Aquaculture Safety for Ponds

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Hazard: Muscle strain from lifting and carrying heavy loads of fish or supplies.

Solutions:

Figure 1. The overhead crane in this photograph can move heavy loads of minnows between tanks and onto live haul trucks.

Figure 2. Simple solutions for moving heavy loads of fish include the use of small wagons.

Figures 3 and 4. Water is pumped into tanks conveniently as the hauling truck drives underneath the water supply pipe. This alleviates the need for filling up tanks manually, bucket-by-bucket.

Figure 5. This catfish farmer suffered a torn rotator cuff from lifting a 10 h.p. boat motor by himself. Use of mechanization or enlisting others' help can help to avoid such injuries.

Figure 6. This bobcat is used to carry heavy loads of fish and water at this hatchery.

Figure 7. Oxygenated fish-holding buckets are carried and elevated by forklifts to load baitfish on this Arkansas minnow farm's live haul truck.

Figure 8. Workers and buckets of ice are elevated to the top of hauling tanks with forklifts. Although this prevents muscle strain, the practice would be safer if workers had hardhats and were supported by harnesses suspended from the shed ceiling.

Figure 9. This boom truck can lift and move heavy loads of fish from ponds to live haul trucks. Boom trucks are regarded as being much safer than backhoes because the boom can be moved more slowly and precisely than a backhoe boom.

Figures 10 and 11. Boom trucks are loaded with a seine and John boat for traveling from pond to pond during harvest. The boom truck sets up on pond banks and unloads the seine and John boat for harvesting.

Figure 12. Fish can be unloaded from live haul trucks with chutes, a practice that can save a lot of labor and potential muscle strain.

Figure 13. Two-handled dip nets spread out the weight of fish loads between two workers and prevent muscle strain.

Figure 14. Dip nets should be deep enough to prevent fish from falling out when a reasonably heavy load is carried, but they should not be an excessive depth that would encourage workers to dip up a load of fish heavy enough to cause muscle strain. Dip nets that are 15 inches deep work well to meet these criteria.

Figure 15. Catch basins external to fish ponds allow for a much more efficient harvest that avoids the need for physically demanding in-pond harvests involving pulling seine nets and climbing slippery banks. Less expensive, temporary catch basins can also be used.

Figure 16. This water pump is used to remove filamentous algae from this pond, preventing muscle strain from the long, arduous process of manually raking out the algae.

Hazard: Tripping, Slipping and Falling

Figure 17. Falls from high elevations can occur in fish farming. Safety harnesses may not be practical unless the work is done under a roof where the harness can be suspended.

Figure 18. This metal “grip-strut” walkway to this floating paddlewheel aerator provides a safe way to access the electric motor. (Note: Although it is safer for workers to access and work on aerators using such a walkway, this also allows children to walk out to the aerator exposing them to potential injury.)

Figure 19. Rough, unfinished lumber nailed onto the surface of the dock made of weather-proof, treated lumber adds traction even when wet and helps to prevent slipping injuries.

Figure 20. Keeping work areas organized and free of clutter (good “housekeeping”) removes trip and fall hazards.

Figure 21. A chain attached to the hatch on top of this feed bin allows the bin to be opened for filling without having a worker climb to the top, minimizing the chance of a fall occurring.

Figure 22. Feed trucks eliminate the need for manual feeding.

Figure 23. Wooden floors and walkways can be very slippery when wet and/or icy.

Figure 24. Rough concrete floors, providing traction even when wet, can be created with a coarse broom when the newly-poured drying concrete is still wet.

Figure 25. Wet floors in hatcheries can have better traction if grit/sand is put in the paint.

Figure 26. Metal platforms/walkways on the side of hauling trucks provide a stable work area that helps to prevent falls. They can be folded up when the truck is in motion.

Hazard: Equipment entanglements and cuts, bruises, etc.

Figure 27. Power take-off (PTO) shields prevent workers from becoming entangled in the spinning PTO. Severe injuries and fatalities can be prevented by the use of a PTO shield. This PTO shield is cut near the tractor to allow for lubrication to be applied. The farm owner recommended that PTO shield manufacturers provide a way to lubricate the PTO shaft without having to remove the shield.

Figures 28 and 29.

The antenna on this remote control for the pond's paddlewheel aerator (photo, left) picks up a signal from the dissolved oxygen probes floating in the pond (photo below), indicating that the oxygen has reached a critically low concentration causing the aerator to turn on.

