Spring 2015
Volume 22,
Number 2

Process Safety News

REVISITING DIERS' TWO-PHASE METHODOLOGY FOR REACTIVE SYSTEMS THIRTY YEARS LATER

By: Hans K. Fauske, D.Sc., Regent Advisor, Fauske & Associates, LLC (FAI)

In connection with celebrating the 35th anniversary of the company, it seems appropriate to revisit the DIERS research project completed in 1985 under my leadership. As a follow-up in response to frequent suggestions by the industry that the DIERS methodology can be too complex and time-consuming, and overly conservative in many cases leading to impractical relief system designs, we have devoted time over the years to develop more "easy-to-use" adiabatic calorimetry and relief vent sizing equations demonstrating very good agreement with all available experimental data including vapor, gassy, and hybrid systems and plant experience (remember without data all you have is an opinion).* At this time, I am very pleased to report that the frequent industry concerns have been properly addressed.

As such, the "easy-to-use" methods provide alternatives to methods dependent upon sophisticated computer algorithms such as SAFIRE, and others, and can be properly viewed as the key practical component of the current DIERS vent sizing methods. It should also be noted, that the "easy-to-use" methods can serve well as an independent check on accuracy of the more complex algorithmic methods.

The "easy-to-use" methods provide:

- Verified two-phase flow equations including flows through PSV
- Verified relief sizing equation(s) applicable to vapor, gassy and hybrid runaway reaction systems
- Accounting for flow regime variations such as churn turbulent, bubbly and viscous
- No need for physical properties, which in many cases are not readily available
- Illustrate the large advantages of setting the relief activation pressure as low as practical (less than MAWP), and
- Elimination of oversizing which is essential in assuring stable PSV operation

To learn more about the "easy-to-use" DIERS adiabatic calorimetry vent sizing methods, join us at the forthcoming relief system design seminar May 4 and 5.

* Hans K. Fauske, "A Practical Approach to Pressure Relief Sizing: Non-Reactive and Reactive (Vapor, Gassy, and Hybrid) Systems and the Role of Calorimetry and Two-Phase Flow," DIERS Users Group Meeting, Burr Ridge, Illinois, October 11, 2011.

Upcoming Events

- FAI presents the Spring 2015 Process Safety Training Courses, April 20-21, Burr Ridge, IL
- Representatives from FAI will attend the Electric Power Show, April 21-23, Chicago, IL
- FAI Engineers Martin Clouthier, Jens Conzen, Ken Kurko, Amy Theis and Gabe Wood will present, and FAI will exhibit at the 11th Global Congress on Process Safety, April 26-29, Austin, TX
- FAI presents the Spring 2015 Relief System Design Course, May 4 - 5, Burr Ridge, IL
- FAI presents the Spring 2015 Free User Group Forum, May 6 - 8, Burr Ridge, IL
- Tim Cullina, Sr. Consulting Engineer at FAI, presents a 1-Day Combustible Dust Training Course and FAI will exhibit at the American Industrial Hygiene Conference & Exposition (AIHce), May 30 - June 4, Salt Lake City, UT

Letter From the President

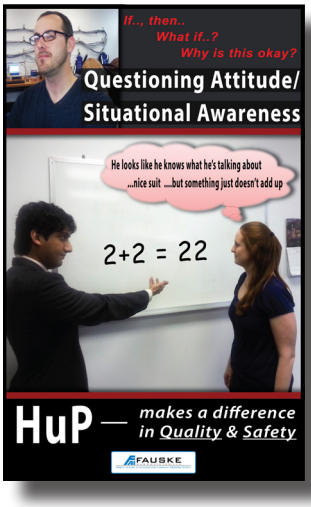
The beginning of Spring brings a new fiscal year for us here at Fauske & Associates, LLC. As a business leader, I take great pride in keeping employee safety a number one priority, stressing an accident free working environment while still maintaining quality of service. With this in mind, I am happy to report that we finished FY14 with no incidents, which is an excellent record.

I credit this in part to our diligent safety culture, as well as our adoption of a human performance (HuP) way of thinking. HuP is based on an understanding that as humans, there is always a chance for error, but through establishing certain appropriate behaviors their frequency and severity may be minimized.

The structure of HuP is a change for us, something we are incorporating to build upon existing safety procedures. But it is a change that will benefit everyone it touches - both internal and external customers, and it reinforces our internal credo of "Safety is the Priority, Quality is the Standard".

