Kleen Gun harnesses exhaust air generated by your pickup or tractor engine. It can be hooked up to siphon cleaning liquid from a container. Or, you can use it as a "dry" cleaner to blow out radiators, filters, etc. Can also be used to warm cold motors, remove ice from windshields, or to spray livestock.

**NEW WORLD WORKHORSE**: FARM TRACTOR OF THE FUTURE

All-Electric Tractor Being Developed

An all-electric farm tractor called the "New World Workhorse" is under development by a Missouri-based partnership led by Jim Downing, inventor and chief design engineer. "We're satisfied that the conceptual problems have been solved and that we'll have a complete electrically-powered modular farm system in the field within a couple of years," he told FARM SHOW.

The partnership formed to develop the all-electric tractor is also the principle owner of Bear Industries, Sedalia, Mo., which manufactures gooseneck trailers and other farm equipment.

Downing has incorporated high frequency alternators, gas turbines and solid state control circuitry into the blueprints for a turbine electric tractor which he is confident will work and be economically feasible.

"This farm tractor of the future is based on an electric power generating unit," he explains. Electric power for driving its wheels and auxiliary implements is supplied by a gas-fueled turbine turning a large alternator.

Downing predicts the all-electric tractor will pull the largest tillage equipment now built. "It will be able to do this without slipping, thanks to independent induction motors which power the four separate drive wheels. Power flows to the wheels without differential slippage. Today's tractors, not being electrically powered, supply power instead to the spinning wheel," he explains.

"Threshing heads, cutters, windrows, pickers and every other imaginable piece of auxiliary equipment will attach to either the front or back of the unit by way of forklift-like hitches. Truck beds, bins, and tanks of every sort will either be carried or pulled. When pulled, carrying beds may form a land train in which each trailing vehicle is separately powered — by its own drive wheels, connected by electric cable. Electric power is fed by simply plugging in to the vehicle ahead. Variable speed control of each pair of wheels, and of each auxiliary implement, will be achieved electronically through variation in the frequency of independently supplied alternating current. At all times, the turbine alternator will run at a constant speed and, while running, never requires throttling. An infinite number of speeds, forward or reverse, will be available — while the operating speed of the auxiliary implement, or implements, will be separately controlled through cyclo-converters."

In short, the mobile unit Downing has designed is the basic building block for a complete system of modular agricultural equipment. "The same mobile unit can serve as a power-generating heavy tillage tractor before breakfast, a combine until after lunch, and a heavy duty forage harvester before supper and then a 200 kilowatt standby generator overnight," Downing explains. "At different seasons of the year, the vehicle can be variously configured as a tractor pulling plow bottoms, as a single-pass planter and chemical applicator, small-grain combine, or as a road grader or snow blower."

Downing first considered the use of D.C. electric motors and generators, but abandoned them because they were "too bulky, heavy and costly." He also explored but gave up on hydraulics. "Hydro-static devices provide either high torque with low speeds, or high speeds with low torque, but it's impossible to obtain high torque over a wide speed range without the use of a transmission." Needing individual wheel motors with a very broad speed range, Downing also considered steam turbine engines. "They would work but their efficiency with variable speed operation would be terrible."

His solution: A.C. electric power with cyclo-converters, which provide variable speed control of alternating current. In checking with manufacturers of cyclo-converters, Downing was told that while it was theoretically possible to use them to control high-frequency A.C. current on mobile machinery, manufacturers warned that cyclo-converters may be expensive.

Undaunted, Downing is satisfied he figured out a way to make his work economically. "Electric power is the key to making a farm equipment system modular. A modular system is the key to lowering costs of farm machinery and the cyclo-converter is the key to mobile electric power."

Here's a recap of key features incorporated into the blueprints of his all-electric tractor:

- It's powered by a turbine engine.
- It has four wheel drive, and has no transmission or clutch. It has completely variable speed forward and reverse, with a material transfer tunnel which runs through the base of the tractor. It has a standby generator capable of quick interchange of parts and implements.
- Drive motors and gear reducers are self contained, totally enclosed and modular. All motors are 3 phase AC induction.
- Downing believes his all-electric power system, when perfected, can be sold for much less overall cost than buying a separate machine for each job. "All machines will be modular and self contained, allowing quick interchange of parts and implements. You'll be able to switch from one machine to another in a matter of minutes. Implement design can be much simpler because drive (clutch) motors can be placed where the job must be done and not where the drive shaft dictates. Implement can be much more compact and efficient due to this increased design flexibility."
- Downing and his partners welcome inquiries on their "New World Workhorse" from anyone interested. We'll keep you posted on latest developments. Meanwhile, interested parties can contact: FARM SHOW Followup, Virgil Clark, Bear Industries, Box 1625, Sedalia, MO. 65301 (ph. 816 827-2000).