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# Society of Fire Protection Engineers

## New Jersey Chapter

# Fusible Link

November 2006

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## President's Message

As I sit here on a business trip I realized that an SFPE seminar was being held in Maryland. While I was unable to attend there were other NJSFPE Chapter members that were able to take advantage of the programs. At the next meeting we will have a brief overview of the business portion of the SFPE meeting.

Work has been completed on the chapter website and everyone is encouraged to take a look. The more "hits" the site receives the better it is. The Link to the site is:

<http://www.sfpe.org/Chapters/NewJersey.aspx>

Our next meeting will be a field trip to a Continental Hangar at Newark Airport. Space is limited by Continental Airlines and is on a first come first serve basis. If you have never been able to visit the background of the airport this is an ideal opportunity, especially if you travel. If you are planning to attend send in your registration early to make sure there is an available spot.

I look forward to seeing many of you next month.

Best Regards  
Glenn Deitz

<http://www.sfpe.org/chapters/newjersey.aspx>

## NJ SFPE Membership Meeting Minutes October 2, 2006

The meeting was called to order at 6:00 by Glenn Deitz our President; introductions followed the salute to the flag as is our custom.

The General Meeting Minutes for our September Meeting were approved as published in the *Fusible Link*. The Treasurer's Report for September was read and accepted.

Ed Armm addressed the meeting with information about an AFAA of NJ upcoming Advanced Fire Alarm Systems class.

Sarge Slicer spoke about National's upcoming Engineering Technology Exposition which is being held in conjunction with the Annual Meeting of the Society of Fire Protection Engineers on Monday, October 16, 2006 at the Turf Valley Resort and Golf in Ellicott City, Maryland south of Baltimore. The event is strategically positioned following the technical sessions and preceding the Awards and Honors Banquet. Sarge will be representing our chapter at the SFPE Chapters Congress meeting as well as the Banquet.

The speaker at tonight's meeting was Louis Bergeron Director of Technical Services for Fire Flex Systems Inc. Mr. Bergeron introduces us to Fire Flex and their Integrated Compressed Air Foam Systems or ICAF. He started with the history of compressed air and AFFF foam technology which began in 1941 with hose lines used by US Army during WWII, the use was and is continued to today by many local fire departments worldwide. He explained that due to water supply problems the Canadian Government sought a method to apply foam to fires while using the least amount of water possible. This led to tests in fixed piping for Canadian areas with water supply problems in the early to mid

1990's and to a FMG<sup>®</sup> approval in 2004 as a fixed extinguishing system and in 2006 a TIA was provided by NFPA. (TIA #05-1 - NFPA-11, Chapter 7 addition of Compressed Air Foam Systems)

Mr. Bergeron continued with an explanation as to how homogenous foam is produced by combining foam concentrate, compressed air and water in their patented mixing chamber. Within the chamber, foam is mixed at a 10:1 ratio, the foam is uniform, stable, and maintains a high momentum through the piping to their special sprinkler heads. This is with a reduction to 25% of the normal water requirements for standard foam deluge systems as well as a reduction in the amount of foam needed for fires of hydrocarbons. For fires of polar solvents such as alcohol or ketone, water was again reduced; however, more foam is needed.

We were treated to a number of movies depicting fires suppressed with both standard AFFF foam deluge systems as well as ICAF systems side by side. The movies showed the ICAF systems to be both faster in suppression and more economical in operation. The use of less foam for typical fires also provides an environmental advantage. After seeing the system in operation, we looked at the components of a typical system layout which is comprised of air cylinders, a foam tank, and an integrated cabinet where the mixing takes place, the piping network and finally their special sprinklers or nozzles. Within the cabinet was a manual release mechanism, the sprinkler alarm valve, mixing chamber, release trim both electric and a pilot line that uses standard sprinklers as heat detectors and finally the drain.

Next, we got an overview of Fire Flex's proprietary releasing panel. We

then looked at components a little closer to find that the foam tank can be from as small as 5 pounds of foam to 500 pounds and needs no bladder. The compressed air comes in factory-assembled racks of 4, 6, 8 or 10 cylinders per skid; the manifold has a pressure transducer and a field refilling port. The pressure outlet of the compressed air is 100 psi; however, the pressure is greatly reduced in the mixing chamber.