To this end, we are participating in a pilot campaign sponsored by our parent company, Westinghouse Electric Company, LLC, where we have utilized our employees in posters to introduce these behavioral concepts to the organization.

Below I have shared the first three of these posters and concepts. I hope that you find them both as informative and entertaining as I did in reinforcing some sound concepts of quality and safety.



Stay safe this spring,

H. Kristian Fauske
President

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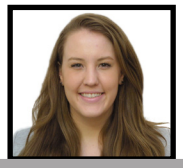
FAI Welcomes New Employees



Elizabeth Raines
Chemical Engineer

Statement of Purpose:

FAI's "Process Safety News" is intended to be a forum on recent advances in chemical process safety and FAI's current and related offerings in this area. It will address subscriber's concerns regarding issues and practices for relief system design as well as laboratory testing and techniques for process safety management.

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Fauske & Associates, LLC

A NEW AND EXCITING DEVELOPMENT IN DUST SCREENING DEVICES — THE PORTABLE HARTMANN APPARATUS

By: Rick Kwasny, Ph.D., Sr. Consulting Engineer
Fauske & Associates, LLC

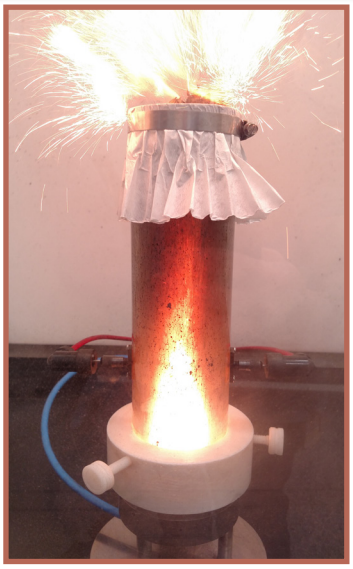

Figure 1: The Portable Hartmann Apparatus

In response to our client's frequent requests, Fauske & Associates, LLC is pleased to announce the availability of a portable Hartmann Dust Testing apparatus that can be used on-site at a client's facility.

The practicality of this device is its simplicity to test and determine if dusts in question are classified as combustible; it uses a very small sample size (0.3 - 3.0 grams). The portability aspect is appealing as the device can be brought onto the plant site and local samples can be tested in a very short time, providing an instant identification of combustible materials. Applications include, but are not limited, to combustible testing of: floor and process samples per NFPA 654/OSHA CPL 03-00-008, R&D, process development, and commercial scale-up of starting materials, isolated intermediates and final products, including final packaged forms with excipients. The data can be used internally or shared using Material Safety Data Sheets. The device conforms to EU and UN test requirements. We can send an engineer with the device or we can train plant personnel to use it.

The modified Hartmann apparatus consists of a dispersion cup, a PTFE tube holder and a glass tube with a volume of 1.0 liter. By means of pressurized air a quantity of the powder sample is suspended in the presence of an ignition source. The ignition source used for the tests is a continuous spark generated by a high voltage transformer between two standardized electrodes placed near the bottom of the cylindrical tube. The energy content of the spark corresponds to an equivalent energy of about 10 Joule of a discharge spark. Powder concentrations in air are between 30 mg - 3000 mg/liter (30 - 2500 g/m3). A powder is considered to be explosible if dust fires or explosions are observed during the tests. If no dust fires or explosions are observed in three-series of tests for any concentration, the powder is considered to be not explosible at the conditions of the test.

If the process that you suspect could contain combustible dust, it would be prudent to contact us for advice or if you would like more information on this portable equipment, please contact us at dust@fauske.com.

In 1980, Hans K. Fauske, D.Sc., Robert E. Henry, Ph.D. and Michael Grolmes, Ph.D. left Argonne National Laboratory to form Fauske & Associates, LLC (FAI). In honor of the 35th anniversary of the company, we are pleased to present the following brief interview with Dr. Fauske, Dr. Henry and Dr. Grolmes, which provides insight into the beginnings of FAI, and their thoughts on the company and industry today.

Q: What customer need were you trying to fulfill when you founded FAI?

A:

Dr. Fauske: I think the customer need, just generalizing, would be in the nuclear and chemical process industry. We had been awarded a contract on the DIERS (Design Institute for Emergency Relief Systems) work before we left Argonne, so that would fit into the chemical industry. And, we were also interested in and involved in the nuclear fast reactor development, particularly CRBR and the German prototype, SNR. Then, of course, the Three Mile Island incident (TMI-2) happened in 1979 and Dr. Henry was heavily involved in that. So, that really represents both the chemical and nuclear industries.

