MIOSHA Fact Sheet

Electroplating – Automated Hoist/Transfer Systems

Process description

Automated hoist and transfer systems are used in the electroplating industry to move racks or barrels of parts from tank to tank in an electroplating line.

Safety hazards

Automated hoist and transfer systems pose a safety hazard if the operator places any part of their body within the envelope of movement of the hoist and attached rack or barrel. Reasons why an employee would enter the envelope are—to retrieve fallen parts, unjam the line, test the plating baths, or to add fluid. Inside the envelope, the worker can be:

- Struck by the rack or barrel as it is moving from tank to tank. The impact can lead to lacerations and trauma to the head, chest, and arms.

- Caught between the rack or barrel and the sides of the plating tank and other fixed and immovable components of the line, like the cradles for the racks and barrels.

- Knocked into the plating solution by the momentum of the hoist. As the solutions are corrosive, contact can cause chemical burns.

Part of the hazard stems from the intermittent and unexpected movement of the hoist. It often sits motionless for several minutes while the parts are in the solution, and then it starts abruptly and moves fast. When the hoist travels bi-directionally, or if there are multiple hoists on the same line, the risk to the operator increases.

Relying on the worker to be alert for movement and to step back from the line whenever the hoist is in motion is an inadequate method of protection. An operator maintaining the line can easily become engrossed in the task and block out sensory input like motion alarms or the sound and sight of the traveling hoist.

Regulatory requirements

In Michigan, the automated hoist system falls under the definition of a conveyor in General Industry Safety and Health Standard Part 14. Conveyors (Part 14). In Part 14, Rule 1421(4) requires the conveyor to be guarded so that an employee will not be caught or trapped between the conveyor and a stationary part. Rule 1433 of Part 14 requires an emergency stop device to be located at each point of operation where a hazard exists and within reach of an employee at that point. Be aware that an emergency stop cable is not a form of guarding as it does not prevent the employee from entering the danger zone.

According to Rule 1412(3) of Part 14, repairs or clean up where unexpected motion would cause injury shall be done when power is off and locked out. General Industry Safety and Health Standard Part 85. The Control of Hazardous Energy Sources (Part 85) describes the requirements of a lockout program. A lockout program must include energy control procedures, equipment (such as locks), annual inspection, and training of employees to understand the program. For an automated hoist, the lockout procedures would give step-by-step instructions to employees on how to de-energize the machine.

Minor servicing activities (like retrieving fallen parts, unjamming the line, testing fluids, and adding fluids) that take place during normal production operations are not covered by Part 85 provided that the work is performed using alternative measures which provide effective protection. The alternative measure must be under the exclusive control of the

employee performing the minor servicing (one example: a control switch with a single key). The alternative measure must prevent the unexpected activation of the hoist, or the release of stored energy. An un-keyed switch or stop command on a computer panel would not be considered acceptable.

Employers must remove operators from the envelope of movement of the hoist and its attachments. This can be accomplished by guarding the area (engineering controls) or with work practices (administrative controls). **If employees do not enter the danger zone, then there is no employee exposure and no basis for a citation for lack of guarding.** This would include no guarding necessary of the V block, which is the cradle on which the rack or barrel sits in the tank.

The acceptability of work practice controls in lieu of engineering controls at an establishment is based on no injuries or near-misses associated with the hoist system and the economic and technological infeasibility of guarding. Work practice controls are considered to be inferior to guarding because they are less reliable.

Methods of compliance – guarding

Guarding methods include barrier guards (Lexan barriers), electronic safety devices (light curtains, proximity sensing devices on both sides of the hoist arm, bump sensors on the hoist arm), pressure-sensitive mats, and standard barriers. Employers should choose products that can withstand the corrosive and high-humidity environments of plating plants. Due to the insensitivity of some sensor technology and the punishing environmental conditions, electronic devices must be tested and adjusted at installation and periodically afterwards to confirm reliability.

Methods of compliance – work practices

Successful implementation of work practice controls usually involves written procedures, annual employee training on the procedures, periodic observation by supervisors to check for worker adherence, retraining and progressive discipline for violators, and documentation of these actions.

Examples of work practice controls are:

- **Remote monitoring**. Sensors are placed inside each of the plating baths and their output is fed to a console at the operator station. The operator monitors the plating solutions remotely, from a computer screen. Sensors are available to gauge fluid level, temperature, pH, current density, conductivity, and metal ion concentrations. When hard-wired sensors are unavailable, or they are too expensive, portable monitoring equipment can be used. The operator stands on the catwalk adjacent to the tanks and extends a wand with a sensor at the end into the plating solution without his or her body entering the danger zone. Likewise, plating solution can be extracted with a long ladle and then analyzed outside the danger zone.

- **Remote adjustment**. Pumps controlled at the operator station can adjust fluid composition and fluid levels. An inexpensive, safe alternative is to add or withdraw solution by hose from the walkway next to the tanks.

- **Use of tools**. Poles with hooks can be used to fish out stray parts and free parts that get stuck.

- **Tank design**. Tanks can be fabricated or retrofitted to have ports on the side for sampling and fluid addition/withdrawal. Side access keeps the operator away from the danger zone, which is above the tanks.

As the characteristics of plating lines vary, each line needs to be evaluated individually for the appropriate control. Cost, the availability of reliable technology, plating product specifications, and the age and configuration of the existing line will dictate the best control measure.

Resources

For additional assistance, please contact the Consultation Education and Training Division at 517-284-7720. A representative can examine your automated hoist system and offer suggestions for safe operation.