Rain Management and Salt Floors in Solar Salt Plants

Guy Wilkins Jr. PE
Solar Salt Harvesters LLC, 1785 29th St. #703 Ogden, UT 84403
guywilkinsjr@gmail.com 801-309-4103

Salt Production

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Abstract
The handling of heavy rainfall on solar salt plants has a major effect on salt production, and if handled effectively may allow the use of salt floors in crystallizer operations where it would otherwise not be possible; thus preventing loss of production.

One of the most effective steps that can be taken to mitigate the serious effect on production is the decanting of rain from the surface of all ponds with the use of simple weir gates installed in the pond dikes. A salinity gradient can be measured within a few hours of the time the rain fell with saturated brine near the bottom and almost fresh water near the top. Decanted brine of various salinities should be conveyed back and saved in ponds with matching salinities and any brine below sea water salinity should be drained to sea. Time passed will have a major effect on how well this step works—wind will stir the brine.

Salt floors in crystallizers are the most desirable of operating methods for this day and age because of the effect on insoluble impurities in the final product—high insolubles will cause the salt to be rejected by chemical companies.

The development of a salt floor is fairly simple in new plants. It is not so simple to convert old mud floor crystallizer plants to mechanical harvesting, regardless of whether mechanized harvesting is done with or without salt floors. All the same, rain mitigating steps are still required in either situation because of the effect on production.

For new plants, the salt is grown in the crystallizers and the bottom half is left for a floor with the haul equipment traveling on the full crop. If there is any indication that a one year growth of salt is not enough then grow some additional thickness before attempting to harvest.

The steps for converting mud bottom ponds to larger ponds for mechanized harvesting is essentially the same as for a new site except for site preparation. The ditches around the site should be built and the old bunds and ditches should be dozed over flat. New bunds and ponds should be finished and graded individually to a plane surface.

The first harvest on new salt floors should be done with care. Any failure in the floor which allows haul equipment to break through the floor will press salt down into the mud below and cause problems with the bottom that are very difficult to fix—salt mixed with wet mud will not dry and earth moving equipment aggravates the problem.

Salt floors are a lot of work but they are worth it—the operation and equipment are so much simpler and trouble-free.

Rain Management

The handling of heavy rainfall on solar salt plants has a major effect on salt production and if handled effectively, may allow the use of salt floors in crystallizer operations where it would otherwise not be possible.

One of the most effective steps that can be taken to mitigate the serious effect on production is the decanting of rain from the surface of all ponds with the use of simple weir gates installed in the pond dikes. An example of such a weir gate is shown in Figures 1 and 2.

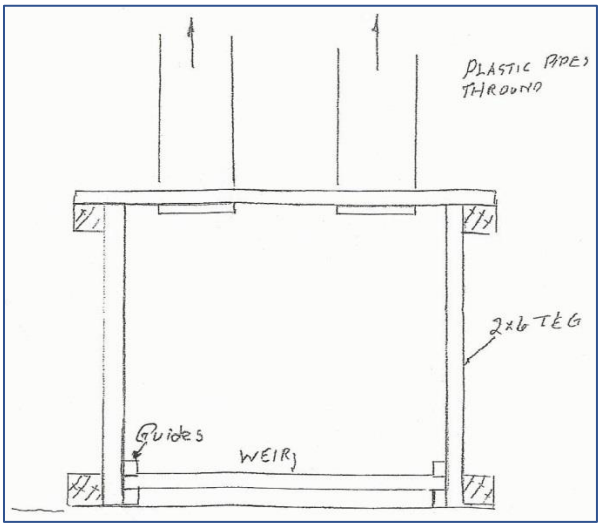

Figure 1: Weir Gate – Plan View

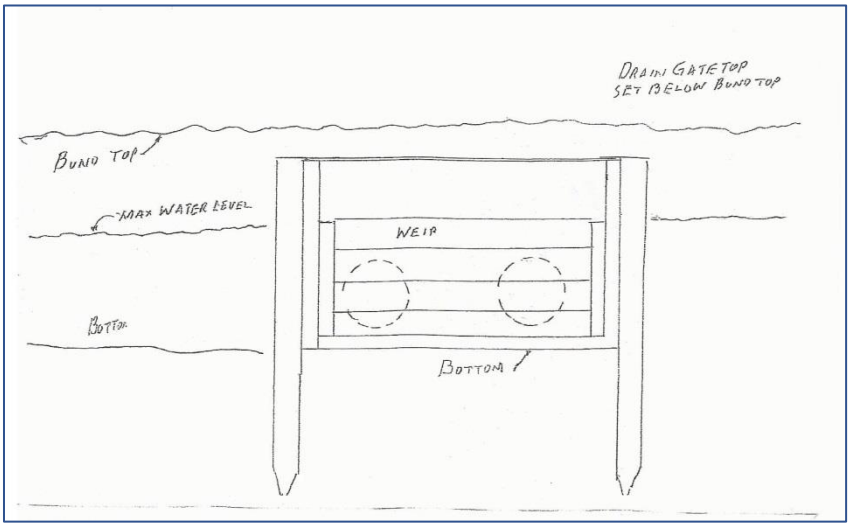

Figure 2: Weir Gate – Side Elevation

This type of gate can be modified with extra sets of guides to use with full height sheets of plywood as feed control or shutoff gates as shown in Figures 3 and 4. The gate is set in the levees with the top of the gate below the top of the levee (bund) to prevent wash outs.

