Frank Notes

Satish Chander

Improving Safety in Fertilizer Plants

Safety of plant and personnel is accorded the highest priority in fertilizer plants due to nature of operation. Manufacturing of fertilizers involves processing of hazardous chemicals at high temperature and pressure. Another factor that makes plant vulnerable to accidents is its age. There is possibility of accidental release of harmful chemicals, fire and explosion which pose danger not only to plant and personnel inside the plant battery limit but also to surrounding population and environment. Therefore, plant and equipments have to be maintained in excellent condition and all operating parameters have to be kept in safe limits. There is a need for continuous investment in ageing plants by way of revamp and replacement. Fertilizer industry has never compromised on safety of operation, irrespective of investment required. This is reflected in continuous improvement in safety parameters of fertilizer plants.

FAI carries out safety survey every five years to assess the safety performance of the fertilizer plants. The last survey was conducted for 2010-15 period. The analysis of data showed considerable reduction in incidence and severity rates of accidents over the years. The incidence rate i.e. number of accidents per million man-hours worked stands reduced from 0.74 in 2005-06 to 0.27 in 2016-17. The severity rate which is a measure of man hour lost due to accident per man million hour worked came down drastically from 0.39 to 0.08 during the same period. Majority of accidents occurred due to slip and fall; fall from height; burn due to hot condensate, water or steam; improper use of tools and tackles, unsafe work practices and road accidents. Very few process related accidents have been reported. This underlined the need for keeping the work areas clean, adopt safe work practices including use of personal protective equipments and need for focus on behavioural safety.

Inspite of very low rate of incidents related to process and plant equipments, process safety remains a focus area to maintain this high level of safety. A large number of plants have put in place process safety management system and occupational health and safety management system (OSHAS 18001). The Process Safety Management (PSM) system strengthens the management of hazards associated with processes using highly hazardous chemicals. PSM includes 14 key elements such as process safety information, hazard analysis, operating procedure and practices, mechanical integrity, incident investigation, management of change, pre-startup safety review, hot work permit, emergency response planning, employee participation plan, contractor evaluation and selection, operator training, control of trade secrets and compliance audits. PSM helps plants in early identification of hazard and its rectification on time, thus preventing accidents. Reporting of near-miss incidents also helps in identifying potential hazard condition and in taking timely corrective action. Plant managements are encouraging employees to report near-miss incidents. A detail analysis of near-miss incidents is carried out to further improve the safety system or procedure. A number of plants have adopted online reporting of near miss incidents.

Process safety has been improved by carrying out modifications in equipments prone to accidents, eliminating hazardous condition and improving emergency control system. Modernization of instrumentation system with improved safety features help in safe shutdown of plant in case of emergency. Management of change plays an important role in process safety. HAZOP studies and safety audits are carried out before any modification. Any modification in plant or equipment or change in operating philosophy is communicated to concerned operating staff. It is properly recorded and updated in the operating manuals. Further, plants should keep pace with development in technology. For example, in conventional plant,

any toxic gas release during start up or shut down or during any malfunction are connected to a high vent stack. However, now, it is connected to flare system to eliminate risks altogether. For example, the pungent and toxic ammonia gets converted to non-toxic species i.e. nitrogen and water in the flare stack.

Fertilizer plants employ a large regular workforce and contractors also employ large manpower. Plant management is responsible for the safety of both regular employees and contractual workers. Workers need to be educated about hazards associated with the work involved. Contractual workers need greater attention as they may not be well informed and disciplined. Short and regular training programmes in vernacular language are required for contractual workers. It has been observed that a number of accidents are preventable if personal protective equipments are used properly. It is necessary that each worker is aware of importance of personal protective equipment and plant management should ensure that it is being used. Plant management should ensure that a safety checklist is available for all activities. Work in hazardous conditions especially confined spaces to be carried out only after work permit is obtained. Participation and involvement of employee in safety committee meetings and encouraging/incentivizing suggestions also help to improve safety performance. Good housekeeping in bagging or material handling areas also prevents accidents.

Fertilizer industry has improved its safety performance by maintaining health of equipments, adopting safety management system and safe work practices. One should continue to make efforts to achieve near zero accidents.

Many plants have started working on behavioural aspect of safety and adopted behavioural based training system. Understanding perceptions of employees towards safety have been helpful in analyzing the reasons behind accidents. According to survey conducted by a plant, it was found that behavioural aspects accounted for 46% of the total incidents in last 30 years. It was also observed that young personnel are more prone to accidents. Therefore, plant management should carry out surveys to understand the causes of accidents and the age group more prone to accidents. Identification of needs of each functional area and employee age group can help to design and conduct customized training programme for best results.

In spite of all the precaution and safe practices, accidents may take place. Preparedness plays an important role in reducing the severity of any accident. Hence, onsite emergency plan is part of safety plan of each plant. Plants are carrying out mock drills for fire or toxic release incidents which is also a statutory requirement. There are many plants which go beyond the statuary frequency of mock drills to ensure better readiness of man and equipment during emergencies. Safe shelter at multiple locations are also part of the onsite emergency plan. Initially, plants were commissioned on the barren land at isolated location. Over time, the sites are surrounded by thick population. It became incumbent on the plant management to ensure their safety. Therefore, robust offsite emergency planning has also become important for safety of people in nearby communities. Offsite emergency plans are prepared in coordination with nearby industries, district administration, hospitals and other stakeholders. Offsite emergency drills are as essential as onsite drills. Modern methods of communication including mobile based applications help both in education and providing information in emergency situation.

It is evident from various safety surveys that fertilizer industry has improved its safety performance by maintaining health of equipments, adopting safety management system and safe work practices. However, maintaining safe operation is an ongoing process. One has to make efforts to achieve near zero accidents. The current issue of Indian Journal of Fertilisers has been devoted to the safety in fertilizer plants. There are 9 articles which cover system and practices adopted by fertilizer plants for improving safety of both plant and personnel. We hope that all concerned will find the information in this issue useful and help in maintaining the highest level of safety in fertilizer production.■