U.S. Solar designs solar pump systems to customer specifications to power remote pumps.

Solar-Powered "Go-Anywhere" Pumps

Solar Pump Trailers from U.S. Solar Mounts let you pump water where you need it without a power source. The customized trailers hold the pump and a folded-up solar array. Tow it to the site, open the array, and watch the water flow.

"The Wisconsin Cranberry Association wanted to know if we could build solar-powered aeration systems for their fields, but one member was interested in pumping water," explains Eric Pipkin, U.S. Solar Mounts. "We engineered a system to operate on a mobile platform."

The biggest challenge was coming up with a dual access tracker that could collapse for road transport. Once on-site, the array is unfolded and elevated to rotate with the sun.

As word spread, Pipkin got more requests for trailer-mounted systems. "Each is customized to the customer's needs, which drives the cost up," says Pipkin. "Even the trailers are fabricated in-house. With so much customization to be done, there would be little left from a purchased trailer. Plus, we have yet to see a factory-built trailer with the quality we put into ours."

The system design is built around how high and how far the water is to be pumped. Added to those parameters is how much water is to be pumped per day or per hour.

Customization includes not only the pump mounting and solar array, but also adding outriggers and a water tank for priming the pump. Even the outriggers are customized for the system.

The company uses all American sourced and manufactured steel. Parts are cut and fit to the purpose by a certified welder and CNC plasma cutter, in-house.

Most trailer-mounted systems have an upper limit of about 7 kW. That equates to a solar array of about 350 sq. ft.

"Any bigger than 7 kW would require a semi-trailer, and anchoring and ballast becomes an issue," says Pipkin. "We did one where the entire trailer frame was fabricated to hold water. We filled the frame first when on-site, and it served as ballast."

All trailer-mounted systems are 3-phase with a variable frequency drive fed by high voltage from the arrays. The company also builds smaller, single-phase, battery-powered, mobile systems with AC pumps. They are used for irrigating a remote garden or filling cisterns and water tanks.

While the latter are relatively inexpensive, the solar-powered, trailer-mounted pumps run from $25,000 to $80,000.

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An alternator added to a Gravely 2-wheel tractor proved to be an economical solution to coil issues.

Car Alternator Added To 1979 Gravely

A long career as a machinist and the wisdom of 90 years on the planet came in handy for Robert Cole of Salem, Virginia. He uses a 1979 Gravely 2-wheel tractor to clean snow off driveways and sidewalks. One day the tractor gave out and he came up with a creative solution to keep the old machine running.

The 12 hp. Kohler engine quit running after the charging coil quit. That meant he had no way to charge the battery to operate the starter motor. It would also cost quite a chunk of money to get going again.

"If I wanted to replace it, I would have to update to a newer fly-wheel coil and regulator," Cole said. "That would have cost me $700.

"So, I went and got an alternator off a 1970's Chevy vehicle," he said. "I added a crankshaft extension and made brackets to hold the alternator in place. It works perfectly, and I only spent $80."

He said 56 years in a machine shop came in handy when making the brackets. Once the alternator was successfully secured, it was easy to get it wired up and provide electricity to the engine. "It puts out more amps than the other one did," Cole said.

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He Computerized His Chicken Coop

Brian Buhler added a door opener triggered by a light sensor to his chicken coop and temperature sensors that turn a heat lamp on and off. But he didn't stop there. He connected the chicken coop to the internet so he can control it from wherever he is.

Of course, when you can 3D print and computerize a mousetrap (Vol. 45, No. 5), automating a chicken coop is easy.

"I started out with a linear actuator to open and close the coop door," says Buhler. "I wired it to a couple of relays controlled by a microcontroller with a toggle switch to open or close the door."

Once he had that part of the update working, Buhler added temperature sensors inside and outside the coop. He then added a display screen so he could see the temperatures. He also added another relay wired to an outlet to which he plugged in a heat lamp.

"I programmed the Arduino to turn on the power to the outlet when the temperature gets below 25 degrees," says Buhler. "That turns on the heat lamp."

Keeping his chickens warm in the subarctic climate of southeastern Alaska is important. Buhler's area averages 30 days or so of subzero temperatures.

Not content with what he had done, Buhler added a Raspberry Pi (RPI) single-board computer to the mix. It has an ethernet connection, Bluetooth and multiple USB ports. It also has a built-in web server.

"I thought I'd build a webpage on it so I could open and close the chicken coop via the internet instead of going out to the coop to do it," explains Buhler.

Buhler notes that he has learned a lot doing the project, which has run flawlessly for 2 years. He would be glad to share. "If anyone wants more information on our Chicken Coop Automation project, drop us an email and we'll post some schematics and code snippets."

Actuator opens and closes the coop door (above). The system uses a low cost computer unit to operate and automate the door (below).

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Varty made a frame to hinge the radiator and AC condenser on his Big M mower, making it easy to keep clean and avoid overheating.

Mower Radiator Modification Cools Better

Nat Varty didn't like the design of his Krone Big M mower radiator and grill, so he changed it. Not only does it cool the motor better, but it's easier to service too.

"Our Krone Big M mower is an awesome machine," says Varty. "However, in really hot weather and thick hay, it would overheat, even with the reverser fan."

Repeated trips back to the farm shop to wash out the radiator or to bring an air compressor out to the field were frustrating. The grill wasn't removable, which made it tough to clean. Hay caught on a ledge, and the air conditioner condenser was in the way. The thin fins were getting beat up from efforts to clean it.

"It was also hard to climb up to reach the grill and the radiator," says Varty. "Last winter I cut it all apart and made a frame from the top of the radiator to the bottom. I took out the grill, extended it and made hinges and a latch for it, so it'll swing open to expose the whole radiator."

Varty also hinged the AC condenser, so it also swings out of the way, making it easier to pressure wash or blow the radiator out from behind. Holes drilled in the sheet metal behind the radiator allow wash water to drain.

With the changes, he can wash the AC condenser, swing it shut and latch it with two wing nuts. Once the grill is shut and latched, the mower is ready to go again.

"We eliminated all the overheating issues," says Varty. "We can do a better job cleaning it, and because the entire radiator is exposed to the grill, it breathes better. I also welded two steps on the rear bumper to allow easier and safer access for maintenance."

He encourages others with an overheating problem with the Big M to make similar changes. "I'll be glad to advise anyone wishing to make the same upgrades," says Varty.

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