Dr. Henry: I was consulting for the Canadian utility, Ontario Hydro, while I was at Argonne, with Argonne's knowledge, so even before Three Mile Island, we were doing things nuclear related that people were coming to us saying 'we want you specifically to work on this'. Well, that is difficult to continue to do inside the framework of Argonne. Then, as Hans said, when the Three Mile Island incident happened I got involved doing work for Argonne, going out to the west coast every Sunday night to EPRI, and then flying back on the red-eye every Wednesday night. I did that for three months, and I could see that there were a lot of things that our expertise could help these people with on the industry side. So, there was a chemical need and a nuclear need that were very clear to us.

Q: What made you decide to break away from Argonne to form your own company?

A:

Dr. Fauske: Besides the things already mentioned, my answer is generally that it was about time to follow family tradition. Most of my family were all in business, so I decided it was about time to leave and become my own boss for a while. That allowed me to do things that you otherwise couldn't do at the national laboratory.

Dr. Henry: Once I got involved in Three Mile Island, I could see there was going to be a lot of other things that the industry wanted to do and we wanted to get involved in it personally. It has been a tremendous amount of fun. It's also been a lot of pressure at times, but a lot of fun.

Dr. Grolmes: I would offer a slightly different perspective to augment the above valid comments. First of all, we had spent together quite a few years at Argonne. It was a great place to learn how to carry out good applied science and engineering research that would stand up to peer review. This was the fun part. Second, after the program that we were working on (the liquid metal fast breeder reactor or LMFBR) was canceled by President Jimmy Carter, the fun sort of went out of the work at the Lab. Then along came the opportunity to do some interesting work in chemical engineering space. So when I reflect on the question with 30 years hindsight, the decision to leave should have been obvious. That said, at the time there were plenty of unanswered questions, but we had the knowledge, the good work ethic, and some very good luck.

Q: What fundamental values come to mind when you think of safety?

A:

Dr. Henry: I guess from my perspective, just very simply, people think of this area as being a highly technical area but the fundamental value that you have is you have to understand the technology. You can't just be a practitioner you have to really understand what it means to use it effectively. Then, people understand why certain things are things you don't have to worry about and why other things you have to worry a lot about. If you are just a practitioner, you can't separate out the two.

Dr. Fauske: In a similar way, you know, having the opportunity to make the workplace safe, you feel good about it. Some of the work we are involved in, we are talking about saving lives.

Dr. Henry: We are also helping our clients protect their investment.

Dr. Fauske: Yes, that's important.

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Dr. Henry: I am sure Hans feels this way about all the things they have developed on the chemical side and I certainly feel this way about MAAP itself - is its in essence a textbook that's teaching people what the technology is all about. And the documentation is there for you to read and understand it; including the experiments behind the technology. The same is true of the VSP, the RSST, ARSST etc. These are tremendous tools that enable the user to know their own system and understand what the fundamental safety issues are.

Q: Tell us some of the most significant ways that you have seen the industry change over the last 35 years.

A:

Dr Fauske: Unfortunately, significant changes take place only following catastrophic incidents like Three Mile Island which happened in 1979, the BHOPAL incident which happened in 1984, that's roughly 30 years ago, and which killed several thousand people in India, the Chernobyl incident in 1986 and the Fukushima incident in 2011. After such incidents, generally there is a real push in the industry for a time to improve safety in whatever way it takes but it really takes these big incidents for it to happen. Having said all that, as a result the industry has become safer but there is still work to be done.

Dr. Henry: Along those lines, one of the key things that we were involved with on the nuclear side was putting together the first set of Severe Accident Management Guidelines (SAMGs). This is the first time the industry pushed its way beyond what the operators are trained to do by procedures. So there was an understanding of what could happen if things went beyond their procedures. Now they have this integrated technology reference book that the operators can go to in an accident, or they can write their own general guidelines, saying 'if we get this far and things look like this, here's what we should do.' This makes the plants a lot safer.

Q: What do you see as the biggest change for the near future of process safety based on what you have seen so far to date?

Dr Fauske: The biggest change that I would like to see is basically making process safety a number one priority, even before profit. That's a tough one, but I think it's needed. I talk to a lot of people, customers and so on, and they say, 'you well know the upper management isn't willing to spend the money, it's too costly.' But it really comes down to a safety culture. You need to have a safety culture in a company, and you need to practice it, not now and then, but all the time. And particularly it has to come from up above, the president, the chairman or whoever is the top guy. It's very important. And, I think if you are going to improve the industry from a safety point of view that's got to take place. And in some companies, that is the case. You may have a good company doing all the right things and you never really have a serious incident. But if you have another company that has a big one, that affects everybody, and that's important.

