Saluting the AE 50

Acceptance in the marketplace is the highest accolade any new agricultural product can ever receive. But for innovative developments introduced last year, a singular honor is to be named one of The Agricultural Engineering 50 “outstanding innovations in product or systems technology for 1988,” state industry designers and managers.

Showcased within this 32-page section are 50 top engineering developments in agriculture introduced during 1987. Virtually all companies supplying components, making products, or developing systems for food and agriculture were eligible to submit for consideration “developments that embody the application of new technology or the innovative application of an older technology.”

Hundreds of “product nominations” vied for coveted spots among The AE 50. A distinguished panel of engineering experts from several well-known organizations reviewed entries to select those considered most likely to make “worthwhile contributions to the advancement of engineering technology in food and agriculture.”

Agricultural Engineering magazine is proud to play an important part in making known these significant developments in engineering technology for helping farmers, processors, and equipment makers to cut costs, enhance quality, boost nutrition, become competitive, and improve profitability. To all firms — and especially to you honorees — here is our AE 50 Salute for 1988.
Lube-Metering Lines
Grease Picker Drums

Power dispensing system lubricates in less than 1.5 min the intricate cotton-picking mechanisms that previously required over 30 min to grease by manual methods. Originally introduced on a 4-row harvester, the on-board lubrication system for Deere's 2-row Model 9930 cotton picker carries a two-week supply for performing a lube job every 10 h. A transfer pump with coupler attachments (bottom inset view) can refill the system's 60-gal reservoir (second from top inset) in about 10 min. Two cab-based controls are used to activate the system when the picking units are warm from field operation. A floor-mounted lever triggers a 20-s burst of grease for drive and sun gears, cam tracks, and thrust washers. A console-located button actuates the 1-min lube sequence for bars and spindles on all four drums. Two console lights give visual indications that grease is flowing in response to the operation of a belt-driven, gear-type metering pump. An electric clutch engages this pump when the cotton picker's engine is idling at 1,000 rpm. The on-board system eliminates lube-service vehicles or areas, shortens maintenance and warm-up periods, and boosts on-the-row harvesting line speeds. John Deere, De Moines Works, De Moines, IA (315/228-9306)

Small-Bore Viewer Illuminates Hidden Flaws

Diagnostic probe enables researchers to view, study, and maintenance tools to function efficiently without time consuming disassembly, the condition inside engine cylinders, hydraulic lines, and mechanical drives. A low-cost version of the hand-held device can cost up to $6,500 for high-volume production. It comprises of a 60-volt rechargeable cordless drill, a hollow drill bit, a fiber-optic cable, a camera, and a 25-mm bore, probe light, a battery pack, and a control system. The probe contains a fiber-optic strain cable. The miniaturized light source offers bright illumination of part recesses and cavities. As a result, troubleshooting time is the system alone, probe reportedly delivers a 30% increase in productivity. Lavo Instrument Co., Pione, PA (315/322-9990).
Drive-Reversal Unit Frees Material Jams

Integral motor/clutch unit is normally an unactuated/disengaged assembly built into the drive system for a harvester's drag chains or feeder devices. But when activated, the unit must drive mechanisms in a reverse direction to dislodge jammed-up rocks or plant material. An operator first actuates a valve allowing fluid pressure to a piston that imparts an axial clutch movement causing interdigitiation (or lock-up) of teeth projecting from both clutch surfaces. TRW Ross Gear Div., Lafayette, IN (317-439-5377).

Force-Balanced Shaker Energizes Vibratory Conveyor

Four gear-driven weights are featured on a flat-type apparatus that generates linear oscillating forces propelling vibratory conveyors in food-processing plants. The energy-balanced design is claimed to eliminate the extraneous side-to-side forces experienced with a conventional drive having only two eccentric weights that rotate in opposite directions. The new Iso-Drive unit is shown with and without safety guards and is manufactured in various sizes. It is designed to facilitate setup and calibration, reduce skewed vibration and provide longer equipment life. An Iso-Drive gearbox has large-diameter shafts, tapered roller bearings, and composite material gears. The oscillatory or shaker drive unit can be mounted on proprietary Iso-Drive vibratory conveyors (top diagram) as well as on conventional vibrating equipment used.
Polymer Absorbs Fuel-Borne Water Molecules

