FPC TRENDS 13

May 1997

Professional Worldwide Consultants on Risk Analysis, Safety, Fire and Explosion

## EDITO

For a long time, FPC has been concerned about the lack of formal educational programs which we believe are necessary for a successful implementation of a fire protection engineering practice. Currently, there are no specific educational requirements that have to be fulfilled by a firesafety engineering job applicant. This is especially true in Europe, where academically and professionally educated 'Fire Protection Engineers' are sparse. FPC is therefore strongly in favour of standardising the status of FPE in the future through education.

For the last 15 years David Lucht has been managing one of these rare fire protection engineering programmes at the Worcester Polytechnic Institute in the United States. We are very pleased to include an article in FPC's Trends about this programme written by its creator.

In this issue, we are also proud to present to you :

- new staff members
- an overview of FPC's specialised fire engineering software
- some of the major projects FPC is currently engaged in.
- F·I·R·E·S©, a new product recently developed by FPC

and,

we question the fact whether a fire fighting operation involving 200 fire fighters can be called successful...

# Fire Protection Engineering at Worcester Polytechnic Institute

### INTRODUCTION

**In this issue we feature an article by Professor David Lucht of the Worcester Polytechnic Institute regarding their graduate programs leading to degrees in fire protection engineering. WPI is the third oldest private technological university in the United States and has been conducting formal academic programs in fire protection engineering since 1979.**

*Professor David A. Lucht*

Alert to the growing international concern for firesafety and the rapid development of new technology, WPI established the Center for Firesafety studies to bring together talents from many disciplines for the common purpose of focusing on firesafety problems. Key features of the Center include graduate degree programs in fire protection engineering, continuing education for the practitioner and research to uncover new knowledge about fire behaviour and fire protection methods.

WPI's fire protection engineering degree program adheres to the philosophy that effective professional performance requires more than just knowing the subject matter. Successful engineers must also be effective communicators, have the ability to solve instructed problems and develop and astute sense of professionalism. WPI's fire protection engineering program is oriented toward developing a well-rounded professional who can be successful in a competitive career environment. The curriculum is considered to be a major foundational element in a process of career-long learning.

The fire protection engineering curriculum is designed to teach students current standards of practice and expose them to state-of-the-art research literature that will support future practices. The thesis or graduate project, along with class room projects, helps reinforce the ability to solve open-ended problems and communicate solutions.

The academic program at WPI is supported by five leading fire protection engineering faculties with backgrounds in teaching and research as well as consulting, government,

## Inauguration of a renovated and modernised FPC Office

***After 25 years of enduring hard labour, we finally decided to put our old interior to rest and give the FPC office a new look. Still no Van Goghs or Renoirs on the walls but ample means that provide the atmosphere of a modern consultancy office.***

insurance engineering and testing laboratories.

Course subjects taught cover the spectrum of fire protection practice including :

- fire dynamics
- detection
- alarm and suppression systems
- risk management
- building firesafety design and analysis
- failure analysis
- industrial applications
- explosion protection
- material flammability
- codes and standards
- process safety management.

Research conducted at the Center has involved fire protection engineering students and faculty as well as those from other academic departments including civil engineering, mechanical engineering, computer science and management. Research thrusts have included firesafety evaluation methods for buildings, submarines and ocean-going surface vessels; computer fire modelling; explosion phenomena; modelling the fire performance of building structures; fire detection and suppression; and risk management techniques. These and other research activities help WPI students and faculty remain on the cutting edge of fire technology.

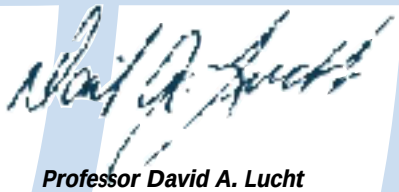
A new Fire Science Laboratory was completed in 1995, giving students and faculty access to state-of-the-art fire research and testing capabilities.

This new facility is also available to industries having common interests with the Center for Firesafety studies, its faculty and students. Experimental capa-bilities are available in flammability and explosibility, combustion phenomena, detection and fire and explosion suppression.

Key features of the new Fire Science Laboratory include the Cone Calorimeter, LIFT Apparatus, Room Calorimeter, Radiant Panel Test Apparatus and Smoke Density Chamber.

Over the past years, WPI's fire protection engineering curriculum has grown from a small part time program to one of the leading fire protection engineering education curricula, world-wide. Professor David A. Lucht, head of the fire protection engineering curriculum reports ... 'We are anxious to expand our student body and industry interactions on an international scale. Our new Fire Science Laboratory, modern computer capability and distance learning technology strengthen our opportunities in this direction'.