Dr. Henry: I'm not quite sure where to even start on this but it is extremely important. I can't tell you how many times in discussions of all these types of possible accident conditions that we have to take care of or to at least address or think through that the subject has come up 'well that's never happened.' And, a lot of people fall into the trap that if it hasn't happened before then it isn't going to happen.

Most of the time we are dealing with things that are very low probability, but they still happen and, sometimes the consequences are considerable, just like Chernobyl. But the other side of the coin, if you're going to have a safety culture, when the problem is solved you say it's solved. You don't just continue to milk it and let it hang on because all you are doing is diffusing the focus on the real activities that are needed. All of us think strongly that you don't give up on a problem until its solved, but when a problem is solved, you don't back away saying "this issue is solved".

Dr. Fauske: Another thing, I think there is still a strong need for training courses in safety. In that regard, to take even more advantage of some of the incidents that have happened. What do you do to prevent another incident? That's an important topic. I don't think it gets enough emphasis, but that's an area that certainly we can support.

Q: What are you most proud of in your years of professional achievements?

A:

Dr. Fauske: You may be surprised when I say this but every question you're talking about except for maybe one, relates to safety, and our work relates to safety, and so the thing I think we are most proud of, well myself, I am sure Bob too will agree with this, is that we have basically been responsible for ensuring a safe work place – I am talking about FAI now, since 1993 up to now. If you make that subtraction that's 21 years where we have not had a lost work day due to incident. That's quite an accomplishment. I think we take it very seriously. It's a hell of a record. The other more obvious one, I think it's fair to say that Bob, Mike, myself and other people in this company, we established a reputation as being a world leader in process safety, both nuclear and chemical, a fact nobody would question.

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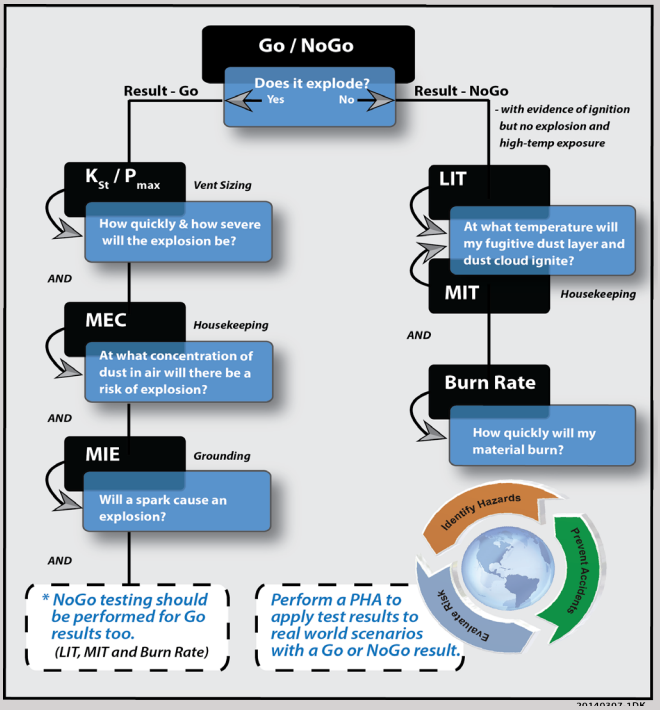
COMBUSTIBLE DUST MANAGEMENT MADE EASY

By: Ashok Ghose Dastidar, Ph.D., MBA
Vice President, Dust & Flammability Testing and Consulting Services
Fauske & Associates, LLC

Customer inquiry inspired us to develop the Combustible Dust Flowchart to help guide the decision-making process when dealing with a potentially combustible dust. The flowchart illustrates basic elements of the testing process and the specific tests that can give helpful guidance about a dust's behavior, from the initial screening (to see if the dust is explosible), to the other tests that may be needed to give vital information to protect equipment or a facility.

The process of managing a potential dust hazard is made challenging by the fact that there are several different official standards that guide combustible dust management (like NFPA 654, NFPA 68, etc), and general rules that are helpful in guiding an approach managing dust concerns. However, the only real way to understand the hazards associated with a dust is to test the dust and to have an engineering professional determine how to apply the test data to a process.