A water-absorbing polymer — like that used in disposable diapers for infants — is employed in cylindrical filter elements that remove molecules of water from gasoline and diesel fuel. Previous filter designs could only trap droplets of water. Installed at the outlet of a storage tank, the new Water-Block filter absorbs molecular water as engine fuel flows to a vehicle's tank at a gravity flow rate of 5 gpm with a 24-in. head. After trapping about one-half cup of water, the unit begins to restrict fuel flow and thus signal the need to change the replaceable element. Water-absorbing media also provides filtration for 15-micron size particles and may be teamed with a companion 10-micron filter. The die cast zinc top cap is fitted with standard 1-in pipe threads for easy installation. The DL Goldenrod Water-Block filter is 9.5 in. high with a 4 in. diam, and made by Dutton-Lainson Co., Hastings, NE (402-462-4141).

Subsoiler's Shanks Dispense Nutrients

Deep band applicator for dry lime and fertilizer helps to correct subsoil pH levels and nutrient deficiencies while providing a deep slot that enables the roots of cotton and soybean plants to reach ample water and nutrients during their critical fruiting periods. Based on a rig developed at the Delta Branch Experiment Station, Stoneville, MS, the new type of applicator delivers dry lime or fertilizer into vertical 2-ft-wide by 9-in.-deep slots left by shanks mounted on the subsoiler's parabolic shanks. This arrangement is said to require less power than straight shanks working to the same depth, and to take much less energy than deep moldboard plowing to incorporate surface-applied lime and fertilizer. A variable-speed hydraulic motor drives a mesh-type conveyor that meter dry lime or fertilizer from side of hopper into top of applicator, where it catches the subsoiler's shanks. The delivery tubes have internal deflectors plates set to deliver one third of the material at each of three depths (6, 9, and 15 in.). Due to shank curvature, deposited soil blocks the tube's lower depositing slot so that materials deposited at the upper level do not fall to the bottom. M.G. Dickson Industries, Inc., Batesville, AR (816-261-0143).
Tilt Roller Conveyor

Pairs of tiltable rollers cradle and transport fruit past electronic size/grade/color sensing equipment that analyzes each piece of fresh market fruit. Fruit release instructions are transmitted to the appropriate pair of rollers through an electronic computer system. At a programmed drop-out location, the rollers tilt in unison to discharge fruit onto specially designed protective mats and the take-away conveyor. The spoon-shaped rollers are claimed to carry more fruit in the same lateral space than cup conveyors running at the same speed, and they provide 80-90% exposure of total fruit surface for color sorting by optical devices positioned on either side. A CAD program proved the tiltable roller theory before a prototype was built, reports the Decco Div. of Pennwalt Corp., Monrovia, CA (818-358-1938).

Multimeter Tracks Six Factors

Six field parameters can now be measured with a single instrument—the size of previous hand-held infrared thermometers. The Ag Multimeter from Everest Industries Int'l., Fullerton, CA, (714-992-4461), can be used on crops such as cotton, wheat, alfalfa, tomatoes, sugarcane, rice, or any other crops. Claimed to be the first self-contained, microcomputer-based infrared multimeter on the market, the hand-held device gives a continuous display of the Crop Water Stress Index (CWSI) which indicates the amount of water available to the plant independent of environmental conditions. No auxiliary equipment or supplies are needed, and no probes are required. A PC card stores a string of data for up to 500 readings. By downloading into a computer, this device can be used as a portable soil moisture meter. The Ag Multimeter's strength is in its rate of data collection. Just by holding the instrument's probe in a crop canopy, a taste of the crop's water status is given at any point within 6 to 48 inches of the sensor. Additionally, the multimeter is compact, with a rechargeable battery and battery charge status.
Line-Spanning Design Advances
Boost Tractor Performance

Major technological innovations in Magnum Series rowcrop tractors encompass an 18-speed powershift transmission, 6-cylinder diesel engine, cab/hood visibility enhancements, operator-friendly controls, electronic draft sensing hitch, 360-degree circumferential lighting, and electronic instrument cluster. Novel features in the lower model have accounted for 15 patents awarded to the engineers who work for Case IH, Racine, WI (608-630-3201).

