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DEVELOPMENT AND APPLICATION OF FIRE & EXPLOSION RISK INDEX METHODS TO CHEMICAL PROCESS PLANTS.

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ABSTRACT

Fire and explosion risk evaluation in the industrial context is a fundamental tool for work owners and safety manager to individuate critical scenario and issues related to industrial facilities and sites. The main objective of the risk evaluation is the definition of the range of possible scenario and its consequences in terms of damages to people and facilities, as to define the most adequate firefighting strategy and preventive-protection measures.

In this work, we adopted three different fire and explosion risk evaluation methods, among the most adopted worldwide to perform this type of analysis:

- F&EI "Fire and Explosion Index, by DOW Chemical Company;
- The Mond Index, by Imperial Chemical Industries;
- Safety Weighted Hazard Index (SW&HI), by Khan, Husain, Abbasi (2001).

All of these methodologies could be classified among semi-quantitative index methods, their outputs are quantitative values (indexes) which indicates to analysts the most hazardous units or processes and help to define priorities on protection system implementation in the site investigated.

The three methods have been applied to the "chemical process" department of a chemical plant (located in Northern Italy), where main products were fine chemicals and powdered products. The site was among those considered subjected to Major Accident, the so called "Seveso III" regulated sites, from directive 2012/18/EU of the European parliament and of the council ().

A critical and comparative analysis of the different incomes and application strategies of the methods is reported in the work. All the methodologies have assessed a moderate level of risk, while Mond Index is the highest. The most critical process is well underlined and individuated by all the methods, being the combustible powder packing procedure. An attempt to draw damage distances has been made, here hydrogenation process and the powder-packing department has the larger exposure areas, extending out of the establishment burdens. A new index, incorporating the incomes of the three methods adopted is proposed.

A sensitivity analysis was also performed, as to investigate whether operating conditions or peculiar characteristics of substances involved in processes has the greater influence on the risk evaluation, in function of the method adopted.

This work has also posed the basis of a new method development, derived mainly from the SW&HI methodology: the method has to apply to a wide range of industrial facilities and incorporate main features of previous methodologies with the attempt to eliminate critical points and issues that have been underlined.