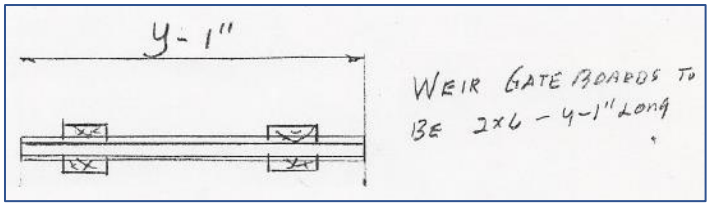

Figure 3: Shutoff Gate – Plan View

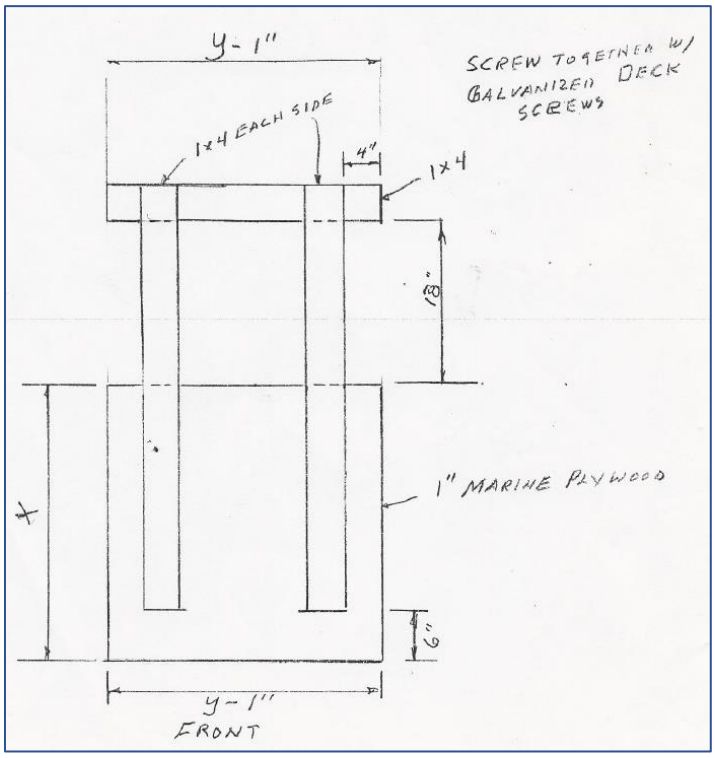

Figure 4: Shutoff Gate – Side Elevation

A salinity gradient can be measured within a few hours of the time the rain fell with saturated brine near the bottom and almost fresh water near the top. Decanted brine of various salinities should be conveyed back and saved in ponds with matching salinities and any brine below sea water salinity should be drained to sea. Time passed will have a major effect on how well this step works—wind will stir the brine.

Most plants as currently built are not arranged to be able to pump or drain back rain diluted brines. Changes must be made to many pump stations, gates, and ditches to accomplish all of this but the difference to evaporating out the surplus rain to get back to brine operating conditions results in such a loss of production that it is well worth it.

Salt Floors

Salt floors in crystallizers are the most desirable of operating methods for this day and age because of the effect on insoluble impurities in the final product—high insolubles will cause the salt to be rejected by chemical companies.

The development of a Salt floor is fairly simple in new plants. It is not so simple to convert old mud floor crystallizer plants to mechanical harvesting, regardless of whether mechanized harvesting will be done with or without salt floors. All the same rain mitigating steps are still required in either situation because of the effect on production.

For new plants, the salt is grown in the crystallizers and the bottom half is left for a floor with the haul equipment traveling on the full crop. If there is any indication that a one year growth of salt is not enough then grow some additional thickness before attempting to harvest.

The steps for converting mud bottom ponds to larger ponds for mechanized harvesting is essentially the same as for a new site except for site preparation. The ditches around the site should be built and the old bunds and ditches should be dozed over flat. New bunds and ponds should be finished and graded individually to a plane surface.

The first harvest on new salt floors should be done with care. Any failure in the floor which allows haul equipment to break through the floor will press salt down into the mud below and cause problems with the bottom that are very difficult to fix—salt mixed with wet mud will not dry and earth moving equipment aggravates the problem.

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To protect the salt floors in the crystallizers after harvest in plants where the climate is such that there is a period that the crystallizers are Idle, saturated brine is used as a cover over the salt floor and rain water is decanted from the surface over the weir set at the pond water level and set at lower levels occasionally to remove a set amount of level from the pond. Occasionally not all of the salt crop is harvested to effectively regrow the salt floor loss.

Conclusion

The handling of heavy rainfall on solar salt plants has a major effect on salt production, and if handled effectively may allow the use of salt floors in crystallizer operations where it would otherwise not be possible; thus preventing loss of production. Salt floors are a lot of work but they are worth it—the operation **and** equipment are so much simpler and trouble free.