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*Graduate Faculty of Environment*
*University of Tehran*

# Evaluating the Reduction of Hazardous Waste Contact in Tabriz Petrochemical Complex, Focusing on Personal Protective Equipment Method

**Abduli, M. A., Nabi Bidhendi, G. R , Nasrabadi, T.* and Hoveidi, H.**

Department of Environment, Engineering Graduate Faculty of Environment University of Tehran, Tehran, Iran

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**ABSTRACT**: Tabriz petrochemical complex is located in northwest of Iran and west of Tabriz oil refinery and mostly produces raw plastics. In this study the implementation of Reduction of Hazardous waste Contact in this Complex with special emphasis on Personal Protective Equipment (PPE) is discussed. Accordingly different hazards threatening personnel, indoor and outdoor environment were determined. In order to identify hazardous waste generated in different parts of the complex, national, European, environmental protection agency (EPA) and Basel convention standards were taken in to consideration. Considering general frame of risk classified pyramid containing engineering controls, administrative controls and personal protective equipment (PPE),a couple of practical recommendations has been suggested to promote the security level. Personal protective equipment, suggested in this study are all manifested according to the Iranian Petroleum Standard (IPS). Despite perfect implementation of PPE method, it is recommended that incident insurance be taken in to consideration as the last mitigation effort.

**Keywords**: Iran, Tabriz Petrochemical Complex, Hazardous waste, Personal Protective Equipment (PPE)

*Corresponding author E-mail: t_nasrabadi@yahoo.com

## INTRODUCTION

Tabriz petrochemical complex is located in northwest of Iran and west of Tabriz oil refinery. Being located 1362 m above sea level, it occupies 391 ha. Major products of this complex include raw plastics like, polyethylene, polystyrene, ABS, etc. Required raw materials including naphtha and liquid gas are mainly supplied via Tabriz oil refinery. Water supply is provided by east Azerbaijan local water organization, while electricity is produced in-site by means of domestic power plant. Location of Tabriz petrochemical complex in Iran is shown in Fig. 1. The complex consists of different units. A general view of the complex is illustrated in Fig. 1. As it is seen in Fig 2, existing sites may be classified in 5 distinct units; unit one deals with olefin and benzene, unit two 1-buthene and polyethylene, unit three resistant, ordinary and expansive polystyrene, unit four ABS and 1-3 butadiene, and finally unit five which consists of services like steam, electricity, recovery and off-site (Abduli, 2005).


