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Reducing the attractiveness of chemical plants to terrorist attacks: dehorning rhinos

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Abstract

The terrorist attacks to two french chemical facilities in June and July 2015 raised the flag about the attractiveness of chemical plants to terrorist groups and the imminent risk of similar attacks in western countries. Although the 9/11 terrorist attacks in the US put the security of chemical infrastructures in a spotlight, the majority of previous attempts have since been made toward threat assessment and vulnerability assessment of chemical plants yet overlooking their attractiveness as an influential parameter in security risks. The recent poaching of a rhino in a French zoo on March 6, 2017, despite all the security measures in place, can be taken as a metaphor to show the inefficacy of security countermeasures if not coupled with measures to reduce the attractiveness. The present work aims to emphasize the applicability of safety concepts such as inherently safer design and land use planning to this purpose.

Keywords: Security risk; Chemical industry; Attractiveness; Inherent safety; Land use planning.

Preface

What makes a rhino an attractive creature? Some might say its huge size, tremendous power, or prehistoric appearance, but the majority would say its horn. On Monday night, 6 March 2017, poachers broke into a French zoo and killed a rhinoceros for its horn. "The poachers forced a grill at the rear entrance to the zoo […] then broke through two further locked doors into the building" (the guardian, March 2017). The foregoing security measures along with 3.5 m high fences, padlocked doors, five staff members living on the site and security cameras could not stop or even deter the poachers from killing the poor rhino since its horn's attractiveness was a predominant factor.

1. Introduction

The terrorist attacks of 9/11 in the US put the security risk assessment and management of critical infrastructures in the spotlight. Factors such as large inventories of hazardous chemicals which can cause catastrophic consequences if released maliciously, the presence of chemical agents which can be used either in terrorist attacks or in making weapons of mass destruction, and the key role of chemical plants in national and global supply chain can make chemical plants attractive targets to terrorists. Although the terrorist attacks to chemical facilities (excluding the ones located in war zones) have been few and far between, recent attacks on two chemical facilities in France in June and July 2015 raised a red flag about the attractiveness of chemical facilities and imminent risk of terrorist attacks thereof.

Centre for Chemical and Process Safety (CCPS, 2003) and American Petroleum Institute (API, 2003) were amongst the first to develop methodologies for security risk assessment of chemical and petrochemical facilities; threat assessment, targets' attractiveness and vulnerability, and envisaged consequences given a successful attack are identified as the main factors in security risk assessment. By analyzing the threat and the target's attractiveness, the likelihood of attack can be estimated. However, it is the target's vulnerability which determines the success of the attack; the vulnerability depends to a large extent on the performance of available security countermeasures.

Among the security risk parameters, the attractiveness of the chemical facility – an indication of the value of the facility in the eyes of the attackers –plays a key role in influencing both the type of threats considering the facility as a potential target and the threats' determination in attacking the target. For instance, a chemical facility which contains toxic gases and is located near a densely populated area may be a much more attractive target than a remote oil pipeline to Islamic extremist terrorist groups like ISIS which seek mass casualties and panic. Reducing the attractiveness of chemical facilities, thus, is as important as reducing the facility's vulnerability and the potential

consequences. Despite the vital role of attractiveness in security risk, the majority of previous work has been devoted to threat assessment or vulnerability assessment of chemical plants (Pate-Cornell and Guikema, 2002; Garcia, 2006; McGill et al., 2007; Henry and Haims, 2009; Rios and Rios Insua, 2012). Nevertheless, concepts which are currently practiced in safety risk management such as inherently safer design techniques and land use planning can effectively be applied to reduce chemical plants' security risk especially through lessening their attractiveness.

2. Inherently safer design

The concept of inherently safer design was first introduced by Trevor Kletz (1922-2013) following the Flixborough disaster in UK in 1974 as a philosophy and way of thinking which is aimed at eliminating the hazards instead of trying to control them or to mitigate the consequences. Kletz' famous quote "What you don't have, can't leak" has been interpreted via five themes: (i) minimization, and (ii) substitution of hazardous materials and/or processes with less hazardous ones, (iii) moderation of process parameters such as temperature and pressure (iv) simplification of processes, and lately (v) limitation of effects, via, for example, safety distances between critical units to avoid, among others, domino effects (Kletz and Amyotte, 2010).