Additional information about WPI's fire protection engineering programs can be obtained by contacting Professor Lucht at the WPI Center for Firesafety studies, 100 Institute Road, Worcester, MA 01609 USA, or via Internet (dalucht@wpi.edu). Details can also be accessed through the world wide web at **http://www.wpi.edu/~fpe**.



***Professor David A. Lucht***

## INDUSTRIAL NEWS

# CLARK REFINING AGREES TO PAY $1.2 MILLION IN FINES

A U.S. Department Labour Press Release reported that Clark Refining & Marketing has agreed to pay US $ 1,257,000 in penalties and to make significant safety improvements at its Blue Island Refinery.

This agreement follows an investigation of a fire and explosion which killed two maintenance workers and injured three operators. The accident occurred during repair work on a valve for a hydrocracking unit used in producing gasoline.

Operators not trained in maintenance procedures were performing the work and did not properly lockout the equipment. Pressure in the line blew off the valve bonnet, shooting flammable liquid and vapour 70 feet into a welding shop, where it exploded into a fire that flashed back to the hydrocracking unit.

The employees who were killed had been eating lunch in the welding shop and the three operators of the hydrocracking unit suffered severe burns.

# V . A . C . A . N . C . I . E . S

*FPC is a dynamic, growing company. We now have job vacancies for Firesafety Engineers to join our team. We are looking for enthusiastic self starters, competent and not afraid of accepting responsibility.*

*Education should be at a Master degree level in fire protection, chemistry, chemical or mechanical engineering, with a minimum of five years hands-on experience in any of these disciplines.*

*If you have the right qualifications and are interested in this challenging position, write to us at **FPC, Noorderlaan 133 - bus 1, B-2030 Antwerp, Belgium**, enclosing your CV.*



# 200 FIRE FIGHTERS ?

**How many times have we read this in the newspapers or seen it on TV all over the world ? I quote from a recent article regarding a fire in the UK that destroyed 10 000 tons (!) of polypropylene: *'After eight hours of fire-fighting operations involving 200 fire-fighters the fire was successfully brought under control!'***

What does it mean to read such contradictory statements like '10.000 tons destroyed' and 'fire brought successfully under control' ? In my humble opinion, it is a cast iron proof of the impossibility to fight fires manually which involve large amounts of stored combustible materials (read, huge amounts of stored energy).

In the field of modern Fire Engineering techniques we can estimate how much water is required to absorb a certain amount of heat generated during the uncontrolled reaction of oxygen and combustible materials. In order to successfully control any fire, incipient or significant alike, the three most important factors that must be satisfied are :

- *ample quantity of extinguishing media, e.g. water*
- *applied at the right time*
- *applied at the right spot.*

If any of these factors fail, a fire will continue to grow in size.

Let us question the options of a well trained professional fire brigade to comply with those factors (in order to be successful):

- *can a fire brigade always have a dependable and sufficient amount of water available ?*
- *can a fire brigade always apply water where needed at the right time ?*
- *can a fire brigade always apply a sufficient amount of water at the right spot ?*

It is obvious that most fires start as small ones and that during this so-called incipient stage of a fire, only a little amount of water is required for extinguishment. However, if water application is delayed a fire can spread quickly.

In the fire engineering world, the growth phase of a fire is often characterised as increasing proportionally with the square of time ($t^2$). If flammable liquids or warehouse commodities are involved, this proportionality factor can increase by up to the power of nine ($t^9$). This leads us to the criticality of the element time and here most fire attacks fail to be successful.

Too many elements can influence this time factor negatively.

To name a few :

- *fire discovered too late*
- *poor weather and road conditions*
- *insufficient information*
- *distance too long*
- *mechanical problems (with equipment)*
- *poor communications*
- *human failure, etc....*

To illustrate this time factor even better, I recall a total failure of an emergency trial in a hilly region. The well equipped and trained municipal fire brigade was located less than 5 minutes away from the plant. The date and time of this trial was agreed in advance but unfortunately that day there was ice-rain and black ice covered the streets. None of the fire-fighting vehicles managed to reach the scene and the trial was called off. Consequently, special tyres for fire trucks were introduced for winter conditions after this trial but unfortunately, a two family dwelling had to burn-out that same day to prove the point.

Now the question, where to apply the water (when available)? Anyone who has been involved with industrial fires and fires in buildings, knows that it takes only a little time to fill a building or compartment quickly with dense smoke. Tackling a fire from the inside becomes ineffective and even dangerous for the men involved. During this time elapse, a fire will get more intense and soon too much material will get involved in the combustion process resulting in a flash-over and full room involvement.