The Magnum's 3-in-1 Powershift Transmission

- Spacing Out the Gear Ratios
- Stacking Up the Torque Curves

Hull in tractor engineering are considerably influenced on the performance of control devices, electronic instruments, safety features, and visibility enhancements. Cab/hood provisions give an unobstructed view and easy access to controls, gauges, and the right-side mirror, representing 25% of the case’s 40-feet total gross area.

Tough design challenges required integrating these general elements of tractor performance and transmission. In-situ tests were performed throughout the design phase, control of hydraulic systems, operator comfort, and safety were critical. Powershift switch options offer a progressive, smooth forward speed across all locations.

AE 5973
Outstanding innovations for 1988
Plastic Bodies Guide Tiny Solenoid Valves

Fluid-dispensing valves feature 0.8-in.-diam homopolymer acetal bodies molded with threaded inserts and external trim of stainless steel. These tough, stable thermoplastic valves with excellent creep resistance and high fatigue endurance require only 2 W to actuate tiny solenoids that cycle up to 40 times/s and reportedly offer over 250-million cycles/unit. Such capabilities facilitate programmable digital pneumatic control and give lifespans like those associated with solid-state relays; however, the low-cost valves are considered most applicable for pilot operation of bigger fluid-handling valves and for the overall control of liquid-sampling systems. Valcor Scientific Div., Valcor Engineering Corp., Springfield, NJ (201-467-8400).

PC-Based System Handles 64-Site Network

Sixty-four different alarms can now be issued via a special radiocoupled card for an Integrated Control and Instrumentation System (ICIS) offered by Western Telecommunications, Inc., Roanoke, VA (406-526-1541). Wanted conditions at as many as 64 remote sites move above or below set-at-threshold values, the action station at ICIS installation is prompted immediately and each alarm is sent to a 1024 character ASCII terminal port for printing out the information. Radio links (for generating synthesized voice messages) or telephone modem. Three data-logging and condition monitoring capabilities. Internal computer may be extended to assume process control functions. Environmental equipment is in a portable, radiocoupled, field station with 1024 character ASCII terminal port for printing out the quality-of-life circumstances.
Optical Data Links Report Field Status

Light beams can now replace radio waves and electrical wires for carrying analog as well as digital data from remote field units to central base stations. The information about air temperature, soil moisture, insect population, and equipment/water status is first collected by various types of sensors. Their condition-revealing electrical impulses are then converted to optical waveforms by electro-optic devices housed inside a post-mounted transmitter. Next, the data-encoded optical signals are beamed on a line-of-sight basis to a receiver located up to 1 mi away. Devices inside the receiver return the signals to far-flung sensors to electrical form so they can be stored in the memory of a process-control computer, inputted as analog values to a programmable logic controller, or even used in direct readings on the display of a simple reader. The photo accompanying this article provides, in addition to the infrared telemetry capabilities of Data Lynx equipment already made by Automata Inc., Grass Valley, CA, 95912. A 2730890, infrared link can thus supplement many systems featuring interference-prone radio waves and maintenance-plagued electrical wires.

Huge Grain Cooker Boosts Feeding Value

Nutritional value of animal feed grain is increased by a solution called the "Beech cooker." The product is in an oxygen-starved chamber before being put through a baking or tempering stage. The tempering process, with its controlled-partaging and mixing, is a major factor in differentiating high-quality feed from inferior ones. The process can be controlled by a computer, which can precisely control the temperature and other conditions. The computer can also monitor the progress of the independent control of grain rotation, which more precisely monitors the changes in temperature and maintains a uniform feed. For more information contact: Beech Amador, 760-424-9212.
Self-Adjusting Unit Programs Ventilation

Microprocessor-based unit offers a choice between two basic control strategies for operating the ventilation equipment in structures used mainly to produce eggs, hugs, and plants. When set to maintain a constant temperature level, the Director environmental controller responds to outside temperature changes by detecting inside variations as small as 0.2°F and issuing the proper combination of corrective signals to inlet baffles, sidewalk curtains, circulation fans, heating units, and cooling pumps. The controller can also be programmed to orchestrate progressive changes over a given number of days or weeks. When set for this mode, the current [starting] and desired future [ending] values trigger incremental (hourly or daily) changes in air temperature and circulation rate. Aerovent, Fan & Equipment Inc., Lansing, MI (517-323-3930).