Next, we got to look at the total flooding and local application 'TAR' or Turbine Action Rotary nozzles and the piping network. The piping network has to have a balanced flow with a maximum of 64 nozzles per zone. The networks can have 2, 4, 7, 16 or 32 per side. The nozzles for total flooding have a ceiling spacing of 12'-3" x 12'-3" for hydrocarbons and a 10' x 10' spacing for polar solvents, irregular spacing is allowed with a maximum length of 16' with nozzle heights of from 8 to 46'. We also got to see a nozzle for local application which would be aimed directly at the hazard with a 7' discharge pattern and a 10' horizontal throw.

Mr. Bergeron then went over some applications with us such as hydraulic presses, diesel generators, flammable liquids, lube oil storage skids, pumping facilities for flammable liquids, transformers both in vaults and those outside and finally aircraft hangers.

In closing Mr. Bergeron discussed cost savings and issues such as water supply, suppression capabilities with no requirements for large water tanks & pumps, drainage and/or containment issues and finally the high cost of water treatment.

After a Q & A period, the meeting was adjourned at approximately 8:30.

## Do You Know the ABCs of Career Change?

Making a career change is one of the toughest job-search challenges. For clarification, “career change” means much more than “job change.” A career change means choosing a completely new profession or industry. A “job change” is simply changing employers within the same industry and profession.

Why do people change careers? The two main reasons are:

- The industry or occupation becomes obsolete (or is outsourced overseas) Job dissatisfaction (If you dread going to work on Monday morning, you’re probably in this category.)

What makes a career change so difficult? After all, most job seekers attempting a career change know exactly why they would do well in a new profession or industry. The problem comes down to communication. Most job seekers have difficulty communicating in their resume their ability to excel in a new career. Resumes, by definition, focus on career experience (history), but career changers need employers to see their expertise (current skills) in order to be viewed as a viable candidate.

If you are attempting a career change, it becomes easier when you understand the ABC’s of career change:

- A: Assess
- B: Bridge
- C: Communicate

### **Assess what you want changed**

Before you can make a successful change, you must decide what needs changing. Is it the duties you perform? Your overbearing boss? Your current geographic location? The industry you work in? The size of company you work for? The level of responsibility you hold? Once you pinpoint your exact source of unhappiness, you’re on your way to making the correct choice for change.

### **Bridge the gap between what you’ve done and what you want to do**

The key to selling yourself based on your expertise rather than your experience is transferable skills. Transferable skills work like bridges to help you cross over from one industry to another or one occupation to another. Transferable skills are those skills you now possess that qualify you as a viable candidate for your career change.

### **Communicate your ability to excel in your new profession or industry.**

Your resume is your front-line communication tool to prospective employers. No matter how well you interview, if your resume doesn’t sell you, there won’t be an opportunity to convince them in person. Use your accomplishments to prove the strength of your transferable skills, and you’ll get interviews faster and with more enthusiasm.

An experienced career coach can help you apply these ABCs to your current resume and your interview skills. Once you practice the ABCs of career change you’ll be on your way to changing your career and changing your life - for the better!

The following article was taken from the Fire Protection Research Foundation's Fire Risk and Hazard Assessment Research Application Symposium. This is the second and final part of this paper.

## THE PHYSIOLOGY AND BIOCHEMISTRY OF COMBUSTION TOXICOLOGY - Part II

James M. Feld, P.E.  
Feld Engineering  
Fairfield, CA

### THE PHYSIOLOGICAL EFFECT OF TOXIC SPECIES

#### CARBON DIOXIDE (CO<sub>2</sub>)

Carbon Dioxide is a common product of combustion when carbonaceous fuels are burned. It is also a common product of metabolism when pyruvic acid is converted to Acetyl CoA during aerobic respiration and produced during the Krebs' Cycle.

The body is capable of responding to levels of CO<sub>2</sub> within a certain range. Indeed CO<sub>2</sub> is necessary in the physiology of breathing. If CO<sub>2</sub> levels in the blood were reduced to nothing, breathing would stop. Excessive amount of CO<sub>2</sub> in the blood reduces the pH level of the blood which has many effects including the reduction in the capability of certain molecules from being transported across cell membranes and the change in the tertiary and quaternary structure of proteins (i.e., enzymes) rendering them inoperative. When the atmospheric concentration of CO<sub>2</sub> exceeds 15,000 ppm (1.5%) the blood level of CO<sub>2</sub> becomes dangerously high and the pH buffering system of the blood is overwhelmed.