At this stage, the difference between 20 or 2000 fire-fighters being present at the fire scene becomes negligible. (I am deliberately not quoting fire engineering facts such as the poor absorption capacity of 10 fire hose streams; that is not the purpose of this article)

Business people are faced with an ever increasing competitive world, where reducing cost is in many cases the only available way to maintain or improve profitability. They do not like to accept the cost increase for storing products with properly engineered and installed fire protective systems. If however, the rules for effective protection against fires become universal, all parties must absorb this cost equally and the competitive edge will remain the same. The benefit will be that the world will experience less and less spectacular and costly fires with, as an extra bonus, our feeble environment not having to absorb the $NO_2$ and other non-desirable substances resulting from large industrial fires.

**In my opinion, only those businesses with a clear cut vision including a profound Firesafety Management style will survive in the long run.**

A simple calculation shows, for this particular fire case, the following interesting information: Assuming that the cost of a trained fireman plus equipment will be US $ 500/hr. This means that 200 x 8 hr x 500 = US $ 800 000 plus the value of 10 000 tons of material plus the building cost plus the clean-up cost equals roughly the total loss.

Versus :

200 fixed installed fire-fighters, also called sprinklers. Cost 200 x US $ 500/sprinkler = US $ 100 000.

Notice the difference. Which of the **200 fire-fighters** would you prefer ?

***André van Gaalen***
***Senior Life and***
***Firesafety Consultant***

# Staff Additions

**Ralf Bruyninckx** is one of the few Europeans who holds a *Master's Degree in Fire Protection Engineering,* which he recently obtained from the Worcester Polytechnic Institute in the United States (see main article). Previous to this specific professional education, he completed a Bachelor and Master's program in Applied Economics offered by the University of Antwerp, Belgium. Within FPC, his major tasks are oriented towards the application of performance based fire engineering. His combined engineering / administration background will enable effective communication with our clients and facilitate the engagement concerning financial aspects of studies and projects.

*

**Reginald Degryse** holds a chemical engineering degree. Before he joined the FPC-team, he was active as technical administrator within a construction company. He also obtained several years of experience as an environmental inspector. His strengths are : design of fire protection engineering and analysing bids, site supervision and commissioning.

*

**Erik De Smet** is a mechanical engineer who started his fire protection career 23 years ago at Coppée-Rust - Brussels, an engineering company specialised in turn-key industrial projects. For years, he designed fire protection systems for all kinds of industrial projects. Next, he moved to the Zurich Insurance Company where Erik worked as an international Risk Engineer in the fields of risk assessment, safety at work, fire protection and product liability. He is the author of F.R.A.M.E., the Fire Risk Assessment Method, that allows to calculate the balance between fire risk and protection for buildings, in a flexible approach.His areas of professional specialisation are analysis of fire and building regulations, lifesafety evaluations and fire resistance of materials.

*

**Liesbet (Femke) Loossens,** who holds a degree in chemical engineering, is specialised in Safety and Environmental technology. This was put into practice by an elaborate research project carried out at the University of Glamorgan in Wales. She recently joined FPC as a Fire Technologist. Her field of expertise involves the correct translation and design of firesafety plans by using specialised fire engineering software.

*

**Dirk Smeets** joined the FPC company as a Fire Protection Engineer and Technologist. His major tasks are fire modelling and the implementation of consequence and impact calculations. He is a graduate chemical engineer of the University of Leuven, Belgium. He is also licensed in quality control and quality management.

*

**Peter Van Gorp** is a graduate electro-mechanical engineer with several years of on-site experience. His areas of specialised competence are the conceptual and detailed engineering of fire and explosion protection and detection systems, material and installation specifications and construction supervision.

*

**Sabine Willems,** a graduate in English, German and Dutch, joined the FPC Antwerp staff early this year. Previously, Sabine worked for an international law firm and a multinational construction company, where she was responsible mainly for legal and technical translating. At FPC, she is responsible for all technical and commercial translating from and into her degree languages. She also assists in project and office administration.

***In this section, we selected three appealing new high quality fire engineering projects out of the more than 75, which FPC is undertaking at this moment.***

# Beautiful

## Emir's Palace - Amiri Diwan, Qatar - Middle East

FPC has been authorised by the Government of Qatar to conduct a performance based Life and Firesafety Study of this unique piece of architecture located in one of the wealthy states at the Arabian Gulf. In this majestic palace 'His Highness H H Sheikh Hamad Bin Khalifa Al Thani' resides during his lifetime. Prominent people from all over the world are invited throughout the year and the ministry staff gathers daily. Here too, irreplaceable treasures are being guarded for eternity.