Hay-Slashing Knives Shred Massive Bales

Hay packed into square bales, used to transport and buy cattle, must be shredded before giving the cattle. Bales not over 4 x 4 x 4 ft. bales, the feed miller's knives shred the ends of hay bales and then fragment into large chunks as they are rotated. A large capacities hay shredder with built-in hydraulics motors, provides for hydraulically driven by remote hydraulics motors. Shaker miller can be used for transport and buy cattle. Bales not over 4 x 4 x 4 ft. bales, the feed miller's knives shred the ends of hay bales and then fragment into large chunks as they are rotated. A large capacities hay shredder with built-in hydraulics motors, provides for hydraulically driven by remote hydraulics motors. Shaker miller can be used for transport and buy cattle. Bales not over 4 x 4 x 4 ft. bales, the feed miller's knives shred the ends of hay bales and then fragment into large chunks as they are rotated. A large capacities hay shredder with built-in hydraulics motors, provides for hydraulically driven by remote hydraulics motors. Shaker miller can be used for transport and buy cattle. Bales not over 4 x 4 x 4 ft. bales, the feed miller's knives shred the ends of hay bales and then fragment into large chunks as they are rotated. A large capacities hay shredder with built-in hydraulics motors, provides for hydraulically driven by remote hydraulics motors. Shaker miller can be used for transport and buy cattle. Bales not over 4 x 4 x 4 ft. bales, the feed miller's knives shred the ends of hay bales and then fragment into large chunks as they are rotated. A large capacities hay shredder with built-in hydraulics motors, provides for hydraulically driven by remote hydraulics motors. Shaker miller can be used for transport and buy cattle. Bales not over 4 x 4 x 4 ft. bales, the feed miller's knives shred the ends of hay bales and then fragment into large chunks as they are rotated. A large capacities hay shredder with built-in hydraulics motors, provides for hydraulically driven by remote hydraulics motors. Shaker miller can be used for transport and buy cattle.
Multi-Grade Oils Pamper Fleet-Wide Engines

Lubrication oil formulated for the diesel engines of agricultural vehicles is offered in two SAE Grades—10W/30 and 15W/40. Each oil is designated for an API Service Rating of CE/CF. Base oils and special additives for the multi-grade Premiere engine lubricants provide blends said to exceed both European and U.S. requirements for immediate high-temperature/high-shear viscosity and for permanent shear stability. These superior test figures reportedly indicate the oil's ability to maintain its viscosity during extended service, thereby protecting critical parts, minimizing powerplant wear, prolonging engine life, and reducing oil consumption. The two new blends are also claimed to pump like 30W and 40W oils, or one full SAE number lower than conventional 10W/30 and 15W/40 lubricants at low temperatures. Improved fluidity in cold weather is known to lower engine-cranking requirements and to lessen part wear. Another claim for the two grades of Premiere oil is based on the use of friction-reducing additives. That is, extensive tests of the heavy-duty oil in equipment fleets reveal that it can boost fuel economy by up to 4% over straight-grade engine oils. Other additives are blended into the oil to resist foaming, oxidation, carbon build-up, sludge formation, breakdown, and part rust or corrosion. Premiere engine oil is designed for conditions of the upper Midwest (in the USA), reports the Farm Oil Co., St. Paul, MN (612/444-7511).