Carbon dioxide is transported through the body in three ways:

1. 70% of the CO<sub>2</sub> is transported in the red blood cells as the bicarbonate ion (HCO<sub>3</sub>)
2. 23% of the CO<sub>2</sub> combines with an amine group of the protein portion of hemoglobin forming carbaminohemoglobin
3. 7% of the CO<sub>2</sub> is dissolved in the plasma as CO<sub>2</sub> is soluble in water

Mild levels of CO<sub>2</sub> are not harmful by itself. An atmospheric concentration of 4% to 5% will increase the breathing rate by approximately a factor of 2. When breathing twice as fast as the normal resting rate of breathing, other toxic and irritant gases enter the body through the lungs twice as fast. This results in certain adverse physiological conditions (such as incapacitation and death) being attained faster.

#### CARBON MONOXIDE (CO)

Carbon monoxide is probably the most significant toxic species produced in a fire. This is partly because it is readily produced in fires and it is easily detected in fire victims (both living and dead). In addition, CO is the most studied toxicant from both a fire engineering and physiological perspective. The physiological mechanism by which the fire victim is incapacitated or dies when exposed to carbon monoxide is somewhat straightforward but still not entirely understood. Of particular note is that CO is produced by the body. This endogenous production is a result of catabolism of heme. This is a normally occurring process. The quantity of CO so produced is minor (less than 2%).

CO is transported through the body by hemoglobin (~80%), myoglobin (~15%), other compounds (~5%), and dissolved in fluids (~1%).

One of the most studied aspects of carbon monoxide poisoning is the combination of carbon monoxide with hemoglobin forming carboxyhemoglobin. Carbon monoxide, when inhaled, is transported across the cell membrane of the alveoli and the capillaries by diffusion. It is then dissolved in the plasma of the blood where it soon comes in contact with an erythrocyte and subsequently diffuses across the cell membrane. Once inside the erythrocyte carbon monoxide attaches to the iron atom (Fe<sup>+2</sup>) of one of the heme groups of the hemoglobin molecule. The affinity of CO for isolated heme is 20,000 times that of O<sub>2</sub>. The affinity of CO for hemoglobin is 200 to 300 times the affinity of oxygen for hemoglobin. The difference in the affinities is due to the location of the heme group in the hemoglobin structure. Since there are 4 heme groups for each hemoglobin molecule, a maximum of four carbon monoxide molecules will combine with each hemoglobin molecule (just as a maximum of four oxygen molecules will combine with each hemoglobin molecule).

#### CYANIDE (CN)

Hydrogen Cyanide is the most common form of cyanide given the typical fuels involved in a fire. The physiological mechanism of cyanide, as currently understood, is quite simple. The Cyanide radical combines readily with cytochrome a<sub>3</sub> oxidase, thereby inhibiting its action. The Cyanide radical has an affinity for the iron atom at the center of the heme group of cytochrome a<sub>3</sub> oxidase. The inhibition of cytochrome a<sub>3</sub> oxidase affects the last step in the electron transport system preventing the combination of hydrogen with the oxygen, which was inhaled, to form water. This shuts down the electron transport system and the production of ATP.

*Continued on Page 5*

**EDWARD B. ARMM, SET**



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### CYANIDE (CN)

Hydrogen Cyanide is the most common form of cyanide given the typical fuels involved in a fire. The physiological mechanism of cyanide, as currently understood, is quite simple. The Cyanide radical combines readily with cytochrome  $a_3$  oxidase, thereby inhibiting its action. The Cyanide radical has an affinity for the iron atom at the center of the heme group of cytochrome  $a_3$  oxidase. The inhibition of cytochrome  $a_3$  oxidase affects the last step in the electron transport system preventing the combination of hydrogen with the oxygen, which was inhaled, to form water. This shuts down the electron transport system and the production of ATP.

Interestingly, treatment of CN poisoning is accomplished by use of nitrites (amyl nitrite and sodium nitrite) which induce methemoglobin production. Methemoglobin combines with CN more readily than cytochrome  $a_3$  oxidase. This removes CN from

### IRRITANT GASES

Certain products of combustion are not as toxic as CO, HCN, and CO<sub>2</sub>. Some are not considered toxic but are irritants. Depending on the fuel source, these products can include HCl, HF, H<sub>2</sub>S, oxides of nitrogen (NO<sub>2</sub>, NO<sub>3</sub>), oxides of sulfur (SO<sub>2</sub>, SO<sub>3</sub>), acrolein, and others.

