Building a Raceway for Cyanobacterial Bio-fertilizer Production

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thin air nitrogen solutions

Swanie's Specialty Construction

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Supplies:

To build the frame, you will need:
Two 18 ft 2x12's
One 14 ft 2x12 (cut into two 6 ft 3 inch lengths)
One 12 ft 2x12
Two 18 ft 2x4's
One 14 ft 2x4 (cut into two 6 ft 6 inch lengths)
One 12 ft 2x4 (cut into two 6 ft lengths)
Lay out the lumber like the picture, and you'll be ready to start!

Tools:

These tools will come in handy for building the raceway:
Drill
Workgloves
Level
Rake
Shovel

Building the Frame:

Begin to build the frame by joining a 6 ft 3 inch 2x12 with an 18 ft 2x12.

Use 3 inch deck screws with Phillips heads (2 on each corner for a total of 8 to build the frame).

The corners should look like this.

After joining all 4 corners, the frame should look like this.

The next step is leveling the frame. The more level the building site before you begin, the easier this will be. Start with the short sides, and then level the long sides. The longer level you have, the easier this task will be.

You may have to prop up the corners with wood scraps to get the frame level.

Check that you have good right angles, by measuring the diagonal. The diagonal should be 231 and ½ inches in both directions.

Next, fill the frame up to the bottom of the 2x12's so that no light can be seen. You can use soil, sand, or pea gravel. Sand is probably best.

Two bucketfuls or lots of shovelfuls should be placed inside the frame.

Use a rake to smooth it out.

(Using the rake upside down works well, too!)

Finishing the Frame

Attach the two 18 ft 2x4s to the top of the 2x12's on the long sides.

The rim should look like this.

This is how it looks after you've attached the 2x4s on both sides. Then be sure to pile some soil around the outside edge to provide support.

Mounting the Corners

Use 4 pieces of 26 gauge galvanized sheet metal, 1 for each corner. Each one should be 12 ½ inches x 48 inches. First tap the screw (1½ inch deck screws with Phillips heads) with a hammer to make an indentation.

Then use your drill to screw it in.

Do the top first so it's level with the frame.

Then secure the bottom (4 screws per corner should be adequate).

A completed corner.

With all four corners finished.

Lining the Raceway

Now it's time to line the raceway. Make sure the bottom is as smooth as you can make it. Then use a 10 ft x 25 ft piece of 6 mil clear plastic to line the pond.

Placing lumber on the long sides helps to smooth the base. It's very important to make the lining as smooth as possible! A smooth floor will cut down on energy costs, because the paddlewheel will be more efficient.

Use a wacker-tacker (stapler) to secure the liner in just a few places (maybe 6, just enough to secure it but still allow it to stretch to the edges when you fill it with water). A sledge hammer is helpful to hold down the plastic prior to stapling.

Mounting the Center Divider

The next step is mounting the center divider. You will need the 6 ft 6 inch 2x4s. Measure 3 feet from the end and attach one of the 2x4s on one side only (using a deck screw or a nail).

Then attach the other 6 ft 6 inch 2x4 three feet from the other end (on one side only so that the 2x4s can still be lifted to make way for the divider).

Before placing the divider (a 12 ft long 2x12), attach a 6 inch piece of 2x4 to the end as shown in the picture.

Then place the divider into position as shown, and attach it using deck screws.

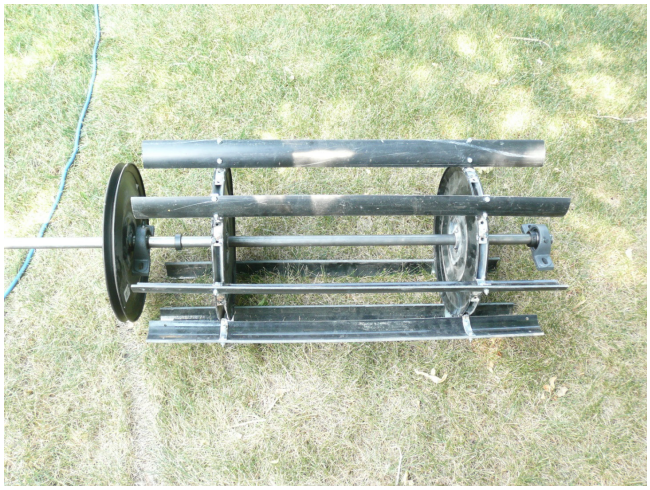
Then, the 2x4 supports should be screwed in place (the end that was previously unfastened should now be fastened).

Mounting the Paddlewheel

Now it's time to mount the paddlewheel. Use a 12 inch 2x4 block and place it on the center divider to support the paddlewheel. Place it 24 inches from the 2x4 cross piece, and attach it with 2 deck screws.

Then attach another 2x4 (same length) on top of that. One deck screw should be enough to attach it.