Even after getting test data, we have many clients that still have questions regarding the application of test data to a given facility. To help with these questions, our Risk Management Group specializes in on-site hazard assessments to ensure that the facility is compliant with relevant NFPA and OSHA requirements relative to combustible dust.



Hopefully, you find this Combustible Dust Flowchart a helpful starting point in the process of combustible dust management. Contact us at dust@fauske.com for more information.

Fauske & Associates, LLC Connected to the Community

FAUSKE & ASSOCIATES, LLC (FAI) SPONSORS BIG GYMNASTICS CLUB BIG CLASSIC 2015 COMPETITION

Fauske & Associates, LLC (FAI) showed its support for neighbor, BIG Gymnastics (BIG), as one of the sponsors of their home competition *Big Classic 2015* held this past February 21-22.

During the competition, BIG hosted gymnasts from nearly 25 clubs, levels 3-10 & Xcel at the Five Seasons Sports Club in Burr Ridge.

Opened in September 2006, BIG is an award winning gymnastics club located in Burr Ridge, Illinois. BIG is home to close to 70 competitive gymnasts as well as an EXCEL team of 55 gymnasts and a recreational program with almost 800 students.

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Dr. Henry: I am going to be very specific about what I am most proud of. It's a very short list but it encompasses a lot things. The thing I am most proud of is the fact that we have created these jobs for all these very fine people that surround us every day. Of course, we didn't do it by ourselves, but we did have the initial idea to go do it and we've had such talented people here. It has been a joy to come to work every day and the fact that you can just go down the list of people we have and see how long they have been with us, I am extremely proud of it. It's not often that you go out and start a company where you aren't sending work overseas, you are selling overseas.

Secondly, it goes along with what Hans says about being world leaders. I'm just very proud of what we have done both on the nuclear side and chemical side, developing products that are used on a daily basis by these major companies: chemical companies in the United States, utility companies in the United States, MAAP specifically is used in numerous companies now that are in just about all the nuclear countries of the world.

Dr. Fauske: On the chemical side, we are everywhere. If no one knew any better they would think we were a company with thousands of people working here.

Stepping down from the FAI leadership role 3 years ago (I am still a full-time employee), we are proud of the current leadership team. During their leadership the business has increased nearly threefold and is still growing, which gives us confidence that the company is clearly in good hands.

Dr Henry: We always thought of FAI like a family and we are very proud to be contributing a highly productive organization to the Westinghouse corporate portfolio.

Dr. Fauske: The other thing that's enjoyable, particularly to Bob, Mike and me, is that we've been working together since 1964. At times we didn't necessarily agree on everything, but we have always had a wonderful relationship.

Dr. Henry: Hans was my thesis advisor when I came to Argonne to do my Ph.D. thesis. I was his first graduate student.

Dr. Fauske: Not only that, but for Bob's son Chris (who also works here), I was also his advisor for his Ph.D., which is kind of unique. I get a kick out of it, father and son.

Dr. Henry: Let me just add that Mike Grolmes was one of the first classmates I met at Notre Dame the first day of freshman year and we went all the way through graduate school together. We came to Argonne to write our theses and we were office mates in an office that was right next to Hans' office.

Dr. Fauske: I wasn't Mike's Ph.D. thesis advisor, but I enjoyed discussing with him the progress in his research work.

Dr. Grolmes: I left the FAI organization at the end of 1992, so I have been out of the FAI picture for about 20 years. The organization now is vastly different from the early years. This is as it should be if an organization and a concept are to survive. The FAI organization now is well and firmly established in the industries that are being served. The leadership position is widely acknowledged. All of the excellent company developments in the last 20 plus years have been a result of the dedication, conviction and leadership of Hans and Bob.

As for myself, I can be proud that I was able to (for a time) establish an independent presence in the chemical safety business. However, the real story here is the lifelong good relations with Hans and Bob. When the time came and circumstances changed for me, Hans did not hesitate to offer shelter. So I am very proud to be once again associated with the company that long ago I was a part of its birth on the scene. But again, the fact that there is a substantial company to return to is the remarkable accomplishment of Hans and Bob.

Recognition

Dr. Robert E. Henry, emeritus senior vice president and Regent Consultant of Fauske & Associates LLC, is one of 67 new members and 12 foreign members elected to the National Academy of Engineering for 2015. He was recognized for understanding and analysis of severe power reactor accidents and their impact on design and accident management. Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer.