The primary action of these gases is that of combining with water lining the respiratory pathway forming acids which destroy the epithelial cell membranes lining the respiratory tract. For example HCl will break the chemical bonds between the amino acids which make up proteins of the cell membrane (similar to the action of HCl in the stomach when digesting meat). The destruction of these cell membranes ruptures the cell releasing the cell contents, including water. The water so released may cause edema and settle in the lungs resulting in other complications (including pneumonia).

**Acrolein:** Acrolein irritates the cells lining the airway resulting in destruction of the epithelial cells as described above for HCl. The cilia lining the airway are affected which prevents the body from expelling foreign material including bacteria. Acrolein also impairs enzyme function and depletes glutathione. Glutathione is responsible for maintaining the hem iron of hemoglobin and myoglobin in the reduced form of Fe<sup>+2</sup>. This form of heme is necessary to bind O<sub>2</sub>. Thus, glutathione helps prevent the oxidation of Fe<sup>+2</sup> to Fe<sup>+3</sup> which forms methemoglobin.

**Hydrogen Sulfide (H<sub>2</sub>S):** The effects of Nitrogen dioxide (NO<sub>2</sub>) may be both damaging and beneficial. Upon combining with water of the respiratory airway, NO<sub>2</sub> forms nitric acid (HNO<sub>3</sub>) and nitrous acid (HNO<sub>2</sub>). These acids damage or destroy the cell membranes of the epithelial cells lining the respiratory airway. NO<sub>2</sub> also diffuses through the cell membranes into the blood and into the erythrocytes. NO<sub>2</sub> is then capable of combining with the iron of hemoglobin forming methemoglobin. Although methemoglobin is not functional in the transport of oxygen, it has a greater affinity for CN than cytochrome  $a_3$  oxidase. Therefore, the effects of CN in the inhibition of the oxidative phosphorylation of ADP to ATP (electron transport chain) can be substantially reduced and higher levels of CN can be tolerated.

### CONCLUSION

The body of knowledge of the effects of the toxic products of combustion is limited although most of the research emphasis has been on carbon monoxide, it is very important to study the effect of other toxic species on the body and in particular the combined effects.

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# Meeting Dates/Programs 2006-2007

DATE	TOPIC
November 6, 2006	Field Trip - Newark Airport Continental Hangar Fire Protection - Rich Reitberger, Coordinator
December 4, 2006	Life Safety in Health Care Facilities - Tony Meehan RJA New York
January 8, 2007	Industrial Post Fire Restoration - Rich Reitberger, Affiliated FM
February 5, 2007	NIST Station Night Club Fire Analysis - Dan Madrowski, Chuck Gandy
March 5, 2007	Commodity Classification Changes - Joe Janiga, FM Global
April Meeting/Seminar Day	Homeland Security/Disaster Protection of gas and chemical plants
May 7, 2007	Insurance Industry Update - Bob Baker, FM Global, Mike Newman, Johnson & Johnson; Brad Hart, Lockton
June 11, 2007	J&J Explosion - Mike Newman, Johnson & Johnson
June 25, 2007	Golf Outing - West Point

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There are issues regarding combustion toxicology which must be researched and addressed in order to resolve the problem of limited knowledge.

1. Laboratory methods to qualitatively and quantitatively identify the toxic species in the body of the victim (both survivors and fatal victims) must be developed. Such methods must be cost effective and accurate.
2. Studies regarding the half-life of toxic species must be further developed. Blood samples must be obtained as soon as possible from both survivors and fatal victims.
3. Analyses of victims must include specific information regarding the history of the victim - location with respect to the fire, time exposed to toxic species, characteristics of the fire.
4. Currently, the engineering regarding the assessment of fuels with respect to the evolution of toxic species is primarily limited to CO. Types of fuels involved, ventilation rates, varying rates of production with respect to time must be used to identify quantitatively and qualitatively the toxic species evolved.
5. The understanding of the physiological and biochemical processes affected by the various toxic species must be researched. Are other Cytochromes affected? Do toxic species other than CO affect hemoglobin?, etc.
6. Long term effects of toxic species must be studied. Of note are those which are carcinogenic.
7. Autopsies must be expanded to include not only burns and COHb levels, but also other toxic species. The personal characteristics of the victim must also be recorded. Data so generated must be compiled and reported.
8. Interactions of the various toxic species, including physical condition (cardiovascular disease, lung disease, etc.), age, gender, etc. must be studied in great detail. Currently, the N-Gas model developed at NIST provides the best treatment of the effects of multiple toxic species. ■

