



Prototype in-field dryer allows hay to be dried right in the field. The multi-chambered, pull-type machine measures 45 ft. long by 12 ft. wide and about 12 ft. tall.

## Revolutionary On-The-Go Hay Dryer

By Jim Ruen

Prime alfalfa sells for \$90 - \$130 per ton. Good corn ground is capable of producing 6-8 tons per acre per year, so alfalfa can be a crop of gold if everything goes right.

Donald Eickhoff, a farmer, and Conrad Fingerson, an engineer, have been working for 12 years on a dryer that dries hay on the go in the field. It promises to take the uncertainty out of hay harvest and make it a sure thing every year regardless of the weather.

The Fillmore County, Minnesota entrepreneurs designed and built the dryer with the help of Ken Connaughty, owner of a local machine shop. After years of bench tests, computer modeling, and prototyping, the gigantic machine is approaching completion.

The first working model 12 years ago was a 4 by 4 ft. wooden box filled with wet hay and mounted over a fan blowing hot air from a propane burner. After many revisions, that wooden box has grown into a multi-chambered machine, 45 ft. long by 12 ft. wide and 12 ft. tall.

It requires a 200 hp. tractor to pull it and power the fan. A separate engine and hydraulic pump drive an array of hydraulic motors.

"When we started working on it we knew we didn't want to move the hay through the hot air," says Eickhoff. "Every time you move hay, you damage it. Our approach is to pull hot air through stationary hay held in moving containers."

That concept drove the design, and it is the concept which is patented, rather than the individual components. What's more, the inventors believe other crops, including corn, could be dried more efficiently using their new concept.

As hay is cut it's packed into one of 14 20-ft. long chambers—which measure 12 by 17-in.—as the machine moves across the field. As they're filled with wet hay, the chambers

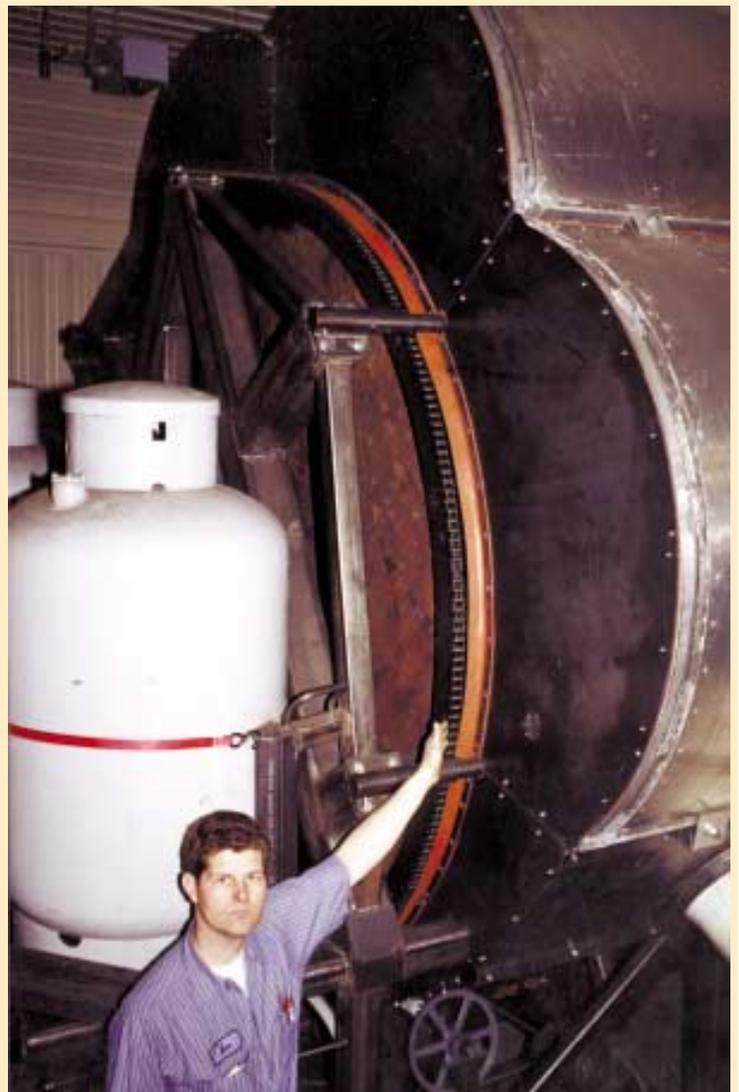
rotate around a central drum moving through heated air zones. Dry air is pulled in from the side of the drum and heated before it passes through the successive zones, starting with the one holding the chamber with the driest hay. As the air exits a zone, it is reheated and pulled through the next zone, constantly being recycled through progressively wetter hay until it exits out the front end of the unit at near 100 percent humidity. Re-circulating hot air from the driest hay to the wettest, combined with the vacuum effect created inside the drum, gives the unit an efficiency rating that exceeds the best corn dryers, says Eickhoff.

Five LP fueled burners heat and reheat the air. Vacuum is created by a 25,000 cfm fan. A ton of wet hay can be dried from 45 percent moisture down to 18 percent or less at a cost of only 9 1/2 gal. of propane.

"The ideal efficiency in drying is 1,000 btus/lb of water removed," says Eickhoff. "We get 1100-1200 btus/lb of water removed. Most corn dryers are in the 1,400 btu range. The key is that by pulling the air through with vacuum instead of blowing it, we avoid the buildup of moisture and residue at the exit point."

Using a vacuum system also provides a safety point if dry grass or hay should overheat in the chamber. A system of steel doors ahead of each chamber can be shut instantly in the case of combustion. Air flow to the fire is cut off immediately, and the fan that pulls the air goes into free stall, thanks to pressure sensors telling it there is no air to pull.

The greatest challenge ahead during this season's field testing is a new feeding system designed to fill and empty the chambers on the go. The unit is designed to travel through the field at approximately five mph. It takes about 40 seconds to fill a chamber and a little over 1 second to rotate the chambers as they're filled. At five mph, at least 7 ft. of



Hot air is pulled through hay held in moving containers. Five LP-fueled burners are used to heat and reheat the air. Vacuum is created by a 25,000 cfm fan.

windrow has to be stored momentarily as the chambers change position.

Five finger tines on a chain feed move hay into an empty chamber until pressure sensors indicate the chamber is full. Once the chamber is filled, a hydraulic coupler collapses the forward most finger, stopping hay movement for 1/4 second. As each tine in turn collapses, an additional 1/4 second is gained. By the time the last tine has collapsed, the new chamber is in place, and the first time is starting to feed hay into it.

If this latest concept works, the inventors are confident the machine will make it into production, and around the clock alfalfa production will be a reality, regardless of the weather. The two expect a self-propelled machine to sell for about the same price as a large combine. Hay will still be cut and baled conventionally.

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## Weed Trimmer Turned Into "Power Scrubber"

You can replace the string head on a weed trimmer with a broom head to turn it into a handy power scrubber, says Tom Hill of Battle Creek, Mich.

He bought a used electric trimmer at a garage sale for 50 cents. He removed the string head and then cut a chunk off an old wooden barn broom and screwed it onto the base.

"It works great for loosening dried-up mud on floors," says Hill. "It also works good for

loosening up sawdust that we sprinkle onto floors to soak up oil spills. We haven't tried using it yet to clean up a vehicle, but it would probably do a good job. The broom head isn't quite perfectly balanced so it vibrates a lot, which probably helps to loosen things up."

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"It works great for loosening dried-up materials off floors," says Tom Hill, who replaced the string head on an electric trimmer with part of an old wooden barn broom.