**Fig. 1. Location map of Tabriz Petrochemical Complex in Iran**

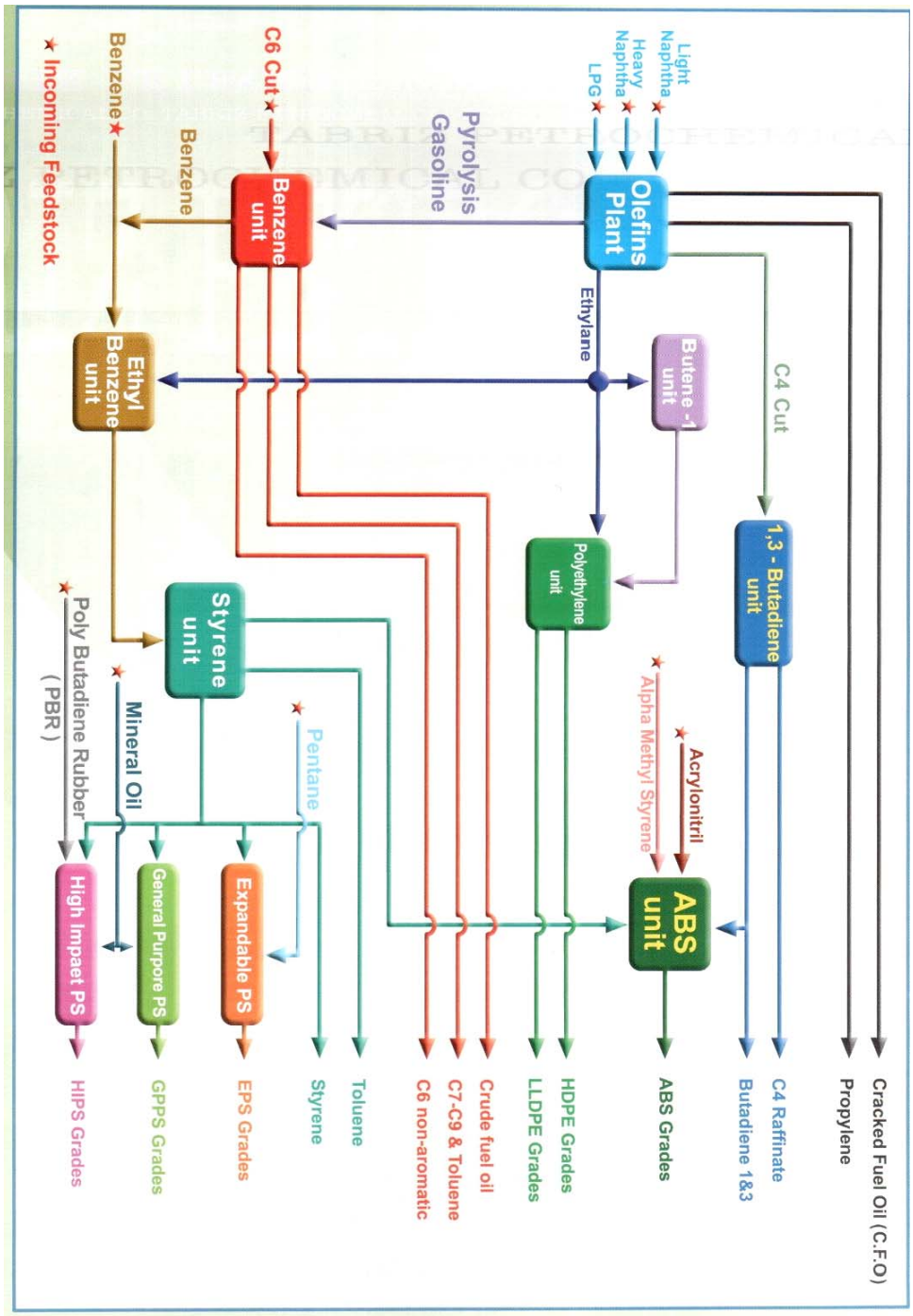


**Fig. 2. Simplified schematic diagram of different units in Tabriz Petrochemical Complex**

## MATERIALS & METHODS

Controlling the performance of suggested instructions followed by evaluation of modified parameters in promoting system deficiencies is the key factor regarding any plan including effective health, safety and environmental management.

In order to implement the goals of reduction of hazardous waste contact in Tabriz petrochemical complex, existing risks has been evaluated in different levels and in-use protective equipment is identified. Site visits with the aim of identification of current status and consequently distinguishing existed deficiencies were made during the spring of year 2004. Gathered information was completed by the filled-out questionnaires distributed among responsible managers of different units.

## RESULTS & DISCUSSIOUS

Wastes generated in different units were identified separately. Having been compared with Basel convention, EPA, European and national standards (US OSHA, 1985; USEPA1999; CEN, 2000), hazardous wastes were thoroughly recognized. Existing threats in current status of the

complex may be classified in to personal, indoor and outdoor threats. A list of hazardous wastes generated in different units of Tabriz petrochemical complex illustrated in Table 1. Potential hazard of each specified waste is shown separately relating to working personnel, indoor and outdoor environment.

**Table1. A list of hazardous wastes generated in different units of Tabriz petrochemical complex**

| No | Hazardous Waste | Physical Status | Personnel Threats | | | In-door Environment Threats | Out-door Environment Threats | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Eye | Respiration & Digestion | Skin | | Water | Air | Soil |
| 1 | Quench oil cakes | Semi-liquid | √ | √ | √ | Flammable | √ | _ | √ |
| 2 | Phenol Water | Liquid | √ | √ | √ | Flammable | √ | _ | _ |
| 3 | Spent Caustic | Liquid | √ | √ | √ | Stability &Reaction with acids | √ | _ | _ |
| 4 | Oily Water | Liquid | _ | √ | _ | _ | √ | _ | √ |
| 5 | HO-11 Catalyst | Solid | √ | √ | √ | Stability | √ | _ | √ |
| 6 | LD-265 Catalyst | Solid | √ | √ | √ | Stability | √ | _ | √ |

This kind of threat includes damages caused by direct contact of hazardous waste with eye and skin and indirect contact via inhale and swallow which terminates in chronic respiration (Health and Safety Executive, 2000) and digestion deficiencies. In order to decrease such threats, according to the level of existing risk, special protective equipment must be applied. Justified use of mentioned equipment would play a key role in promoting the security level of blue-collar workers (Council Directive, 1998).

This kind of threat deals with some specific characteristics of hazardous wastes or raw materials like oxidation, explosion, polymerization, etc. This destructive potential may cause some inconvenience during procedures of storage, transfer, recovery and final disposal. Acids and bases, reactors mud balls, steam generated in different units, toxic solvents, consumed and semi-consumed catalysts are considered to have demolition potential with regard to internal body of the industrial unit.

This kind of threat implies air, water and soil damages caused by discharge of hazardous wastes in to the environment. In this field a wide range of pollutants besides their bioaccumulation potential are significantly highlighted when dealing with this field of threat. Gases generated by catalysts reduction, fumes discharged by burner stacks (Health and Safety Executive, 1997), slurries caused by cleaning the reactors and oily, polymeric and biologic sludge comprise the main environmental threats of this complex.

Modified control process would play a key role in diminishing the risks that threaten the personnel dealing with hazardous raw materials, wastes and instruments. In order to achieve a hierarchical classification of controlling levels, a risk control pyramid is illustrated in Fig 3. In this fig three distinct control levels are considered;

- Engineering controls
- Administrative controls
- Personal Protective Equipment

In first step engineering control must be taken in to consideration. Using this kind of control, we may be able to isolate working personnel from being exposed to hazardous items. In administrative control procedure we encounter two points of view;

- managing the exposure of hazardous items with working personnel
- collaborating a secure work plan

and finally, personal protective equipment (PPE) strategy enhances working personnel resistance against hazardous items.