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**Continental Airlines Maintenance Hanger Tour  
&  
Fire Protection Briefing**

**WHEN:** Monday - November 6, 2006  
**WHERE:** Bus Leaves at **3:00 p.m. Sharp** from Holiday Inn Hotel  
**(Don't be late or you will miss the bus):**

**Holiday Inn Newark Intl Airport**  
160 Frontage Road  
Newark, NJ 07114  
(973) 589-1000  
(866) 270-5110 (toll-free)(973) 589-1000

**PRICE:** \$30.00

\* \* \* \* \*

**Hanger** - 3:30 - 5:00 Continental Airlines Hanger Tour,  
Maintenance Ops & Fire Protection  
System Briefing  
5:00 Bus back to Hotel at completion of Tour

**Hotel** - 5:30 - 6:00 Cash Bar

**Dinner & Meeting** - 6:00 Hot Buffet (Beef / Chicken / Salmon)

\* \* \* \* \*

**RESPONSE DUE DATE: November 1, 2006**  
Email - [vicki.serafin@affiliatedfm.com](mailto:vicki.serafin@affiliatedfm.com)  
Phone - 973-541-6771 / Fax: 973-541-6906

We have **40** seats **Max** available for the tour; please respond ASAP to ensure a seat on the bus.

**Name:** \_\_\_\_\_

**Phone:** \_\_\_\_\_

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## MEETING NOTICE

- Date:** November 6, 2006
- Place:** Hanover Manor  
16 Eagle Rock Avenue  
East Hanover, NJ
- Price:** In Advance - \$22 At door - \$25
- Dinner:** 5:00-6:00 (Cash bar for mixed drinks)  
Dinner at 6 PM
- Speaker(s):**
- Topic:** Field Trip - Newark Airport Continental Hangar Fire Protection - Rich Reitberger

**Please note for this meeting:**

All officers, directors and committee chairman are requested to attend a meeting at 4:00 p.m. at the Hanover Manor.

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PLEASE COMPLETE AND RETURN WITH YOUR CHECK PAYABLE TO "SFPE NJ CHAPTER" TO:

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vicki.serafin@affiliatedfm.com

NAME: \_\_\_\_\_

COMPANY: \_\_\_\_\_ TELEPHONE: \_\_\_\_\_

ALL RESERVATIONS SHOULD BE RECEIVED BY FRIDAY, OCTOBER 29, 2006. TELEPHONE RESERVATIONS OR CANCELLATIONS SHOULD BE RECEIVED BY NOON OF THE MEETING



## 2006-2007 CHAPTER COMMITTEES

### STANDING COMMITTEES

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Consulting - Nick Chergotis & Peter Rullo

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Vicki Serafin, Chairperson

#### **Membership**

Dave Gluckman, Chairman

#### **Nominating**

Rick Reitberger, Chairman  
Chuck Gandy  
Glenn Buser

#### **Scholarship Fund**

Chuck Gandy, Chairman  
Robert Hall  
Mike Machette  
Dave Gluckman

#### **Auditing**

Joe Janiga, Chairman  
John Warnet

#### **Archivist**

Rich Reitberger, Chairman  
Nicole Davidowitch

#### **Historian**

Jim Tolos

#### **Communications**

Fusible Link—Brad Hart  
Ana Crisostomo—Coordinator  
Mailing/Automation/e-mail—Vicki Serafin, Chairperson

### SPECIAL COMMITTEES

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Jim Tolos, Chairman  
Joe Janiga - Co-Chairman

#### **Career Recruitment**

Al Dopart, Chairman  
Glenn Deitz  
Dave Gluckman

#### **Golf Outing**

Richard Reitberger, Chairman  
Joe Janiga

#### **Awards**

Frank Savino, Chairman  
Rich Reitberger

#### **PE Examination**

John Cholin, Chairman  
Joe Janiga  
Mike Newman  
Chuck Gandy

#### **Chapter Seminar/Field Trip**

Richard Reitberger, Chairman  
Dave Gluckman  
Joe Janiga

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#### **Finance**

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