Jill Brandt has been selected as one of the 2015 members of the Westinghouse "Nuclear Safety Culture" Champions Team.

LAURIE BROMBEREK NAMED FAUSKE & ASSOCIATES, LLC (FAI) Q1 2015 GREEN EMPLOYEE OF THE QUARTER

By: Sara Peters, Marketing Specialist
Fauske & Associates, LLC

Laurie Bromberek, Executive Administrative Assistant, was named Fauske & Associates, LLC (FAI) Green Employee of the Quarter for Q1 of 2015.

Our 'Green Employees' are asked to give us their perspective regarding what it means to receive this award. Please see Laurie's response's below.

Q: Why do you feel being 'green' is important?

A: This is probably the same answer everyone else gives, but so that our future generations will still have the quality of living that we enjoy now.

Q: How do you feel about receiving this award

A: I was surprised. Although I know that I do my share, the company is "Green" as a whole, so I feel everyone in the office does their share to keep in alignment with the policies in place, and not just one person should be singled out.

Q: What tips do you have for others to help in their efforts to be 'green' ?

A: It really is just common sense. Almost everything can be recycled. Sometimes a little effort is involved, such as rinsing out a container before recycling, but in the long run that little bit makes a huge difference.

Congratulations to Laurie for her 'green' efforts and for winning this award!

FAUSKE & ASSOCIATES, LLC (FAI) AWARDS "STEP UP" HONORS TO EMPLOYEES

Three Fauske & Associates, LLC (FAI) employees were awarded "Step Up" honors in February. Each was nominated by fellow employees for work above and beyond their normal daily responsibilities

Congratulations to Samad Erogbogbo, Amy Paul and Jason Griffin (left to right) for "Stepping Up" and leading by example.

Spring 2015 Process Safety Training Courses
Monday, April 20 - Tuesday, April 21, 2015

Fauske & Associates, LLC (FAI), presents two individual process safety courses, designed to identify hazards and control strategies that allow for explosion and fire hazard risk mitigation in the process industries. Each course may be attended individually.

Topics to be covered:
- Flammability and electrostatic hazards
- Prevention and protection practices for dust explosion hazards, including OSHA Combustible Dust National Emphasis Program

CEUs: 0.6 per course

Who should attend?
FAI designed these introductory courses for personnel including – but not limited to – chemists, engineers, technicians and operational staff in R&D, process development, kilo, pilot and full-scale production in the chemical, petrochemical, food, cosmetic, detergent, plastic, paper, agrochemicals and pharmaceutical industries.

Technological/ Education Requirements:
There are no technological requirements for this introductory course. Grade 12 or higher education and 2-3 years professional experience are required.

Day 1 – Monday , April 20
8 am - 4 pm

Introduction to Understanding and Controlling Flammability Hazards

Description
This course will enable engineers and process safety personnel to identify hazards of conducting processes with combustible and flammable liquids and gases. A review of common flammable and electrostatic principles will be discussed using theory and case reviews.

Scheduled Agenda
- Introduction – Basic Theory and Definitions
- Review of Significant Incidents
- Conditions for Fire and Explosion
- Small-Scale Tests
- Theoretical Calculations (Predictions)
- Ignition Factors, Including Electrostatics
- Explosion Control
- Case Studies
- Daily Learning Assessment
- Questions and Answers
- Course Evaluation Instructions

Learning Outcomes
After completing this introductory course, participants will be able to describe and define the fundamental principles of flammability and electrostatic hazards in various industry settings, including:

- Defining what constitutes flammability and electrostatic hazards
- Identifying and mitigating conditions that create such hazards
- Interpreting and reporting on such hazards

CEU Credit Eligibility: FAI is an an IACET (International Association for Continuing Education & Training) Authorized Provider. In order to be eligible for CEU credit (0.6 per course), attendees must be present for the duration of the course, score 85% or higher on the course assessment and complete the course evaluation.

Privacy: Fauske & Associates, LLC has a written policy to ensure privacy and confidentiality of participant training records and information. Training records will only be released with the expressed written permission of the participant. The participant record will be released to the participant or designated third party within 14 business days of the request.

Please direct instructor or course related questions to: Lisa Karcz: karcz@fauske.com, (630) 887-5232, Fax: (630) 986-5481

Prices: $495.00 per day or $990.00 for both days
Hotel accommodations and travel expenses are the responsibility of the participant
Fees include continental breakfast, lunch and afternoon refreshments for each day of attendance.