When working on or around these aerators, farm employees must turn off the main breaker switch to prevent the aerators from turning on unexpectedly.

Figure 30. The gears and chain operating seine reels should be covered with a protective shield/screen. Use of a seine reel prevents muscle strain from pulling the seine by hand.

Figure 31. Gas-filled shocks can be used to prevent hauling tank lids from being slammed shut by the wind onto workers' hands.

Figure 32. Locking hinges on hauling tank lids prevent them from being blown closed onto workers' hands. Other techniques for keeping tank lids open include using wedges, bungee cords and screw-down clamps.

Figure 33. Catfish egg hatching troughs pose a safety hazard from the rotating metal paddles that keep the water circulating and the eggs moving. The paddles on this hatching trough will stop rotating if someone blocks them or gets caught in them; the belt on the motor simply slips and the motor is sitting on a movable, unattached sawhorse/support table.

Other hatcheries have used plastic paddles that bend, loosely-attached paddles that slip on the axle, and a release cord extending the length of the trough that turns off the motor when pulled.

Some farms eliminate the hatching trough entirely using aerated water-upwelling “MacDonald” jars (Figure 34, left) to hatch the catfish eggs after dissolving the matrix holding the eggs together.

Figure 35. The tops of these rebar stakes used to secure the aerator are not capped or bent to protect against impaling.

Figure 36. The metal screen welded on the tractor ROPS protects the driver from stones “launched” by a bush hog mower toward the back of his head. Such a screen would have helped a Missouri farmer who was pulling a log behind his tractor; the front of the log collided with and was blocked by a stone, causing the back of the log to flip up and strike the driver’s back. This paralyzed the man from the waist down.

Hazard: Rollovers and collisions

Figure 37. Rollover Protection Systems (ROPS), when used in conjunction with seatbelts, have been shown to save lives when tractors roll over.

Figure 38. Gravel on levee roads reduces the chances of vehicles sliding off of levees or rolling over into ponds.

Figure 39. Tractors with double rear wheels and front wheel drive (4WD) are more stable for mowing on steep levee banks. This enclosed cab acts as a ROPS and prevents injury during tractor rollover especially when a seatbelt is worn. It is important to note that the door on the cab is on the left; if a tractor with a cab is used to mow a pond levee, the door should be facing away from the pond water because in a tractor overturned onto its right, the driver would still be able to escape from the door. Side-arm mowers pulled behind a tractor are correctly oriented to lower the blade down the levee slope on the tractor's right hand side.

Figure 40. Vegetation should be kept trimmed back around blind curves on the farm to avoid vehicle collisions.

Figure 41. The “zero-turning-radius” mower on the left is designed to mow from side to side (laterally) on a hillside to prevent roll-over. The tractor mower, on the other hand, should be driven up and down the hill to prevent roll-over. Both should have roll bars.

Figures 42 and 43. Levee erosion is more common around structures such as inflowing well pipes. Vehicles can drop off levees at eroded areas; adding to this problem, heavy vegetation growth hides the hazard (top photo). Mowing levees increases visibility, but steep levee banks (bottom photo) pose a roll-over risk (which can be decreased by using dual tires on tractors).

Hazard: Electrical shock, electrocution

Figure 44. This electric fuse box cover is missing, and missing breaker switches expose underlying wiring.

Figure 45. An electric company worker was holding power lines on an Alabama catfish farm when a co-worker unknowingly turned the power back on. It burned his right arm and half of his left arm; one complete and one partial amputation were needed. Workers could prevent this kind of incident by using a lock out – tag out system; the person working with the equipment that has electrocution potential locks the power switch in the off position with his own lock labeled by his tag. Only he can unlock this to turn the power back on after he completes his job.

