

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Process Safety and Environmental Protection

journal homepage: www.elsevier.com/locate/psep

IChemE



A review of the past, present and future of the European loss prevention and safety promotion in the process industries

Eddy De Rademaeker^a, Georg Suter^b, Hans J. Pasman^{c,*}, Bruno Fabiano^d

^a Prevention Management International BVBA, Waterstraat 63, B-2970 Schilde, Belgium

^b Swissi Process Safety GmbH, Schwarzwaldallee 215, CH-4002 Basel, Switzerland

^c Mary Kay O'Connor Process Safety Center, Artie McFerrin Department of Chemical Engineering, Texas A&M University, College Station, TX 77843, USA

^d DICCA, Civil, Chemical and Environmental Engineering Department, Polytechnic School, University of Genoa, Via Opera Pia 15, 16145 Genoa, Italy

ABSTRACT

In 2013, the European Federation of Chemical Engineering (EFCE) celebrates its 60th anniversary. EFCE has continually promoted scientific collaboration and supported the work of engineers and scientists in thirty European countries. As for its mission statement, EFCE helps European Society to meet its needs through highlighting the role of Chemical Engineering in delivering sustainable processes and products. Within this organizational framework the Loss Prevention Symposium series, organized throughout Europe on behalf of the Loss Prevention Working Party of the EFCE, represents a fruitful tradition covering a time span of forty years. The tri-annual symposium gathers experts and scientists to seek technical improvements and scientific support for a growingly safer industry and quality of life. Following the loss prevention history in this paper, a time perspective on loss prevention and its future is presented.

© 2014 The Institution of Chemical Engineers. Published by Elsevier B.V. All rights reserved.

Keywords: Loss prevention; Resilience; Process safety research; Inherent safety; Blended Hazid

1. The origins of the Working Party and the symposia

From 1953 onwards, the European Federation of Chemical Engineering (EFCE) has continually promoted scientific collaboration and supported the chemical engineering work of engineers and scientists in thirty European countries. As an organization the EFCE was initiated in the Western part of Europe, but Central and Eastern European countries joined. As for its mission statement, EFCE will help European Society to meet its needs by highlighting the role of Chemical Engineering in delivering sustainable processes and products.

The EFCE Working Party on Loss Prevention and Safety Promotion in the Process Industries (WP Loss Prevention) began in 1971 as a group of very motivated professionals, who decided at the symposium “Major Loss Prevention in the Process

Industries”, held in Newcastle upon Tyne, that in view of the safety situation at the time an international effort was necessary and found a “roof” for it in the EFCE.

The first international symposium was organized by an international committee and officially labelled “on Loss Prevention and Safety Promotion in the Process Industries” (LPS) was held on 28–30 May 1974 in the Aula of the Delft University of Technology in Delft, The Netherlands. The new approach to safety, “Loss Prevention” was originally directed to the prevention of large scale accidents and to set up measures to limit their possible consequences to acceptable levels. From the accident histories in the 1960s, much was learned (Pasman, 1998), as summarized in the following:

- the conditions that lead to an accident are often complex and difficult to reproduce;

* Corresponding author. Tel.: +356 79811662.

E-mail address: hjpasman@gmail.com (H.J. Pasman).

Received 16 December 2013; Received in revised form 17 March 2014; Accepted 18 March 2014

<http://dx.doi.org/10.1016/j.psep.2014.03.007>

0957-5820/© 2014 The Institution of Chemical Engineers. Published by Elsevier B.V. All rights reserved.

Table 1 – Topics at the 1st international symposium on Loss Prevention in the Process Industries 1974.

1. Emergency planning	7. Gas, vapour cloud and dust explosion
2. Guide lines for safe design	8. Transport and storage of liquefied gases
3. Hazards and operability studies	9. Vapour dispersion in the atmosphere
4. Insurance aspects	10. Explosibility, test procedures and results
5. Reliability engineering	11. Loss prevention through design
6. Safety organization	12. Case studies

- test methods were often inadequate for making reliable predictions;
- the effect potential for large mass was often underestimated;
- a system approach appeared crucial for successful prevention.