The benefits of inherently safer design in security risk assessment can be many folds. For instance, by minimizing or substituting hazardous materials, not only the attractiveness of chemical plants as a potential target is diminished but also in case of an attack the extent and severity of consequences would be minor. Not to mention that the severity of anticipated consequences can in turn decrease or increase the attractiveness of the target. A reduction in the attractiveness and consequences will result in a reduction of security risk. Similar benefits can be gained from the simplification of process plants where an intentional release of chemicals is much more likely to be noticed and receive appropriate attention.

3. Land use planning

Land use planning is a non-structural safety measure aimed at mitigating offsite consequences of safety accidents through protecting people from exposure to dangerous doses generated by major fires, explosions, and especially dispersion of toxic gases (Khakzad and Reniers, 2015). In this approach, the land around either a major chemical facility or oil & gas pipeline is divided into zones usually based on the severity of potential consequences of accident scenarios (Figure 1). Accordingly, the zones with lower amounts of risk are allocated to vulnerable users (e.g., residential houses) whereas high-risk zones to less vulnerable users (e.g., factories) (HSE, 2014).

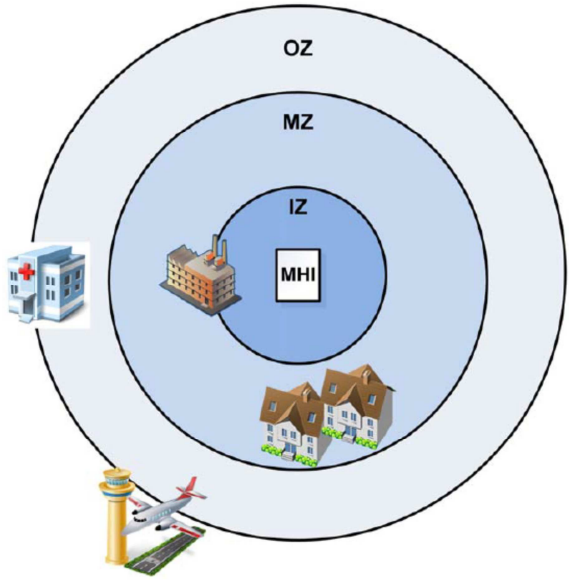

Figure 1. Land use planning to reduce public exposure to major accidents.

Terrorist attacks are usually launched with the aim of causing mass casualties and panic and drawing media attention; land use planning can effectively reduce the extent and severity of consequences at least in terms of loss of lives and environmental damages and thus reduce the attractiveness of the facility from terrorists viewpoints.

The majority of relevant work over the past two decades as to the role of land use planning in safety assessment and management of chemical facilities has been inspired by the EU Council Directive 96/82/EC. The directive explicitly mandates the EU Member States to consider land use planning in the establishment of new chemical plants and also modification of existing plants. However, to the best knowledge of the author, the inclusion of security risks in land use planning has not yet been considered, which otherwise can remarkably lessen the attractiveness of chemical facilities.

4. Conclusions

Since the 9/11 terrorist attacks, most of the efforts in the domain of security risk assessment of critical infrastructures have been devoted to either the identification of security risk parameters such as threat and assessment or reducing the vulnerabilities via, for example, security countermeasures. Yet, a relatively much lower attempt has been made to quantify and lessen the attractiveness of critical assets despite the vital role of attractiveness in threat likelihood. In this regard, a number of well-established and well-practiced concepts such as inherently safer design

techniques and land use planning can be borrowed from the safety domain in order to reduce the attractiveness of chemical plants to terrorist attacks. The role of such concepts in security risk assessment and management can be two folded since not only the attractiveness of the chemical plant but also the severity of the consequences of likely attack scenarios can notably be reduced.

Figure 2. A White Rhino lies immobilized with both its horns removed and with its eyes carefully covered and its ears protected (Photo: Peter Chadwick, African Conservation Photographer)

Commentary

Namibia was the first country to use dehorning to protect rhinos from poaching (Figure 2). Dehorning coupled with extensive anti-poaching security and monitoring efforts have contributed remarkably to reducing poaching. In South Africa, out of the 33 rhinos killed from 2009 to 2011, only one was a dehorned rhino.

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