Needless to say that 'even' the FPC team had to negotiate permission to get access to certain parts of the Palace due to the extremely tight security system. Although the fire load and fire hazards inside the Palace are relatively low, the magnitude and importance of this building combined with its governmental functions assure a challenging, but very interesting and prestigiously *beautiful* project.

# Big

## BSL - Buna Sow Leuna, Germany - Europe

The BSL project, which is currently being conducted in former East Germany, represents one of the vast investments in the chemical industry of this decennium.

BSL has a long history as a large chemical manufacturing company. Together with the Dow Chemical Company of the US, BSL is in the process of upgrading existing installations and constructing new plants at the three major sites Schkopau, Leuna and Böhlen and at the minor sites owned and operated by BSL.

Concurrently with all the renovation works taking place, BSL and the Dow Chemical Company want to protect their installations, their people and the company's assets against the perils of fire and explosion. To ascertain durable high quality fire protection, BSL and FPC negotiated a Service Agreement. Under this agreement, FPC provides Firesafety consultancy and engineering services for the provision of effective and reliable fire protection systems and fire-fighting services. To arrive at the established objectives, Performance and Scenario Based Fire Engineering techniques are employed by FPC**.**

# Brilliant

## Unocal Netherlands
## Offshore Oil and Gas Platforms, North Sea

Last year Unocal Netherlands approached FPC with the request to develop practical and goal orientated fire-fighting and emergency response plans for the several offshore platforms operated by Unocal in the North Sea. Instead of providing our client with a prescriptive and qualitative document, FPC - together with Unocal Safety Department- designed scenarios and time-related action plans to assist operators in taking crucial decisions during a gas/fire incident.

Throughout the execution of this challenging project, State-of-the-Art fire engineering and performance based analysis was employed to satisfy the objectives of the customer and the requirements of the Dutch Authorities.

F·I·R·E·S© (**F**ire **I**nitiated **R**esponse and **E**vacuation **S**cenarios) developed by FPC is a new product to provide practical, time-related and scientifically supported fire fighting, rescue and evacuation plans. It covers all possible emergency situations where fire and gas releases or explosions are involved. The practicality, simplicity and success of F·I·R·E·S© is now the incentive for an expansion of its application towards the entire petrochemical industry. For more information, please see the enclosed leaflet.

# FPC 'Hot' Software

**KY PIPE :** Hydraulic Analysis Software

**HEATCALC :** Calculation of Heat Flux Imposed by Pool or Jet Fires

**ALOHA :** Estimation of the Extent of Chemical Accidents

**ADVENT :** Design of Deflagration Vents

**HYDCALC :** Hydraulic Calculations

**DBFAIL :** Historical Data of Failure Rates and Consequences within the Process Industry

**GASCALC :** NFPA Calculations of gaseous Fire Extinguishing Systems

**EXCALC :** Calculation of Explosion Energy, Damage Contours, Fragmentation and Impact on rigid Structures

**RISK RATING :** Quantitative Identification of Fire and Explosion Hazards

**EVACNET :** Evacuation Planning Analysis and Evaluation

**SPRINK 1.0 :** Prediction of Response Time for Heat Detectors and Sprinkler Systems for Warehouse Storage

**FPE-TOOLS :** A Room Fire Model

**WHAZAN :** Simulation for accidental release of hazardous materials

**HAZOP :** Spreadsheet for recording of HAZOP-meetings

**PIPENET TRANSIENT :** Calculations of pressure surges water hammer in piping systems from pump trips and valve operations

**PRICE FS :** Price Database of specific Firesafety and Fire Fighting Equipment

**HAZARD 1 :** Simulation of Smoke and Fire Transport through Buildings

**DB 4.1. :** FPC's literature and technical information library

## AUTOCAD RELEASE 13 and MICROSTATION VERSION 95

## Public Prosecutor sues Switel Hotel Management !!!!!!!!

Although three years have passed since a burning Christmas tree abruptly ended a New Years Eve party at the Switel Hotel in Antwerp, Belgium, leaving 15 people dead and even more mutilated for life, the catastrophe is still fresh in everybody's mind.

Now, exactly three years later, it seems that the investigation and the verdict is in its final stage. The president of Switel has been considered liable by the prosecutor for unintentional death and arson. If the criminal judge declares the Switel management responsible for the catastrophe, the civil liability insurance of the hotel chain will have to pay an estimated sum of US Dollars 40 million. A final verdict is expected soon. We will keep you informed.

### Send address changes to FPC Trends

To add your name or someone else to the mailing list, send your name and address to:

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