Location:
Fauske & Associates, LLC
16W070 83rd Street
Burr Ridge, IL 60527
1+877-FAUSKE1

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Technological/ Education Requirements:
There are no technological requirements for this introductory course. Grade 12 or higher education and 2-3 years professional experience are required.

Day 2 –Tuesday, April 21
8 am - 4 pm

Introduction to Dust Explosion Hazards, Prevention and Protection Practices

Description
This course will ensure all participants are aware of important issues associated with OSHA's Combustible Dust National Emphasis Program, NFPA 654 and other relevant standards and codes. A logical approach to characterizing a powder's hazardous dust properties will be presented, 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
- Review of Recent Dust Explosions
- Fundamentals of Dust Explosions
- How to Comply With NFPA Codes and OSHA's Program on Combustible Dust Compliance
- Protection Options
- Daily Learning Assessment
- Questions and Answers
- Course Evaluation Instructions

Outcomes
After completing this introductory course, participants will be able to identify potential dust hazards and how to utilize appropriate test methods to determine levels of potential hazards; as well as apply appropriate mitigation techniques to prevent combustible dust hazards, including:

- Identifying hazard levels
- Determining appropriate methodology for hazard characterization
- Ascertaining process application and hazard mitigation

CEU Credit Eligibility: FAI is an an IACET (International Association for Continuing Education & Training) Authorized Provider. In order to be eligible for CEU credit (0.6 per course), attendees must be present for the duration of the course, score 85% or higher on the course assessment and complete the course evaluation.

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Location:
Fauske & Associates, LLC
16W070 83rd Street
Burr Ridge, IL 60527
1+877-FAUSKE1

SPRING 2015 PROCESS SAFETY TRAINING COURSES

Introduction to Understanding and Controlling Flammability Hazards – Monday, April 20, 8 am - 4 pm
Introduction to Dust Explosion Hazards, Prevention and Protection Practices – Tuesday, April 21, 8 am - 4 pm

REGISTRATION FORM

Course Location:
Fauske & Associates, LLC
16w070 83rd Street
Burr Ridge, IL 60527
1+877-FAUSKE1

Trainer/Host:
Fauske & Associates, LLC
16w070 83rd Street
Burr Ridge, IL 60527
1+877-FAUSKE1

First Name:_____ Last Name:_____

Company Name: _____ Position: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Cell: _____ Fax: _____

Email: _____

Price:
$495.00 per day or
$990.00 for both days

Fee includes continental breakfast, lunch and afternoon refreshments for each day of attendance.
All fees must be received prior to course commencement.
We accept Visa, Mastercard, American Express, purchase order or company check.

Payment Method: ____Visa ____Mastercard ____AmEx ____Purchase Order ____ Company Check

Name on Account: _____

Account Number: _____ Expiration Date: _____

Signature authorizing Fauske & Associates, LLC, to charge credit card:

_____

Please select which day(s) you will be attending:

- ☐ Day 1: Monday, April 20 - *Introduction to Understanding and Controlling Flammability Hazards*
- ☐ Day 2: Tuesday, April 21 - *Introduction to Dust Explosion Hazards, Prevention and Protection Practices*

Hotel accommodations* and travel expenses are the responsibility of the participant

***A list of area hotels will be provided upon receipt of completed registration form**

Cancellation Policy: Cancellations will be accepted up to April 13, 2015

Contact Lisa Karcz: karcz@fauske.com, (630) 887-5232, Fax: (630) 986-5481

FAUSKE & ASSOCIATES, LLC
WORLD LEADER IN NUCLEAR AND CHEMICAL PROCESS SAFETY

www.fauske.com

FAUSKE & ASSOCIATES, LLC
World Leader in Nuclear and Chemical Process Safety

Spring 2015 Relief Systems Design Course

Monday, May 4 - Tuesday, May 5, 2015

Location/Host:

Fauske & Associates, LLC
16W070 83rd Street
Burr Ridge, IL 60527

Course Description

Unlike other emergency vent sizing courses, this curriculum highlights "hand" calculation methods; capable of giving safe – but not overly conservative – relief system designs, with an emphasis on reactive systems and the role of two-phase flow.

Benchmarking of these methods will be illustrated with incidents and available plant data. Utilization of methods and equations will be demonstrated through practical design examples; covering condensed phase (vapor, gassy and hybrid systems), as well as gas phase (gas and dust deflagrations) reactions.

