

Mobile “Fuel Factory” Heading To Farms This Spring

Minnesota farmers will be making fuel from farm waste this spring and summer, and they'll be doing it on the farm. A pickup camper-sized prototype (approximately 8 ft. wide, 16 ft. long and 11 ft. high) will be making the rounds of farms as part of a University of Minnesota pilot project. The mobile fuel factory could eventually make farms energy self-sufficient and more.

“We are making some modifications in the design, running some more tests and making some revisions,” said Roger Ruan, biosystems engineer, University of Minnesota. “This winter I will take the design to a factory in China that has been commissioned to build the prototype. If everything goes well this spring and summer, we will talk to companies about commercializing it.”

The trailer-sized fuel refinery is relatively simple in concept, even if the technology involved is complicated. Feedstocks, which can be anything from crops or crop residues to ground up tires and plastics, are fed into an oxygen-free chamber. There they are heated with microwaves to 500°F, breaking the feedstocks into solid and gas components in a process called pyrolysis. While pyrolysis is nothing new, it usually requires finely grinding the material so it can be evenly heated to release component gas. The microwave heats materials from the inside out, eliminating the cost of grinding. Off the shelf components are expected to reduce costs.

The burned solids (biochar) are removed

for use as fertilizer or potentially higher value use. Meanwhile, most of the gas is condensed into a liquid fuel. It can be used on the farm or collected for further refining off-farm. The rest is used to fuel the generator that powers the system. Heat is a byproduct of the process and one that Ruan hopes to capture for use in the reactor or on the farm.

“Further refining of the oils produced will depend on the raw material used and the end uses of the oils,” says Ruan. “Ground tires and plastics produce a very good hydrocarbon fuel.”

He estimates that in the case of biomass, 1 lb. of feedstock could produce a half-pound of bio-oil, a quarter pound of biochar and a quarter pound of combustible gas.

“A lot of biomass can be used to produce heating oil or oils and syngas for electrical generation on the farm,” says Ruan. “Our hope is that it can be produced at a cost that is competitive with the electricity market.”

Final costs will depend on a multitude of variables. However, Ruan expects a price tag in the \$300,000 to \$400,000 range. He suggests that farmers could share a unit, moving it from farm to farm, thereby eliminating the cost of transporting biomass and other farm wastes to a central location.

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“I built it almost entirely out of my junk pile,” says Frank Miller about his 3-pt. “mini spader” that breaks up sod for gardening.

“Made It Myself” 3-Pt. Implement

“I made a ‘mini spader’ that breaks up sod for gardening. I also use it to loosen up hard ground that needs to be graded. I built it almost entirely out of my junk pile,” says Frank Miller.

The 3-pt. tool consists of a gang that supports three 10-in. cultivator sweeps spaced about 8 in. apart. The sweeps are welded to vertical lengths of 2-in. dia., heavy wall pipe, which in turn are welded to a horizontal length of 4-in. dia. pipe. The entire

structure is reinforced by vertical lengths of angle iron and steel rod.

“I couldn’t be happier with it. I use my Deere 4010 80 hp tractor to pull it,” says Miller. “I generally set the sweeps to go down 6 to 8 in., and I tip them to help pull them down into the ground.”

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Carl Rocholl converted the belly-mount mower on his Deere garden tractor to a front-mount model.

Belly-Mount Mower Transformed To Front-Mount

Carl Rocholl loved the cab on his Deere garden tractor, but the cab made it impossible to mow around the many trees in his yard. So, he solved the problem by converting the mower from belly-mount to a front-mount.

The Elizabeth, Minn., truck driver built a frame to attach the mower to the front of the garden tractor using part of the tractor’s front quick hitch. He made push rods out of two 5/8-in. bolts by welding pieces of pipe to fit on the quick hitch pipe (3/4-in.) and the mower deck (5/8-in.). He added a piece of angle iron and a chain to lift the back with hydraulics when he wants to transport the mower and save the wheels.

He gained better maneuverability — and strength — by adding four pivot wheels for the front and back. He bolted angle iron to each corner of the mower to support the wheels.

“This is a prototype,” Rocholl says, noting



He also modified a dozer blade to mount on front.

that even though he doubled up the angle iron on the back, it’s not quite strong enough to support the wheels. He plans to replace it with square tubing.

“One feature I like is that I can pick up the mower deck in front to 45 degrees to clean the blades,” Rocholl says. “The more I use it the more I like it.”

He mows all the way around trees by going forward and reverse from two directions. He’s far enough away to avoid all limbs, including



Joseph Parducci converted an old 10 cu. ft. tow-behind cart into this high capacity “wheelbarrow-style” cart.

Tow-Behind Wagon Converted To Wheelbarrow

“It provides a lot more work space than a wheelbarrow and is also much more stable,” says Joseph Parducci, Hampshire, Ill., who converted an old 10 cu. ft. tow-behind cart into a “wheelbarrow-style” cart.

The cart measures 30 in. wide by 42 in. long, with 1-ft. high sides and a tailgate on back. Parducci removed the tow bar and moved the axle assembly back in order to rebalance the cart’s weight over the wheels. He also bolted 2 long wooden wheelbarrow handles onto the sides of the cart, allowing it to be moved around like a large wheelbarrow. A pair of angle iron legs bolt onto the cart’s front corners. “Flats” at the bottom of the legs keep them from sinking into the ground.

“I built it for my wife to use in our 1/2-acre garden,” says Parducci. “We’re always carrying multiple buckets of material back and forth to the garden, so we wanted

something with a lot of capacity. Yet I can wheel the cart between the rows without compacting the soil like a tractor would. And if I want, I can put the towbar back on and still tow it with a garden tractor.”

The cart also makes a great work station, says Parducci. “I can place a 36 by 48-in. section of plywood on top of the cart to do potting or soil mixing work, or use a nylon cutting board to clean my vegetables directly in the garden. I also built a 2 by 4-ft. wooden framed, wire mesh ‘compost screen’ for use on top of the cart that lets me sift compost material into boxes inside the cart. Later I sprinkle the compost in my garden.”

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low limbs of evergreen trees.

“This hitch could be used on any Deere with a pto-driven mower deck,” Rocholl says, adding he is considering making kits to sell. “I didn’t alter the mower deck except for drilling holes, so it can be converted back to a belly mount.”

He also modified a dozer blade to slip on the front. He removed the arms and placed a

bar across the quick hitch mount to support the blade. He uses it to grade his alley and driveway.

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