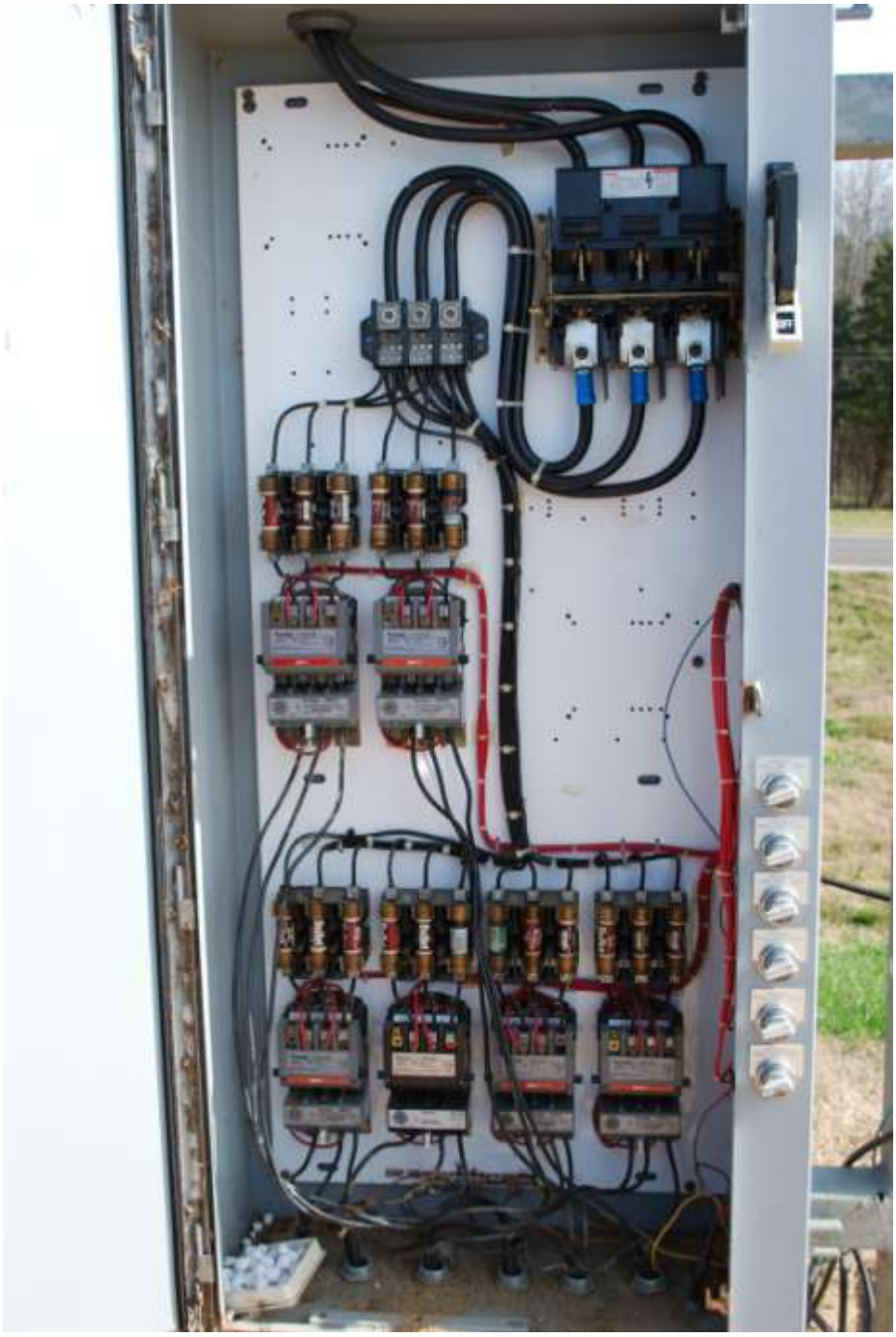

Figure 46. If someone is working on the aerator, the main switch (black color) on the top right side of the box should be turned off as well as each separate aerator switch (six silver switches below the main switch). When a worker is turning power box switches on and off, he or she should not have his or her face in front of the electric box in case it explodes. This happened to an Alabama farmer; he had several days of eye irritation afterwards and had to use an eye ointment treatment.

Figures 47 and 48. Air blown through these lines (left) from an air pump located separately from and above the tank water (above right) provides aeration for fish held in the tanks in this shed.

Figure 49. There is a greater risk of shock when electric-powered agitators are immersed in tank water. Many fish farmers report that they and their fish would frequently be shocked when they used these electric-powered agitators ("bull aerators").

Figure 50. This farm uses only gas-powered pressure washers. This is due to a fatal electrocution that happened in July 2002. One of the farm owners was pressure washing farm equipment when a bare wire in the washer's starter capacitor came into contact with the metal lid covering the capacitor. This happened while he was holding the wand in both hands across his chest and standing in a water puddle. The insulation covering the capacitor wire had eroded away from years of vibrating against the metal capacitor lid (the lid and whole capacitor were permanently enclosed and were not designed to be checked and maintained; it appears to be a flaw in the washer's design that allowed the wire to be eroded during normal use).

