Chapter 74
Effects of Human Factors in Process Safety: Analyses of Chemical Industrial Case Studies

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ABSTRACT

Accidents and near-miss accidents in chemical industries are widespread. Most of the incidents occurred due to combinations of organizational and human factors. To identify the causes for an incident of an accident analysis is needed, because it reveals the possible causes behind the accidents. Accident analysis shows the human and organizational factors that support learning from the events. Literature review shows that human error plays an important role of accidents in process industries. The chapter discusses some case studies which are received very little media publicity and also no proper assessment. At first reports on the incidents were collected from newspapers and then the place was visited to conduct an interview with local people and present and past workers with the help of the PESO (M/S Petroleum and Explosive Safety Organization, Eastern Region, Govt. of India).

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INTRODUCTION

Among industrial sectors chemical industry is one of the important and biggest industrial sectors. It is also an important source of employment sector. Small scale chemical industries manufacture products often run as a batch operation and large-scale production is mostly run as continuous operation. In both cases there may be various kinds of technical systems like chemical reactors (which often have to withstand high or low temperatures and pressures), separation devices (distillation, filtration, etc.), and fluid systems for liquids and gases (pumps, valves, tanks), etc. Large or small scale both chemical industries handled harmful and hazardous chemical for large production. The complex nature of chemical plants increases the health risks of workers. As new industries develop with new technologies then automatically risk arises on human health. Each year all over the world a large number of workers from chemical industries are suffered from work related accidents and illness. Workers suffer from acute effects such as poisoning suffocation; long-term affects respiratory diseases, occupational cancers and health effects that can be both acute and long-term, such as skin diseases, allergies, reproductive problems and birth defects.

There are many types of chemical plants such as refineries, power plants, wastewater plants, biochemical plants etc. Recent years due to rapid development most of plant use more complex technology which create more unsafe process conditions. In general, as the chemical process plant handled dangerous substances and their plant complexity, they can be characterized by a high accident potential. The number of accidents occurred in chemical industries due to different reasons, but one of them is the worker ignorance, as they are not appropriately trained. Sometimes they have a lack of basic knowledge, and also skills. Plant operators are monitor and control the plant for proper functions, so they have responsibility to save equipment and workers health and safety. Due too much stress or pressure some time they play wrong performance. To identify the actual causes for an incident an accident analysis needed, because it informs the unsafe work procedure, analyze how human and organizations failures create unsafe situation which leads accidents that support learning from the events.

Accident analysis carried out to discover the real causes of an accident and also recommend the preventive measure. It also gives useful information to plant personnel in future how to prevent plant operations from accidents. For improvement of process plant safety, it is very important to analyses the past accidental case studies. Because it not only gives the useful information, it also increases knowledge of workers and inform the safe practices. In recent years many research works identified the causes of accidents and lessons learn. Accidental analysis showed that not only one single cause responsible for major accidents but most have multiple and interrelated factors. If accidents are properly reported or investigated then the causes are identified properly and recommended some preventive measures for control future similar accidents. At first collecting the facts, then analyses the gathering information, identify the main causes and then implement the plan of action for future prevention. Many researchers research on Process safety and have analyzed incident or accidents and find out new risk situations. This chapter focused on how to analyze human factors. According to Rassmussen et al. (1990) "Human Factor" plays a part of operators, designers or managerial role which leads error and also worked on the psychological factors and industrial analysis to develop human error taxonomies. Literature review shows that various works has been done on human factor analysis to control hazardous situations and also save life and property. PHA, QRA, HAZOP, HRA, WHAT-IF, FTA, FMEA, SWOT, JHA etc. analysis gain information about how and why situation become uncontrollable, wrong approaches, real unsafe situation, inadequate risk control management and also prevent similar adverse conditions, increase safety knowledge of workers.