Journal of Loss Prevention in the Process Industries 26 (2013) 1679–1684

Contents lists available at ScienceDirect

Journal of Loss Prevention in the Process Industries

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

Screening and prioritizing the precursors of improvised explosive devices from commodity chemicals being controlled under Korean regulations

Sang Tae Chung*, Yi Yoon, Hye Jeong Park

Department of Occupational Health and Safety Engineering, Inje University, Gimhae, Republic of Korea

ARTICLE INFO

Article history:
Received 12 October 2012
Accepted 30 October 2013

Keywords:
Improvised explosive device
Screening precursors
Prioritizing precursors

ABSTRACT

Improvised explosive devices (IEDs) have become an alternative method for terrorists or criminals who face difficulties in obtaining traditional explosives as threatening tools. The ease of obtaining precursor materials from commodity chemicals in the free market and the ease of generating bombs through the hands of novices have created problems. Controlling the potential precursors to defeat illegal acquisition is not trivial due to their widespread use as common merchandise among chemical industries and consumers. However, efforts to identify the potential precursors may be the first step for devising appropriate control measures. In this study, we proposed a systematic screening method for identifying potential IED precursors (IEDPs) from commodity chemicals, which are regulated by Korean controls. We identified 25 potential IEDPs from 3980 candidate chemicals that can be diverted into IEDs or homemade bombs but are not likely to be solely used as an IED. We also developed a methodology of prioritizing the potential precursor chemicals to assess the urgency of controls using a scoring system with four criteria: previous listing as an official precursor; past record of being encountered in criminal use; volume of commercial circulation, which denotes the probability of exposure to individuals; and the degree of regulatory counter-measures against illegal acquisitions that are currently effective in Korea.

1. Introduction

Life threatening terrorism often involves improvised explosive devices (IEDs), which can be easily made from commodity chemical precursors as effective fear-creating tools. Tracking records show that IEDs were involved in 27% of 77,169 total worldwide incidents of terrorism between 2004 and 2010 (US Office of the Director of National Intelligence, 2011). Since the attack on the federal building in Oklahoma City in 1995 with ammonium nitrate fuel oil (ANFO), IEDs have gained tremendous attention due to concerns regarding their widespread use in terrorism. Such concerns enacted the Anti-terrorism and Effective Death Penalty Act of 1996, which mandates the authority to impose controls on precursor materials. However, the control of precursors remains difficult because many of them are already in the hands of general consumers, and their restriction and removal from the market may cause serious commercial inconveniences and possible legislative challenges. Therefore, effective control measures should be enacted at every precursor life cycle level, from manufacturing facilities to the final distribution of retailers at the community level, adopting multi-dimensional control functions regarding prevention, detection, and response (e.g., banning the purchase by individuals, tracking sales by registration, awareness training for first responders, and building a robust information sharing platform for law enforcement) (Rostberg, 2005).

The high terrorism risk of IEDs is also evident in South Korea, as a highly industrialized country facing political tension and confrontation with the North Korea. Additionally, rapid societal change regarding wealth polarization provides the incentive for anti-society-type terrorism. The recent increase in IED proportions among explosive terrorism when compared to conventional explosives implies that more attention should be given to the precursor materials being diverted to IEDs (National Police Agency, 2008). Various IED types have been identified in acts of explosive terrorism in Korea that include research department explosives (RDXs), picatinny liquid explosives (PLXs), ANFO, black powders, and firecracker powders. With the exception of two devastating explosive terrorism cases involving North Korea, which targeted Koreans and occurred out of Korea, massive casualties have never been documented with the use of explosive terrorism within the

* Corresponding author. Tel.: +82 55 320 3309; fax: +82 55 325 2471.
E-mail address: hsstc@inje.ac.kr (S.T. Chung).

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http://dx.doi.org/10.1016/j.jlp.2013.10.017

Table 1
Explosives and precursor materials listed or involved in acts of terrorism.

No.	Chemicals	Officially listed as explosives/IEDPs			Involved in terrorism		Literature	
		USA	EU	Japan-APEC	Oversea	Korea	Internet	Misc[a]
1	1H-tetrazole	●						
2	5-Nitrobenzotriazol	●						
3	Acetone		●	●	●			●
4	Aluminum (powder)	●				●		●
5	Ammonium hydroxide						●	●
6	Ammonium nitrate	●	●	●	●	●	●	●
7	Ammonium perchlorate	●						
8	Ammonium picrate	●						
9	Barium azide	●						
10	Black powder	●				●		
11	Blasting gel	●						
12	Calcium nitrate							●
13	Carbon or charcoal					●	●	●
14	Citric acid		●		●			
15	Diazodinitrophenol	●						
16	Diethyleneglycol dinitrate	●						
17	Dingu	●						
18	Dinitrophenol	●						
19	Dinitroresorcinol	●						
20	Dipicryl sulfide	●						
21	Dipicrylamine or hexyl	●						
22	Ethylenediamine					●		●
23	Glycerine						●	●
24	Guanyl nitrosaminoguanyliene hydrazine	●						
25	Hexamine			●				●
26	Hexanitrostilbene	●						
27	Hexogen, cyclonite	●			●	●		
28	Hexolite	●						
29	HMX or octogen	●						
30	Hydrazine							●
31	Hydrochloric acid			●			●	
32	Hydrogen peroxide	●	●	●	●			●
33	Lead azide	●						
34	Lead oxide							●
35	Lead styphnate	●						
36	Magnesium (powder)	●				●	●	
37	Mercuric fulminate	●						
38	Methanol							●
39	Nitric acid	●	●	●			●	●
40	Nitrobenzene	●				●		●
41	Nitrocellulose	●						
42	Nitroglycerine	●						
43	Nitromannite	●						
44	Nitromethane	●	●		●	●		●
45	Nitrostarch	●						
46	Nitrotriazolone	●						
47	Octolite	●						
48	Octonal	●						
49	Pentaerythritol tetranitrate	●			●			
50	Pentolite	●						
51	Phosphorus	●				●	●	
52	Picrite, nitroguandine	●						
53	Potassium chlorate	●	●	●		●	●	●
54	Potassium nitrate	●	●			●	●	●
55	Potassium perchlorate	●	●					
56	Potassium permanganate	●						●
57	RDX and HMX mixtures	●						
58	Smokeless powder	●						
59	Sodium azide	●						
60	Sodium chlorate	●	●	●				
61	Sodium nitrate	●		●				●
62	Sodium peroxide							●
63	Sulfur					●	●	●
64	Sulfuric acid		●	●	●		●	●
65	Tetranitroaniline	●						
66	Torpex	●						
67	Trinitroaniline	●						
68	Trinitroanisole	●						
69	Trinitrobenzene	●						
70	Trinitrobenzenesulfonic acid	●						
71	Trinitrobenzoic acid	●						
72	Trinitrochlorobenzene	●						
73	Trinitrofluorenone	●						