Safety and Material Handling in Paper Industry

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With the advancement of technology in every sphere of industrial life, accidents and questions of safety in human and machine life are appearing like a "Frankeustein" we are sure that memories of honourable participants are fresh with the disaster in atomic power station in Chernobyl, USSR or Union Carbide in Bhopal, India. Pulp and Paper Industry can not remain aloof from noting such calamities resulting in irreparable losses of costly sophisticated machines and human lives. Very often we hear tragic happenings in the paper mills all over. It will be difficult to locate a person in paper industry who has either not met with an accident or witnessed one. Manufacturing activity is a phenomenon between man, machine and its environment. If any of these sections is neglected, then due to accidents, safety of man and machine is in great danger. Unfortunately safety receives scant attention.

Some of the major reasons for accident occurance are :

- Improper house keeping
- Improper monitoring of equipments
- Corrosion
- Insulation
- Human aspect
- Inbuilt inadequacies in the systems
- Fire hazard etc.

IMPROPER HOUSE KEEPING :

House keeping of a mill reflects the health of the industry and degree of awareness of the working personnel. Lot of human engineering is involved in it and one has to take great pain in developing this habit. Neat and clean working place is like a temple and it helps the man to contribute best in him and be more dedicated. The cumulative result of cleanliness minimise accidents and hazards.

The mill management should form cleaning committees in departments and encourage healthy competition. A proper rewarding system will probably enhance its effectiveness.

To give an example, consider maintenance crew completing a small in-plant overhaul of an equipment which leaves behind grease or loose bolt. More often than not, a man not connected with process or unskilled labourers slip on the same, some times resulting in a fatality.

If cleaniliness had been encouraged and even insisted by the operating personnel before taking the charge of the equipment/sections, probably this mishap would have been averted.

IMPROPER MONITORING OF EQUIPMENTS :

Monitoring of each and every equipment is of vital importance, not only for the safety of the machine itself but also for the working personnel. Close monitoring of every equipment by the *operating people* and regular feed back to the service department about the behaviour of the machine is of utmost importance. The reporting should be factual. For example, the general complaint of "equipment not working properly" would be of little use. Instead an actual observation like "The equipment is vibrating too much" or "The sound coming is abnormal" would be of great help to maintenance department for taking appropriate actions before it endangers the safety.

Whenever the service department attends any maintenance job, operation people should take the charge of the machine only after having complete check-up of machine. If the job is partially attended, the matter should be known to the related operating personnel and

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continuous monitoring should be done on all such parts. This will keep them continuously aware and possibilities of any accident or damage of machine can be averted. we have made an attempt for generating start-up procedure of plants from safety point of view (copy enclosed). we are confident that with proper monitoring of machine and proper house keeping procedures, stated earlier, majority of accidents can be avoided.

CORROSION :

The corrosion problem in pulp and paper industry is very severe in the areas exposed to Cl_2 and SO_2 etc. Other areas also need equal attention like acid and chemicals handling plants, storages etc. Though proven technology is available in India, unfortunately proper care is not taken in most of the cases. Responsibility of an engineer does not cease with the selection of material of construction of machine or choosing proper paints for various applications, but he has to be very specific in monitoring the actual supply of materials and the correctness of the application of various protection measures. Recent visit of the authors to mill commissioned in late seventees was shocking when they observed that complete piping and M.S. pulp retention tanks were almost non-existent in bleaching plant of the mill

In many instances failure of platforms, grills, structural supports, roof, trusses etc. has resulted in sudden equipment damage and injuries to personnel. Normally it is observed that equipments/pipings etc., which are directly affecting the production levels are monitored rather closely. However, the experience indicates that far less attention is paid or close monitoring is not done, for the above mentioned items. For handling Cl_2 gas and other corrosive chemicals emphasis is to be given in selecting the proper material of construction for storage, pipe lines, valves etc The persons working on these areas should be periodically trained and drilled for necessary safety pre cautions. Some of the proven safe materials for different applications are:

i) Cl_2 gas - High density polyethylene pipe coated with FRP is good piping material for Cl_2 handling. Valves made of HDP with Teflon lining is ideal for this application.

ii) HCl acid—M.S. tank with natural rubber lining withstands corrosion problems.

iii) Persons working in Cl_2 handling plant must use gasmasks while handling gas. Hand gloves, safety shoes and goggles must be used while handling acids and corrosive chemicals.

INSULATION :

Insulation protection can be categoris d into two specific headings. Thermal insulation and electrical insulation.