Starting from these considerations, a look at the topics of the first Proceedings, reproduced in Table 1 with the original terms utilized in those days, can give an idea of the wide number of emerging issues connected to safety and loss prevention, which were relevant in the early seventies. One of the most urgent tasks was recognized to be the collection of sufficient relevant data to predict the reliability of technological systems over a given period of time. A good start was explained by Green (1974) presenting reliability data collected in the field of nuclear energy generation and the need of organizing a world-wide data collecting system for the process industry. In the same first symposium, while explaining how safety is good business, Webster (1974) commented “safety is rapidly emerging from a modest chrysalis of injury prevention to become a profit spinner supreme in the guise of damage and total loss control”. Moreover, he pointed out the need that top managers take a keen interest in accidents, so that the effort of the company are properly brought to bear on accident problems. As a matter of fact, we must remember that there was some hesitation in the 1974 LPS selection committee to accept the paper, in that talking about money should not obscure the ethics of safety. Mr Webster modified the title of his paper, which originally was called “Safety as a money spinner”. Sadly, the day after the Delft symposium, the vapour cloud explosion of the 2-years-old caprolactam Nypro plant, near Flixborough, U.K., which over the years became one of the most extensive investigated accidents (Venart, 2004), proved once again how urgent the study of safety issues was at that time.

2. The 20th Century evolution

Forty years of loss prevention and safety promotion in the process industries are well outlined by the LP symposium history, depicted in Table 2 and showing the different hosting countries from the origin to nowadays, with attendance reaching over 500 delegates. Now the figure seems stable around

350–450, with shifts in affiliation and origin of the attendees. In particular, over the last years the percentage of delegates from industry decreased in favour of the number of professors, PhD students, and consultants. This shift seems in some way connected to economic reasons and possible funding cuts for basic safety research at the industrial level. The content of the different symposia reflects, at least to some extent, the evolution of Loss Prevention and the improvement in methods on risk analysis and assessment. Some milestones and examples of the ongoing evolution are summarized in the following.

Risk analysis as a methodology to describe and delimit the risk of chemical process operations was introduced in the mid-seventies to the then newly founded community of Loss Prevention in the process industry. The second and third LPS reflected this debate, focusing on what quantification is worth with definite pro's and con's, with a wide diffusion of Quantified Risk Analysis (QRA). The methodology borrowed from the nuclear industry was seen by some as a panacea but initially stirred up endless discussions and controversy based on misunderstandings on contents of concepts and differences in definitions. Also, from the start, there was an apparent qualitative versus quantitative dichotomy. The International Study Group on Risk Analysis, established within the framework of Loss Prevention Working Party in September 1980, presented the major findings of their work at a specialized session during LPS 1983, covering in a systematic and comprehensive way the up-to-date emerging issues related to risk analysis in the process industries, i.e. hazard identification procedures; consequence analysis; quantification of risk, and application of risk analysis. In the Eighties, “human factor” became an up-to-date issue and with good reason it was not believed by all people that this could ever be quantified. With equipment and single components becoming more and more reliable, emphasis is moving towards human factors not only in running the plant/process, but also in performing activities like maintenance for good quality of which ergonomics, prevention of error of omission, or lack of attention are important. Human factors must be taken into account already at the design stage.

At LPS 1986, a session on Human Factor was explicitly introduced for the first time, collecting five papers ranging from human factor and systems safety, to the incorporation of human reliability into probabilistic risk assessment. Since 1986 to nowadays, human factor represents an evergreen topic within the framework of each Loss Prevention Symposium. A report of the EFCE Loss Prevention Working Party (Mill, 1992) provides techniques for improving human behaviour within the context of Loss Prevention: motivation; social climate and environment; personnel management; instructions and procedures; avoiding stress, alcohol and drugs; adequate training; quality of provided information; discipline, and checking performance.

At the Oslo symposium the concept of loss prevention management was categorized by Bond (1989) by introducing the laws of loss prevention, respectively in connection with looking back at the past, thinking ahead to the future, and measurement attitudes, then established as:

Table 2 – EFCE Loss Prevention symposia.

1971 Newcastle, UK	5th LP 1986 Cannes, FR	10th LP 2001 Stockholm, SE
1st LP 1974 Delft, NL	6th LP 1989 Oslo, NO	11th LP 2004 Praha, CZ
2nd LP 1977 Heidelberg, DE	7th LP 1992 Taormina, IT	12th LP 2007 Edinburgh, UK
3rd LP 1980 Basel, CH	8th LP 1995 Antwerpen, BE	13th LP 2010 Brugge, BE
4th LP 1983 Harrogate, UK	9th LP 1998 Barcelona, ES	14th LP 2013 Firenze, IT

Download English Version:

<https://daneshyari.com/en/article/588279>

Download Persian Version:

<https://daneshyari.com/article/588279>

[Daneshyari.com](https://daneshyari.com)