Map-Data Plots Help Chart Resource Use

Spatial software package called Space/Info extends to personal computers the geospatial information (GIS) capabilities that previously were confined to minicomputers and mainframe units. A space-saving data structure is claimed to be the chief programming advance making it possible for an IBM PC/AT to function as a full-fledged GIS workstation for creating geospatial maps, digitizing various features, populating topologic data, analyzing table attributes, and generating cartographic displays and plots. The software first helps to develop an extensive base of spatial, descriptive, and statistical data. Next, the geospatial data and agricultural information can be integrated through GIS software that automatically creates maps and uses a comprehensive report capture related to future development type, degree of growth, cropping patterns, and other landuse factors. As many as 10 tables of attribute data can be related to each feature at one time, allowing up to 4,000 characters of descriptive data for each map feature. Different types of information also can be superimposed through an overlay function that is used in agricultural planning and natural resource management. Environmental Systems Research Institute Inc., Redlands, CA (817-345-2683).
Conical Valves Preserve Chemical Flows

Three conical inlet valves, an elastomeric diaphragm, and a discharge valve are key elements of pump-head assembly (sketch) developed by the Carr-Griff Div. of SHURflo, Santa Ana, CA (714-554-7709). This positive-displacement apparatus is connected to an eccentric-type wobbling drive that, in turn, is powered by an integral electric motor (picture). Choices of motor types for the assembly include 12, 24, and 36-VDC versions as well as 115 and 230-VAC options. The 4.2-lb motor-driven 9000 series pump can deliver flow rates up to 2 gpm, offer pressures of 0 to 100 psi, and handle fluids as hot as 170°F. Overall motor/pump unit is built to spray chemicals (on a spot or limited basis), transfer liquids, and dispense water. Major design improvements consist of changing from flat to cone-shaped inlet valves, adopting tough Santoprene material for the diaphragm, and incorporating an adjustable pressure shut-off device. The change in valve configuration is said to compensate for the slight swelling experienced by elastomeric valves, and thus preserve consistency in the pump's chemical output.

Stalk-Chopping Rig Reworks Cotton Beds

Multi-function machine accomplishes in one pass the soil/plant manipulations that often require five trips over a cotton field. Developed jointly by industry and university agr engineers in Israel, the uprooter/shredder-mulcher (designated USM) machine plus attachments can perform a conventional system of chopping, loosening, fluffing, and bedding bales. The cotton roots and stalks from two postharvest rows are lifted by two pairs of counter-rotating rubber wheels, chopped by V-shaped conveyors, and delivered to two rows of chain-driven feed rollers. The roller feedstocks are channeled into a draft knife cutting cylinders (all rows), which chop the plant materials into 6 to 12-in. lengths for subsequent disposal. In one machine option, however, the chopped material gets to an automatic loader that, along with two clerks, points and fires the chopped bales to an awaiting field (high-speed, automatic control). The roll and10-15 per cent for lessening soil and root damage, chopped material can also be dropped on the soil surface or blown into a trailer for an additional fuel or fuel. The USM machine has received five patents.

The Agricultural Engineering 1980 113
Rate Checking Unit
Alters Chemical Flow

An adaptive control system for tractor mounted chemical applicators can rapidly change the rate of chemical flow to keep results within desired limits. The system is engineered to work with pumps, motors or other systems that can be controlled by an electronic control element. The field computer programs the system from a start-up menu. Operating parameters and performance settings are entered into the electronic system's nonvolatile memory.

The field computer can automatically adjust the chemical output rate to keep results within specified limits. The system is designed to work with pumps, motors or other systems that can be controlled by an electronic control element. The field computer programs the system from a start-up menu. Operating parameters and performance settings are entered into the electronic system's nonvolatile memory.

When a deviation from the desired application rate is detected, the microprocessor generates appropriate signals to a hydraulic valve that can move from wide open to fully closed in less than 2 s to maintain chemical output. The CCS-100 control system was developed by Dickey John Corp. of Aurora, Ill. (612) 488-9911.

Rechargeable Rig for Remote Lube Jobs

A rechargeable rig developed from a 15-volt, 12-ampere lead-acid battery is used to maintain machine lubrication from a central point. The rig includes an electrical motor and other components that can be changed to serve different needs. It can be used to dispense sprays or oils and operates under various conditions. The rechargeable rig is designed for use in wet or dry conditions and is suitable for use in cold or hot environments.