The tanks, pipe lines storing/carrying hot gases or steam needs proper insulation, not only for energy conservation but also as a safety measure. Workmen can get a burn injury even if he accidently comes in contact with uninsulated hot part of tanks, pipes or ducts. We observe that major part of hot tanks, pipes, boiler and turbine components are usually properly insulated but very often flanges of pipe lines, ducting between ID fan and chimney or the bottom part of the chimney and condensate return lines remain uninsulated. Efforts must be made to insulate such hot exposed surfaces to avoid safety hazard.

ELECTRICAL INSULATION :

Insulation protection of power distribution systems, cables etc. should be considered with utmost seriousness. In most of the plants, steel sub-structures and/or reinforcement steel will inadvertently be used as earthing connection or support to pipe lines and for electrical cables running in plant A serious hazard due to possible occurance of short circuits results. A still better solution to avoid this is to have separate earthing strips covered with alkathine tubes.

The electrical panels should have rubber matting below and in front of it to reduce the possibility of exposing workers to electrical shocks.

HUMAN ASPECT :

The great saying "Chance and accidents are allies of ignorance" comes true when we investigate a lot of accident cases. We must admit that inspite of safety awareness campaign in the industry, plant personnel indulge in negligence. A person enjoying his puff is

often seen sitting in front of "smoking prohibition poster" in the mill premises.

Efforts are being made to make the people aware of safety. It should be borne in mind that this teaching is to be extended not only to the persons working in that particular place but also *to the people in the surrounding vicinity.*

We have come across a very peculiar incident wherein the spout of a recovery boiler had given way with a loud bang. The fitter in the adjacent plant panicked unnecessarily and jumped out and met with a fatal injury. This highlights the need of imparting self training to persons not connected with the working of the plant but are supposed to be in its vicinity. Supervisors responsible for operating and maintaining the plant should be properly trained along with the working personnel for all the safety pre-cautions. *Adventurism should be dis-couraged.*

Very often we notice that safety officer is a *non-technical person,* who is not fully aware of various aspects of operational hazards. It is a recommendation that the industry must employ *a technical man as a safety officer* or entrust this responsibility *to engineering department.* They should be responsible for *monitoring and operating* various precautionary measures in close co-operation with service and operating departments. If we can implement *previously laidout measures and Procedures,* for safety of "men and machine" the accidents can be minimised or even eliminated.

Periodic training of personnel and *simulation of accident drill* will keep the plant personnel alert and safety conscious.

INBUILT PROBLEMS :

We observe that there are inbuilt shortcomings in the initial stages of designing the plant layout, equipment positioning, selection of utilities and lighting, lack of operating and maintenance space etc. The Consultants and the planners have a social and moral responsibility while designing and implementing a project to take special care in all the above areas for safety and protection for men and machines.

Recently, while evaluating a 60 TPD plant in Gujarat we observed that the equipments are laid out at different levels with uneven floors and open drains in between the equipments. It is extremely difficult to move from one floor to another. Even a proper direct communication is impossible between operating people in various sections. Very little working space has been provided for easy movement of men and materials. We strongly recommend the following aspects must be taken into consideration while implemeting a new project or installing sections/equipments.

(a) Sufficient working space around

(b) Equipment selection in such a way that it has built-in safety devices

(c) Allotment of separate space for maintenance and overhauling

(d) Handling of hazardous chemicals is done in one central specified area with necessary protective devices.

(e) Minimum number of floor levels for easy movement

(f) No open drain in the working areas

(g) Systematic piping with minimum crossing, laid-out either on ground or above head height.

FIRE HAZARD :

Though a paper industry needs crores of rupees for implementation, a bare minimum provision of a few lacs of rupees is done for providing fire protection systems. At some places it is done half heartedly just to satisfy the statutory requirements. Recently while evaluating a 50 crores paper project, we noticed that fire hydrants connections are provided from mill water supply line having 2.5 kg/cm^2 pressure only. On enquiry it was revealed that the project engineer had eliminated high pressure pump and auxilliary D.G. set providing emergency power for reducing the basic project cost.

A fire alarm mainly assembles all the people, majority of whom will however be silent spectators due to lack of previous training and frequent fire drills.

Proper fire fighting with trained personnel does not cost much but the returns are staggering. God has created the human beings with in-built safety awareness to safe guard its life.

A proper nursing of this basic instinct in human beings by the industry through suitable trainings will be largely beneficial in having proper safety standards in safe guarding its property, assets including its invaluable personnel. Once this instinct is ingrained in the behaviour of operating personnel, it gets itself magnified by their treatment of the "machines" as fellow human beings. Thus automatically the "machines are cared like human beings", there by reducing the occurance of accidents.

