

Old Chopper Rebuilt Into A Fuel Tank Cleaner

Robert Bauer has spent the better part of 40 years developing his wildly inventive ideas into useful devices for his shop and around his Hastings, Minn., farm. One of his latest creations may be his most unusual yet.

"Cleaning residue and rust from tractor gas or fuel tanks was always a real pain until I came up with my tractor-powered tank cleaner," Bauer says. His rig may be one of the most unusual ideas he or any other FARM SHOW inventor has ever come up with.

"I bought a broken down old two-row Gehl chopper for \$300 at an auction and started making an irrigation hose reel collector on it," Bauer says. "Then I saw a couple of reels for sale on Craigslist and bought them both for \$200 apiece. My half-built idea sat there unfinished until a lightbulb came on one day," Bauer says. "I thought to myself, I bet that thing can be used to clean tanks."

His cleaner has a 6-ft. dia. reel mounted on 12-in. channel iron brackets attached to the chopper's chassis. He had a blacksmith bend pipe for the outside of the reel and used pipe to make the spokes. The chopper's old cutterhead drum forms the reel's center, with bearings on each end of the shaft.

"To rotate the reel, I connected a few sprockets and chains to an old TMR gearbox," Bauer says. "That slowed the drive speed; then I added a 2-ft. dia. chain wheel on the side of the hose reel." The chopper's PTO shaft, hooked to his Super C tractor, drives the whole apparatus. The gearbox has an on/off lever, and an old foot brake from a Deere B tractor keeps the reel from moving when it's stopped.

To clean a tank, Bauer sets and secures it on a plywood platform inside the reel. He uses old disc blades on the opposite side as counterweights to keep the reel from jerking as it moves. If he's cleaning a larger tank, he can add more blades.

Bauer says, "After a tank is secure, I put a couple of gallons of cleaner in it along with



Bauer started to build an irrigation hose reel onto the frame of an old Gehl chopper and eventually turned it into a PTO-powered gas and fuel tank cleaner.

20 or 30 nuts and bolts, then let 'er roll. An hour or so later, I shut 'er down, put the brake on, and drain the liquid. I get the nuts and bolts out with a magnet."

The result is a tank that's perfectly clean on the inside. Speaking from experience, Bauer says, "If anyone else tries this, I'd advise them never to use rocks because some tanks have a lip on the filler spout, and you can't get them out."

Bauer says, "The cleaner reel is probably way overbuilt using the heavy-duty chopper frame, but reconfiguring a few things put that \$300 investment to good use. It works exactly as I imagined and didn't take long to build."

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Photo courtesy of Tommy J. Housman

"With aeroponics, we cut water consumption by more than 95% and eliminate pesticides and preservatives," says Massey.

Indoor Farming Uses Space Tech

A combination of NASA-funded research and native creativity is making high-volume, high-quality indoor food production possible. Anu Pure Produce (APP) does it with less light, water, and labor than other indoor farms using Controlled Environment Agriculture (CEA) technologies. Seeds are planted in self-nurturing, compostable seed pods placed on towers in an aerobic environment.

"The growing plants rotate under grow lights inside the growth chamber, like a chicken on a rotisserie," says Scott Massey, Anu. "We can pack 3,920 plants in a 20-ft. shipping container. The only labor involved is planting the seed pod, harvesting the produce and cleaning the rotating tower."

Rotating the tower so only one side is exposed to light at a time reduces the number of lights needed. This reduces fixed costs, energy costs and excess heat production.

"Plants are very light-intensive, but are able to do without the excess heat," says Massey. "We use less energy to grow the plants than a refrigerator would to store them."

Plant options include leafy greens, herbs, microgreens, flowers and fruiting vegetables like peppers. As a bonus, the produce is healthier too. The company claims twice the overall nutrient content on average, and 10 times the amount of certain essential nutrients, such as vitamin B.

An APP 8 by 20-ft. shipping container can hold 14 towers, each 24 in. in diameter and 80 in. tall, providing 650 sq. ft. of surface area for growing plants per tower. With its own water reservoir, pumps and nozzles for spraying plant roots, each tower can operate individually and adapt to different plant types.

Massey notes that farming is typically described in two dimensions: production per square foot or per acre.

"Our system works in three dimensions, and yields are higher per square ft.," he says. "With aeroponics, we cut water consumption

by more than 95% and eliminate pesticides and preservatives."

A key element of the system is the integration of artificial intelligence (AI) deep learning and computer vision algorithms. The AI constantly monitors the growing plants through super-detailed images. With total control of temperature, humidity and light, it can adjust the growth factors in real time based on how the plants are doing.

Massey and co-founder Ivan Ball designed their first growth chamber for NASA while doing engineering research at Purdue University. They applied what they learned to develop APP.

First efforts focused on a prototype household appliance-type growth chamber. The idea was to produce high-quality food where it's eaten. The home unit is now on the back burner as the company introduces the larger commercial system.

"It takes longer to bring a consumer product to market than a commercial system," says Massey. "The University of Evansville has purchased the first of several units intended to increase the health and well-being of the community."

Shipping container units are currently priced at \$90,000, which breaks down to \$150 per sq. ft. of plant canopy.

"We estimate about 60 sec. per plant to plant, to harvest and for periodic tower/reservoir cleaning," says Massey. "Assuming \$25 per hour labor, that amounts to 42¢ per plant," says Massey.

The company has received funding from state and federal sources, including nearly a million dollars from the National Science Foundation. APP is working with ekō Solutions to produce the container systems from upcycled shipping containers.

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"Our killer feature is we use CO2 headspace sensing instead of temperature monitoring in the grain mass," Frye says.



Bin Monitoring System Manages Grain Conditions

"We developed a retrofit automation kit for a grain bin to provide the earliest alert when grain is beginning to tip out of spec," says Amber Ag owner and co-founder, Lucas Frye. "Our newness factor and how we're different from everyone else is that we don't use any internal cables or sensors."

Amber Ag is an Illinois-based startup focused on grain bin storage technology that reduces spoilage and increases yield.

"Our killer feature is we use CO2 headspace sensing instead of temperature monitoring in the grain mass," Frye says.

"It's an old principle with dozens of papers written about it over the last 100 years, but it's still a relatively unknown process."

The Amber Ag monitoring system consists of a roof-mounted solar panel and hub, and an internal CO2 sensor that hangs inside the bin. The sensor measures the headspace for a risk alert of spoilage. Algorithms use the CO2 readings to calculate the moisture and temperature of the grain.

The bin's fan is connected to the controller and receives directions from the "Robin" app. It starts and stops automatically on dry, cool

and rehydration targets. Robin uses custom scheduling, time windows, alerts, changing weather conditions, humidity, and forecast reports to control fan usage.

An additional option provides laser-based inventory monitoring to calculate volume and manage inventory levels.

"It's the only monitoring unit on the market that pairs predictive CO2 alerts and laser-based inventory monitoring all in one device," Frye says. "It's wireless, plug and play, and installs in about 9 min. Just drill one hole and slap it on with the military magnets provided. It doesn't need internet or Wi-Fi for connectivity but runs off a built-in

cellular modem."

The system monitors every storage crop, including cereals, oilseeds, almonds, nuts, pinto beans, corn, sorghum and rice. It works in steel, wooden and concrete bins and silos from 1,500 to 1.2 million bushels in size.

The Amber Ag grain monitoring process is manufactured in Chicago and sold directly to farmers and commercial operations throughout North America.

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