Featured Speaker

Hans K. Fauske, D.Sc., Emeritus President and Regent Advisor of Fauske & Associates, LLC, served as the principal investigator and leader of the DIERS research project team. He is widely known for having developed a simple and cost-effective approach to relief system sizing, including reactive systems and two-phase flow considerations.

Curriculum

Methodology Overview
- DIERS
- API
- ASME
- NFPA

Vent Sizing Models
- Condensed Phase Reactions (Vapor, Gassy and Hybrid Systems)
- Vapor Phase Reactions (Gas and Dust Deflagrations)

Capacity Certification of Pressure Relief Valves in Two-Phase Flow
- Sizing PRV Nozzles
- Sizing Inlet Piping (3% Rule)
- Sizing Outlet Piping (10% Rule)

Runaway Reaction Classification
- Condensed Phase Reactions & Adiabatic Calorimetry
- Vapor Phase Reactions

Single and Two-Phase Flow Overview
- Vessel Behavior and Flow Regimes
- Vessel Blowdown and Vent Line Behavior
- Subcritical and Critical Two-Phase Flows

Special Topics and Examples
- Non-Reactive Fire Sizing Models for Foamy and Non-Foamy Systems
- Discharge Reaction Forces
- Effluent Control / Containment Considerations

Learning Outcomes

After completing this course, attendees will:
- Understand the up-to-date DIERS vent sizing methodologies and models, as well as the role of single and two-phase flow in venting behavior
- Perform vent size calculations using the correct models and methodologies
- Apply adiabatic calorimetry data
- Be able to use hands-on techniques and "rules of thumb" to ensure that realistic vessel and vent size conditions are specified

Price: $1,500.00 USD

- Fees must be received prior to course commencement
- Hotel accommodations and travel expenses are the responsibility of the participant
- Fees include course notes, continental breakfast and lunch for each day of attendance

Spring 2015 Relief Systems Design Course

Monday, May 4 - Tuesday, May 5
8 am - 4 pm

REGISTRATION FORM

Course Location/Host:
Fauske & Associates, LLC
16W070 83rd Street
Burr Ridge, IL 60527
(630) 323-8750

First Name: _____ Last Name: _____

Company Name: _____ Position: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Cell: _____ Fax: _____

Email: _____

Price:
$1,500.00 USD

- Fee includes course notes, continental breakfast and lunch for each day of attendance
- All fees must be received prior to course commencement
- We accept Visa, Mastercard, American Express, purchase order or company check

Payment Method: _____ Visa _____ Mastercard _____ AmEx _____ Purchase Order _____ Company Check

Name on Account: _____

Account Number: _____ Expiration Date: _____

Signature authorizing Fauske & Associates, LLC, to charge credit card:

_____

Hotel accommodations* and travel expenses are the responsibility of the participant

***A list of area hotels will be provided upon receipt of completed registration form**

Cancellation Policy: Cancellations will be accepted up to April 27, 2015
Contact Lisa Karcz: karcz@fauske.com, (630) 887-5232, Fax: (630) 986-5481

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Join Fauske & Associates, LLC (FAI) for our Spring 2015

FREE USERS GROUP FORUM

Location: **Fauske & Associates, LLC**
16W070 83rd Street
Burr Ridge, IL 60527
877-FAUSKE1

Date: **Wednesday, May 6 - Friday, May 8, 2015**
Time: **8:30 AM - 4:30 PM on Wednesday and Thursday**
8:30 AM - Noon on Friday
followed by lunch discussion

Seminar Objectives

FAI's Free Users Group Forum provides users with tips and techniques for obtaining high quality data. Detailed classroom style presentations and meaningful, customized "hands-on" lab training will enable users to understand the full capabilities of their own equipment. Network with other users and leverage their experience with similar applications as found in your facility.

Seminar Topics

* Overview of VSP2, ARSST and ChemiSens equipment
* Equipment demonstrations
* Daily "hands-on" lab sessions
* Instrument trouble-shooting techniques
* Test design and advanced testing techniques
* Safety and sensibility in chemical testing
* PrEVent software demonstration
* DIERS methodology
* Data interpretation

Please return registration form to Lisa Karcz via fax: (630) 986 -5481 or email: karcz@fauske.com
Contact Lisa at (630) 887-5232 with any questions

Name _____ Company _____

Address _____ City _____

State/Zip Code _____ Country _____

Email _____ Phone _____ Fax _____

FAI will provide a continental breakfast and lunch each day for attendees
Attendees are invited to participate in a group outing on May 6th

*** * Hotel accommodations and travel expenses are the responsibility of the attendee * ***