Figure 51. This ground fault interrupter (GFI, also called a ground fault circuit interrupter, GFCI) is used in the power box of a permanent electric paddlewheel aerator. On this farm, two workers were in the pond rewiring a paddlewheel aerator (all power was turned off while they were working on the wiring). After they finished the rewiring, a third worker turned the aerator on prematurely while they were still in the water (one waist-deep and the other ankle-deep). Both men received heavy electrical jolts, especially the worker who was waist-deep. The shock occurred because the workers had erroneously connected the ground wire to hot and the hot wire to the ground.

Hazard: Drowning

Figure 52. Water is drained or retained in this pond by raising or lowering a gate valve controlled by turning the wheel. In an incident in South Carolina during the past decade, a gate valve was inadvertently left open when the farmer was un-stopping a clogged large-diameter industrial pond drain. The stopped-up drain opening was underwater and was covered by a screen that had become overgrown with barnacles. To allow water to flow through the drain, the farmer cut through the clogged screen and was immediately sucked into the drain pipe and killed.

Figure 53. The pond drain at this pay lake is covered with a wooden structure to protect customers.

Figure 54. Life-saver floats are accessible at several locations around this pay lake's ponds

Figure 55. Plastic pond liners are slippery when wet making it difficult for workers to climb out of these ponds. A solution to this hazard is extending safety ropes along the pond edge that can be gripped while exiting the pond.

Hazard: Chemical Exposures

Figure 56. Chemical boats make chemical application easier and safer.

Figure 57. Flammable aerosols and paints should be stored in a metal cabinet.

Figure 58. This chemical spill cabinet contains absorbent towels and “snakes” as well as sealant/glue to plug leaks in containers.

Figure 59. A hydrogen peroxide (H_2O_2) container sits on a chemical spill containment platform. It is used with Argentyne (povidone iodine) to treat eggs for fungus and is replacing the use of formalin. Fumes from formalin probably pose more of a health risk for fish farm workers compared to H_2O_2 and Argentyne.

Hazard: Poor lighting, visibility

Figure 60. Spotlights mounted on trucks make nighttime work safer.

Figures 61 and 62.

Adequate lighting makes night work safer.

Emergency situations where fish must be saved from critically low dissolved oxygen occur commonly during summer nights when low visibility can increase risk of injury.

Hazard: Miscellaneous Exposures

Figure 63. Two-way radios make communication more reliable in remote/rural locations. A farmer in Alabama was able to get help on his two-way radio after his tractor overturned. Cell phone service is not reliable in some rural counties.

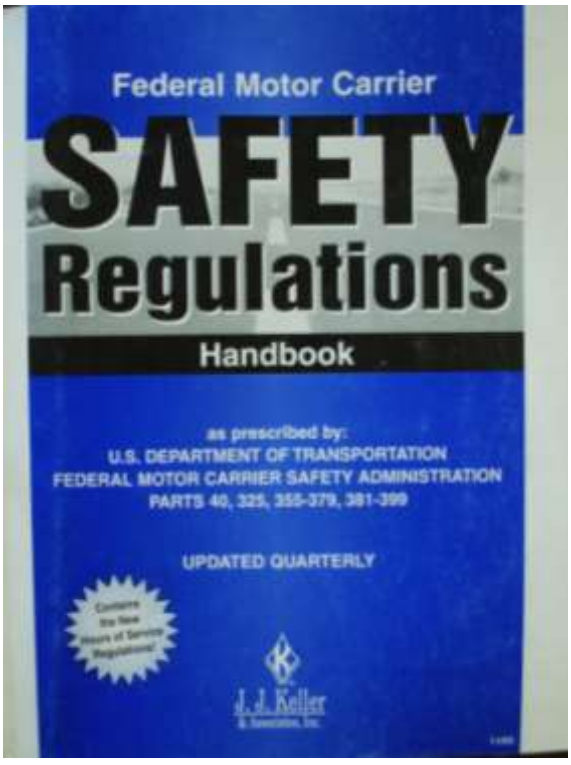

Figure 64. This is a copy of the United States Department of Transportation book of rules for the safe operation of commercial trucks.

This USDOT publication is renewed quarterly and typically requires a full- time employee or consultant to keep up with all of the rules and to make sure the fish hauling business remains in compliance.

Figure 65. Eye protection should be worn when using metal grinders.

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