Tractor's Exhaust Injected Into Soil With Seed

Turning tractor engine exhaust into nitrogen-rich moisture that can be injected into the ground while seeding crops isn't difficult to do, says vo-ag teacher Ray Morrison of Dobbinton, Ontario.

After reading stories in FARM SHOW and elsewhere about the process, Morrison decided to adapt his 80 hp diesel tractor and Grain Plains drill.

"Given the high price of fertilizer, I thought it was an idea worth trying," says Morrison. "At first I thought the goal was to get the carbon dioxide from the exhaust into the soil. I have a brother who is an engineer, and he helped me understand that the real goal was the nitrogen."

The diesel process changes nitrogen in the air into nitrogen oxides, which plants can use. As the exhaust cools, it draws moisture out of the air, and the nitrogen oxide-rich moisture can be injected into the soil.

What Morrison needed was a radiator to cool and condense the exhaust. He designed a manifold he felt was large enough to handle his tractor's exhaust. With the help of the school's auto class and its exhaust pipe benders, the vo-ag class was able to build one without much difficulty. The manifold, or "rad" as Morrison refers to it, is mounted on the front of the grain drill. It consists of nine 48-in. tall, 3-in. diameter uprights with 4-in. spacings. The uprights were mounted between upper and lower 6-in. diameter horizontal pipes. The hot exhaust is piped to the top of the rad where it's distributed across the top of the uprights. As it moves into the manifold, it slows by a factor of ten in the larger system. This also ensures the system doesn't develop any back pressure on the engine.

At the bottom of the rad, the now cooler and wetter exhaust is distributed to the 15 seed rows and knifed into the ground.

The only change made to the tractor was to reroute the exhaust beneath the tractor and back to the outlet on the drill. He estimates the entire system cost about $500.

"You get a pretty steady flow of moisture out of the pipes," says Morrison. "This spring I will be making a couple of runs down my wheat fields to test the effect on yield."

With the help of his school's auto class, vo-ag teacher Ray Morrison designed a manifold large enough to handle his tractor's exhaust and mounted it on his grain drill.

FARM SHOW will follow up with Morrison this summer to get the results.

Morrison also has been cooling exhaust from his propane furnace. So far he has collected about 200 gal. of condensate, which he plans to apply to plots in a hay field.

"I know it will work; I just hope I have the right interpretation of how it will work," says Morrison.

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Low-Cost Drip Irrigation

Sherwood Botsford came up with a low cost drip irrigation system for his tree farm near Warburg, Alberta. He says it would also work great for anyone putting in a shelterbelt.

"Commercial systems like this are expensive and clog easily. I made mine out of 1/2-in. poly pipe. Next to each tree, I punched a hole in the pipe using a thin sewing needle, held in a pair of vice grips."

Botsford makes two holes for each tree on the bottom side of the pipe so that if one gets clogged, the young tree will still get something.

"It's a good idea to run the pipe over a cluster of rocks near the holes so that they don't rest in mud," he adds. "I keep 600 trees watered this way. If your run is more than 500 feet, you should probably go to 3/4-in. pipe."

Botsford installed a 140 mesh filter at the inlet to reduce clogging, and says a system like this works well for water pressures of about 30 to 50 psi. If you have less pressure, you need bigger holes to get the same water, he points out.

"My rule of thumb is, if you water on a 3 to 5 percent downgrade, the slope will compensate for the water loss if you choose the right pressure," he says. "If you water on an upgrade or on rolling hills, then you must use a pressure that is two times the height difference to get any kind of uniformity. For example, with 10-ft. rolling hills, use 20 psi."

Botsford says, if the holes are too big, you will run out of water before you get to the end of the pipe. If they're too small, they clog easily.

"Half-inch pipe can handle between 250 and 300 needle holes. Three-quarter inch pipe is about double that," he says. "If the pipe twists, and you have water spraying where you don't want it, put a scrap of utility tarp around it and staple the edges together."

Botsford adds that, if the pipe wanders too much with temperature changes, you may have to fasten it down. Half a wire coat hanger, bent into a giant staple works pretty well, he explains.

"If you have hard water, you'll probably have to re-punch the holes mid season, but that's easier to do than replacing expensive drip nozzles."

Sherwood Botsford used 1/2-in. dia. poly pipe, punching two holes for each tree on bottom side of pipe so that if one gets clogged, the tree will still get something.

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Burn Box Cleans Up Waste

Why take wood waste to the landfill if you can take ash instead? Air Curtain Fire Boxes reduce waste by 98 percent with no smoke or emissions. Just dump in the timber residue, stumps, construction or other waste, start the fire, and turn up the forced air. High velocity airflow creates an invisible curtain on top of the fire and rotational turbulence within the fire.

"They're used for forestry, land clearing and construction waste," says Norbert Fuhrman, sales director, Air Burners, LLC. "We sell a lot of units to the government - local, state and federal. We also have customers who use them for service contracts. Some rent out the boxes, and others handle the complete clean up job, sending an operator with a box and a loader."

To handle the heat that can exceed 1,000 degrees F, the open top and open bottom fire box is lined with refractory material. The high heat from the oxygen-enriched environment not only speeds the combustion process, but also breaks down chemical compounds and reduces emissions. Smoke is constantly returned to the fire until it has burned up.

The Fire Boxes are available in three series, each having multiple length units. The largest and most popular series measures 12 by 12 ft. in height and width and sells for around $120,000. The smallest at 6 by 6-ft. is priced around $70,000. A mid-sized 8 by 8-ft. unit is also available, as are larger trailer-mounted units designed to be used over open trenches or pits for high volume burns.

"The Fire Boxes are popular because they are so easy to handle," says Fuhrman. "They come completely assembled and can be stationary or moved from location to location. They don't take an engineer to operate, and all that is needed is a front end loader."

The skid-mounted units come complete with a diesel engine and air manifold to create the air curtain across the top.

"We're seeing a lot of interest in Colorado where trees infected with pine beetle are being removed," says Fuhrman. "With our air curtain technology, they can be burned green which kills the larvae and eliminates the chance of moving the contaminated wood into new areas."

Other uses for the units are to clean up forest slash, partially burned trees after forest fires and even homeowner vegetative waste.

Burn box can handle timber residue, stumps, construction waste, and other debris. High velocity airflow creates an invisible curtain over fire and rotational turbulence within it.

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