Power Pack
Hydraulic Coupler
Disposable Cartridge

Pistol Style, Single-handed Grease Control Valve Assembly

High Pressure Hose

Shoulder Strap

Outstanding innovations for 1989.
Row Header Snaps Ears, Chops Stalks

Stalk-chopping attachments enable four and six-row cornheads to shred plant material after the ears of corn have been detached for subsequent processing in Claas combine harvesters. Mounted aft and below a cornhead’s ear-gathering units are sets of hinged diagonal knives that rotate in undershot fashion relative to the combine’s travel direction. By cutting into the cornhead-restrained stalks, the multi-knife flail rotors deliver an aggressive chopping action that sheds all stalks, destroys various pest havens, and spreads the chopped debris. A "Pick-N-Chop" equipped combine thus extracts shelled corn from a field while leaving a residue-covered surface ready for fall plowing or to resist over-wintering soil erosion. Adjustable skid plates determine the stalk-chopping height of flail rotor sections, which are employ springs mounted to "float" independently of the combine chassis. Stalks within the flail rotors are impacted with cross-tied bearing-mounted knives actuated via flexible couplings and powered by engine drives. These severity bolts are rated for high shock loads, tight bends over small pulleys, high speed reductions, and compact overall design. Chopper units can be set for corn rows spaced 26, 30, or 32 in. apart, reports Claas of America Inc., Columbus, IN (812-342-4444).

Field-Coupled Clutch Adjusts Drive Speed

Fitted to AC field torque units, the mechanical clutch control is designed to increase machine productivity by providing operator control of input speed of the AC motor. A unique, field-mounted clutch contains a slip clutch, which is actuated by the drive chain. The clutch speed control can be varied by the operator to suit the field conditions. The clutch provides a means to control the input speed of the AC motor and is designed to prevent the motor from operating "starved" of field drive torque, thus providing a constant and efficient means of control. The clutch is designed to accommodate all types of field conditions and to provide the operator with full control over the input speed of the AC motor. It is a simple, reliable, and effective means of achieving the desired field performance.
PTO Shear Bolt Fits Intersecting Slots

Recessed within the periphery of a flanged tractor yoke is a bolt-type shear device for protecting implement drivelines from overloads. Primary function of the bolt is to join the yoke's input and output members. These facing members with hardened edges also create a shear plane for fracturing the bolt—a protective action that occurs whenever an operating load exceeds the device's rated torque level. Free rotation of the shear-released hub is then allowed via ball bearings incorporated into the so-called "ball shear device," which is available from Weasler Engineering Inc., West Bend, WI (414-338-2161). According to senior staff engineer Roger D. Mayhew, a major objective of product design was to comply with the fastener protrusion/yoke recess stipulations of Paragraph 8.4 within ASAE S318.10, "Safety for Agricultural Equipment." The American Society of Agricultural Engineers issued the latest revision of this important safety standard in April 1988. Weasler's design eliminates protruding elements on its ball shear device by means of right-angle holes. A radial keyhole-shaped port in the yoke flange accepts a nut-type fastener. An axial hole through the hub element admits a 1-in. long threaded bolt. This mating/clamping arrangement for the yoke accommodates standard hardware-size bolts, prevents the use of longer (protruding) bolts, and expels readily the sheared nut so a new one can be installed. Overall ball-shear device is hub mounted on a tractor's power take-off (pto) shaft. The yoke is part of a driveline for transmitting rotational power to the input connection of a stationary implement.

Mulch-Piercing Injector Plants Seed-Bearing Plugs

Pneumatic seed-metering devices and reciprocating plug placement mechanisms are used in vegetable planters developed by Ramah's Sales and Service Inc., North Collins, NY (716-837-3560). Designed for fresh-market production areas, the bed-straddling machines possess several distinctive design features:

* Seed Sprinkler: Vegetable seeds flow against an inclined seed pickup plate. Located inside a metering chamber next to a pressurized seed carrier, the rotating plate aligns seed-filled cells with a presetting port for transfer through a rotating hose.

