianapolis, IN*

- **2020 National Safety Congress & Expo**
  - *October 5-7, 2020, Indianapolis, IN*

- **AIHce Exp 2020**
  - *June 1-3, 2020, Atlanta, GA*

We look forward to seeing you!

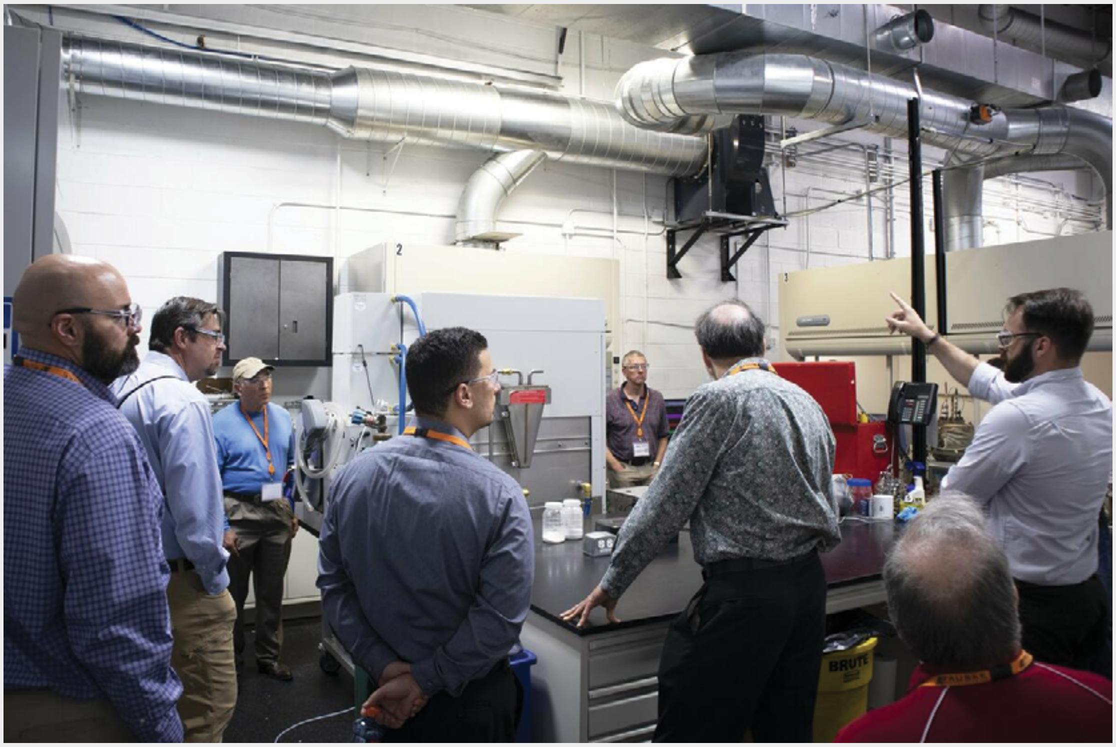
DIERS

Thank you to all who attended the

Fall 2019 DIERS Meeting
Septemer 16-18 at our Headquarters!

Dr. Hans K Fauske at DIERS 9-19


Experts in
Combustible Dust
Testing
& Consulting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FAI experts teach vent sizing training course in Suzhou China

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