MATERIAL HANDLING

In the paper industry generally the following inputs will have to be handled :

1. Fiberous raw material
2. Fuel
3. Chemicals
4. Finished goods

The first stage of transportation is from the source to the mill premises. The cheapest means of transportation is by rail. However, all the mills may not have that facility. They have to depend mostly on road transport. This can be made economical by reducing the sizes of the material itself and using large containers After it reaches the site, various means of handling and transportation to the consuming points are available and the criteria for designing such system should be as follows :

a) To reduce nuisance value and improve productivity
b) Uniformity in input guarantee resulting in improved quality of product
c) Inbuilt safety measures
d) To suit the environment existing in the mill
e) Cost benefit analysis and less down-time.

GENERAL NOTES ON "COMMISSIONING" OF EQUIPMENTS.

1 0 Checks Before Start Up—

1.01 See that the surroundings are clean.

1 02. All nuts-bolts are properly tightened.

1.03. All couplings/transmission systems are properly aligned. After checking all couplings/transmission systems should be disconnected.

1.04. All bearings and mating surfaces having relative motions are lubricated properly. Check oil systems for proper flow.

1.05. All coolants are flowing/levelled properly.

1.06. All sealing connections are made and flow of sealent is proper.

1.07. All glands should be tightened lightly.

1.08. Refer "The instruction/Start up Manuals" supplied by the manufacturer and check that everything is OK as per the procedure laid down.

1.09. Keep the required tools with a fitter ready near the equipment.

1.10. In case if the starting is from a remote point establish a quick way of communication by sign language/through a messenger/by establishing temporary communication system.

1.11. Rotate/move the components by hand or mechanical means and make sure that they rotate/move satisfactorily.

1.12. Station a responsible person at the equipment who should be conducting trial runs.

1.13. Request all other personnel not connected with that work to stay away from the equipment.

1.14. The "Clipon ammeters" of appropriate size should be ready for measuring electrical current.

1.15. By-pass all interlocks, if necessary, taking care to put them back after the trial.

1.16. Check all electrical connections for looseness.

1.17. Confirm that the electrical overload setting is as required.

1.18. Station one electrician with appropriate tools at the M.C.C. Panel.

1 19. See/check that all the persons involved in the test can see each other (if feasible) or are available through measures established as per no. 1.10.

1.20. Check that the motor and the driven equipment are unloaded during dry trial run.

2.0 START UP ON NO LOAD.

2 01. Change the M.C.C. after the megger test.

2 02. Take a control trial after removing the power fuses.

2.03. Megger the motor. Isolate devices like thyristors

and diodes before meggering. Check the grease in the new motors. Start the motor in decoupled condition and check the direction of rotation. Note the "no-load" current.

2.04. Check that the sound of "running" motor is healthy.

2.05 Run the motor for two hours and observe bearing sound and temperature. Note the 'electrical current" perphase.

2.06. Connect the coupling/transmission system to the driven equipment. Connect guards/observe safety precautions.

2.07. Start the motor and record the load.

2.08. Go on connecting couplings/transmission system one by one and repeat above procedures.

2.09. After connecting all coupling/transmission systems run the equipment for 8 hours unless otherwise instructed by the manufacturer.

3.0 TAKING TRIAL ON LOAD

3.01. After running on "No Load" for 8 hours satisfactorily the equipment should be loaded slowly.

3.02. Observe carefully the instructions given by the manufacturer.

3.03. At every change of loading observe the electrical load. In no case it should go beyond the full load.

3.04. While running observe bearing temp., normal sounds, load variations, oil leakages, vibrations etc.,

3.05. Keep the equipment running for 8 hours.

3.06 Check starters in abnormal situations and for large motors.

3.07. Check electrical cables for heating.

4.0 INSTRUMENTATION (Pneumatic)

4.01. Commission "airdryer" and judge the dryness of outlet air.

4.02. Flush all air lines before giving air supply.

4.03. All transmitters, controllers, final control elements should be laboratory tested and calibrated before installation.

4.04. Charge the air supply and check guages, pressure regulators, filters and lubricators where provided.

4.05. Check power supply for chart drive, solenoids and other electrical components.

4.06. Check the control performance, recording indications etc., during wet trials and later in actual production trial, observing the airleakages by soap solution.

4.07. Make field anjustments where ever necessary, observing the manufacturers' recommendations and process requirements.