* Fluidized Material: The particulate material often combined with seed in plug-like modules is carried in a separate hopper. A metering component of the material goes into a hopper beneath which lie a series of mix material suction cups. When the materials are introduced into the hopper, an automatic driving element propels the plug-like module through a series of suction cups. After the plug module emerges, the drive returns to the hopper via a pressurized pipe into the belt of the hopper withdrawal.

* Plunger Drive: Inside the hopper, a plunger that rises and falls to expel the material functions like a tip of a piston and ejects the plug-like module into the field after the hopper withdrawal.

* Source: Seed and mix are supplied to the hopper;

A knack needed to seed planter quickly accommodate a receding, pinging-up plunger chamber to the 4000 units per hour at the planter.
Tough Ceramic Parts Pump Harsh Cleaners

Solid ceramic plungers and spring-loaded inlet valves are combined in portable triplex pumps for high-pressure cleaning and sanitizing applications. Direct driven by electric motors (left) or small gasoline engines (right), the compact and lightweight pump packages eliminate conventional driveline components such as gearboxes, chains, or belts. The line-expanding "SF" series of models weigh only 22 lb, operate at 1,725 and 3,200 rpm in respective electric and gas versions, develop up to 2,500 psi, and deliver outputs of 4.5 gpm, report designers for Cat Pumps Corp., Minneapolis, MN (612-730-5440). The firm has received a total of six patents for such distinctive features as a fluid motion-control provision that improves suction at high speeds, minimize internal cavitation, extend seal life, and lower bolt energy and water consumption. Each Super Flow pump also has a hollow shaft, regulating unloader, and chemical-resistant ceramic plungers. The six-model line of high-performance pumps is said to complement the firm's "SF" units rated for 2 to 3 gpm, 1,200 psi, and 3,600 rpm. The increased speed ratings for these models permit rapid connection to a small gas engine or to an electric motor.

How Air-Blown Plate Meters Hybrid Seed

Relating plate  Seed hopper  Seed pick-up plate

Air jet  Hose to injector  Cell/port alignment

Air Pressure

The Agriculture & Home Improvement Special - 1985
Cow-Cooling Unit Lowers Heat Stress

Multiple nozzles inject atomized water into a turbulent air stream to cool cows in open shaded structures. The system is designed to alleviate heat stress, reduce mortality, and increase production among dairy cows in conditions from desert-like to hot humid climates. Injected water droplets evaporate and cool the air blown over the animals. Some droplets even reach the cows' bodies to provide additional evaporative cooling as air moves over the moist hide. Maximum cooling is achieved by matching the injected water volumes and droplet sizes with the ambient air temperature, relative humidity, and the herd's cooling requirements. This is done by installing five nozzle sets of different sizes in each cow house so that water volume and droplet size can be controlled by selecting any nozzle set — singly or in combination with any or all other sets. A microprocessor-based controller measures wet and dry bulb temperatures, determines which nozzle set or sets to use, and turns on selected valves to give the desired air-water mixture. (Cool-Kern, Mesa, AZ 85202-6641).

Tri-Mode Filter Gives Uniform Irrigation

The tri-mode filter removes solid particles from low-volume irrigation line to prevent clogging, splattering, and soil contamination from plants. The filter applies a consistent flow rate to the soil during any season, ensuring uniformity with high reliability. The filter's body can be rotated to create a tailored water flow pattern. A bypass flow prevents water from escaping at a rate faster than the filter's capacity. It also includes a shut-off valve to stop the flow of water. (Van Seed, Inc., Byt-Lake Village, IL 60033).
Water Pressure Locks Slip-In Fittings

Push-together configuration for the tube ends and couplings of 3-in. diam aluminum pipe permits rapid assembly and disassembly of portable irrigation installations. The new type of fitting can be pressed into irrigation tubing without conventional rolling tools or requiring the hook-and-latch or clamp-type devices often used on portable pipe. When water flows through the assembled pipe, internal components of the female end constrict around a lip on the male fitting to form a tight seal relative to increasing water pressure. The higher the pressure, the tighter the seal. Conversely, shutting off the water relaxes the pressure-activated seal and "locks," enabling the couplings and fittings to be pulled apart without special tools.