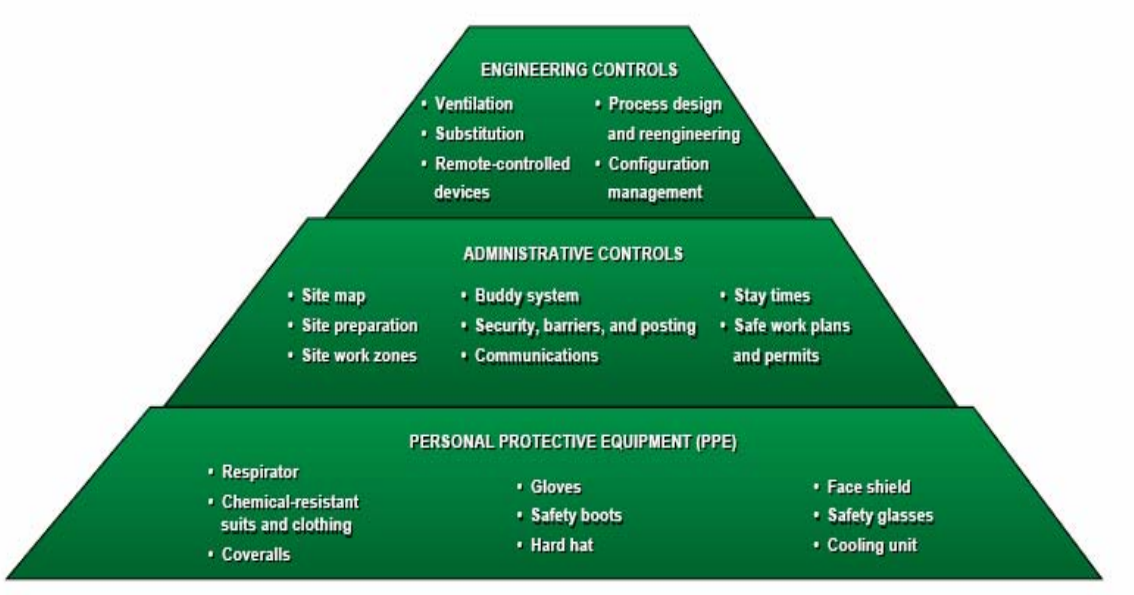


**Fig. 3. Risk control pyramid**

**Table 2. PPE in different risk levels in Tabriz Petrochemical Complex**

| Level of Protection | Personal Protective Equipment |
|---|---|
| **A**<br>The highest respiratory, skin, and eye protection. | **Required:**<br>• Pressure-demand full-face piece self-contained breathing apparatus (SCBA) or supplied-air respirator (SAR) (TLVs, 1980)<br>• Fully-encapsulating chemical-resistant suit<br>• Inner chemical-resistant gloves<br>• Chemical-resistant safety boots<br>• Disposable glove and boot covers<br>• Coveralls<br>• Hard hat<br>**Recommended:**<br>• Long cotton underwear<br>• Two-way radios<br>• Cooling unit |
| **B**<br>The same respiratory and eye protection as Level A, but less skin protection. | **Required:**<br>• Pressure-demand full-face piece SCBA or SAR<br>• Chemical-resistant clothing<br>• Inner and outer chemical-resistant gloves<br>• Chemical-resistant safety boots<br>• Disposable boot covers<br>• Coveralls<br>• Hard hat<br>**Recommended:**<br>• Long cotton underwear<br>• Two-way radios<br>• Cooling unit |
| **C**<br>Hazard-based skin and eye protection, but less respiratory protection than Level B. | **Required:**<br>• Full-face piece air-purifying respirator (APR)<br>• Chemical-resistant clothing<br>• Inner and outer chemical-resistant gloves<br>• Chemical-resistant safety boots<br>• Disposable boot covers<br>• Coveralls<br>• Hard hat<br>**Recommended:**<br>• Long cotton underwear<br>• Two-way radios |
| **D**<br>No respiratory protection. Minimal skin protection. | **Required:**<br>• Coveralls<br>• Abrasion-resistant gloves<br>• Safety boots<br>• Disposable boot covers<br>• Hard hat<br>• Face shield (for flying-debris hazards)<br>• Escape mask |

## CONCLUSION

Considering present status of Tabriz petrochemical complex, the PPE strategy would be efficient in controlling a wide range of existing risks. Recommended personal protective equipment categorized by risk level is listed in Table 2. Four risk level (A, B, C and D) is considered in dealing with threat control in Tabriz petrochemical complex.

Responsible manager of complex environmental department must supervise the perfect performance of instructions relating to environment and occupational health.

Sites of waste temporary storage must be monitored daily. It is highly recommended that this action be rendered in order to prevent contingent leakage and dispersion of hazardous waste in to the environment. Furthermore, monitoring of containers including chemicals must also be taken in to the consideration.

Personal protective equipment, suggested in this study are all manifested according to the Iranian Petroleum Standard (IPS).

Despite perfect implementation of PPE method, it is recommended that incident insurance be taken in to consideration as the last mitigation effort

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