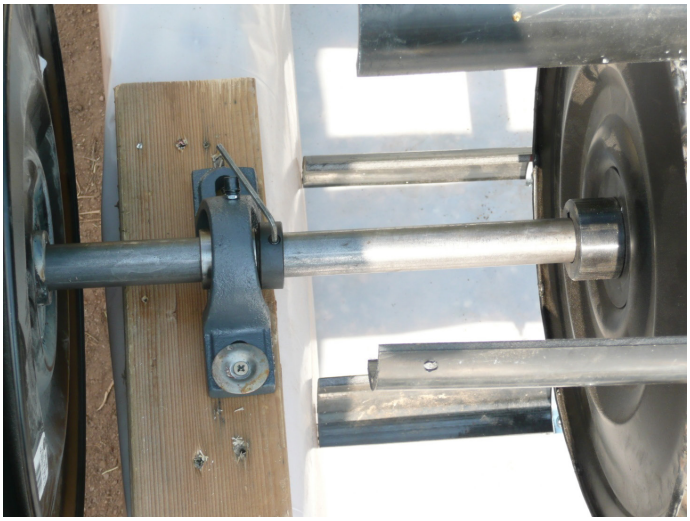
Take the paddlewheel out of its packing material and place it on the ground.



Place it onto the supports with the pillow braces in place.

Measure to be sure it's in the right spot before you attach it. Make sure that the paddlewheel axel is at right angles to the long side and the center divider.

You will need to use washers to secure it. Use 2 screws (with washers) on each end.



Then use an Allen wrench to secure the pillow braces.

Tap the paddlewheel with a 2x4 to center it, and make sure it moves freely.

Then use the Allen wrench to tighten the set screws on both pulleys.

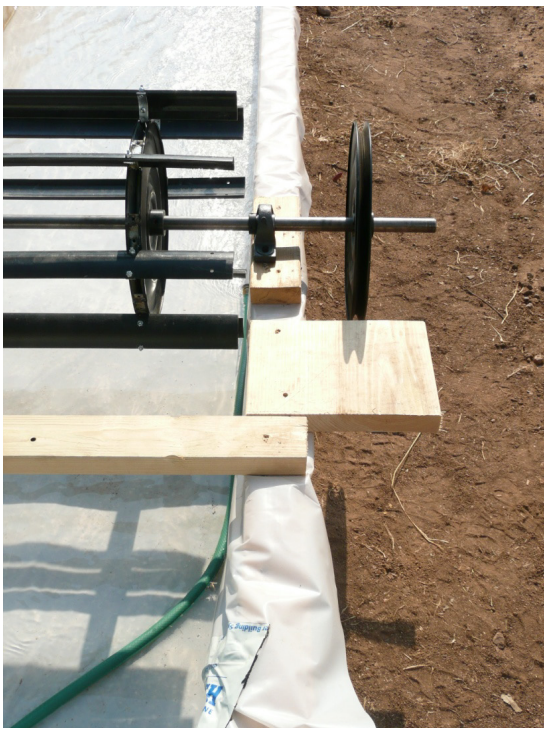
The paddlewheel should spin freely.

Begin adding water. Keep smoothing the plastic liner as it fills, and make sure that the liner is snug against the sides and bottom. Staple the liner in place around the outside edge.

Mounting the Motor

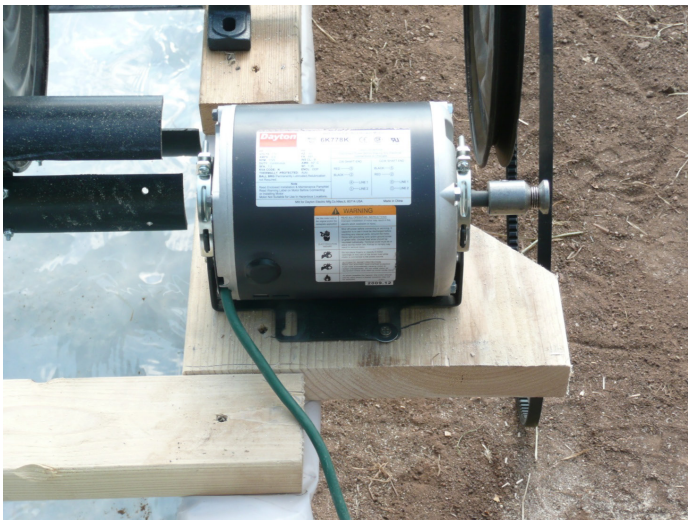
Next attach a 1 ft 2x12 board for the motor flush with the 2x4 cross piece. Two deck screws will be sufficient.

Check the board to be sure that there is room for the pulley and the belt to move.



You may need to cut the corner off to allow the pulley and belt to move freely.

Then place the motor on its support, adjusting the position so that pulleys on the motor and the paddlewheel are aligned with each other.



After attaching the motor, put the belt in place.

Then use an Allen wrench to tighten the set screw on the large pulley (for the paddlewheel).

Now you can plug in the motor and watch the paddlewheel spin!

The completed raceway should look like this.