Altered Lug Profiles Damp Tire Vibration

Equiangular tapers for lug walls and curved length tread bars are key features of dual-wheel tires built to accommodate an increased use of agricultural tractors on hard-surface roads and streets in demand for smoother riding vehicles. Designed to minimize vibration without compromising traction or tire life, the new buslike HI-Traction Lug RT-3 tires from Armstrong Tire Co., New Haven, CT (203-344-2239) have curved long and short lugs that are spaced closer together than the lugs of earlier tire models. The close lug spacing means more lug-to-lug friction with the pavement, increasing surface at all times, thereby reducing vertical and lateral tractor vibrations in the field and especially on paved surfaces. Curved bars force the dual function of providing good forward traction as well as reducing tire deflection. Overall traction improved slightly with HI-Traction Lugs by alternating the long and short tread bars, making it even more wear-resistant to sidewall and trailing edge. Broad production is in progress on both the new equiangular lugs and rubber.
Plastic-Clad Grain Header Parts Lower Cutterbar Losses

Grain platforms for combine harvesters will operate at a more uniform cutting height when the skid shoes and wear plate are clad with a soil-shedding layer of ultra-high molecular weight polyethylene (UHMW-PE), states an early 1988 patent awarded to T. Dean Rabitsch of Poly Tech Industries Inc., Monticello, GA (404-468-2801). According to cited claims, the soil-shedding plastic layer enables header shoes to glide over the surface, following ground contours and keeping the cutterbar at the proper height. This capability is particularly desirable when harvesting low-lying crops. The plastic-clad skid shoes thus reduce two types of potential build-up problems. For headers equipped with automatic height controls, soil adhering to unclad shoes can cause a unit to rise and miss several inches of crop. Similar build-ups beneath other headers can push soil ahead of the skid shoes, developing a mass that spills into the cutterbar. The sheet-applied UHMW-PE panels overcome these problems by conforming to part contours, offering low coefficients of friction, and providing resistance to abrasion, impact, and corrosion in harsh agricultural conditions.

Soybeans missing deviations in header height are minimized through use of plastic sheets.

Radio Links Extend Controller's Reach

With the tanked system orchestrated with help from radio communication links, a supervisory control computer in Central Control keeps tabs on multiple control functions when a central headquarters. The system, which improves control and monitoring, the use of a 400 MHz tanked radio system. A microprocessor-based control controller, the tanked system orchestrates all channel assignments with help from radio communication links. This capability, plus the system's ability to be extended, makes the system perfect for monitoring all tanked radio systems. The system's capability extends to 10,000 feet, or 2,000 linear feet. In a large installation, this might equate to 100,000 square feet or more. The system, which uses radio communication links, is perfect for monitoring a central headquarters. Control Center, Motorola, Inc., 5620 Research Park Dr., Austin, TX 78756.
PC Bus Card Issues
Step Motor Signals

Complex motions of stepper motors are controlled along one to four independent axes with one bus-size card and a personal computer (PCI). Featuring an on-board proprietary chip, the 13.2-in. long by 4.1-in. wide motor-control card generates the following signals—dual-speed jog inputs, limits (2) and home inputs, moving and trip output, two input ports, and three output ports—to power drivers for motors oriented along each axis. These capabilities are claimed to provide low-cost control with an IBM PC/XT/AT (or compatible) personal computer, squeeze all bus-required elements into one card slot, and simplify the integration of overall systems. Precise electronic control of complex stepper-motor motions is reportedly needed in today's food processing operations, packaging automation machinery, and agricultural robotics. Programmable for step rates in excess of 14,000 sps, the PCMC controller for high speed indexing is a development of Advanced Micro Systems Inc., Hudson, NH (603-862-9447).

Heat-Diffusing Tubes Warm Greenhouse Plants

Thick-wall, corrugated tubing molded from polypropylene transfers to greenhouse vegetation the thermal energy released by an internal flow of hot water. A recommended water temperature of 59°C (138°F) is said to release 1.5 BTU/ft² for heating tray areas, root zones, or above-ground foliage. Developed in Europe and the recipient of two patents, Agroliner ribbed tubing is claimed to have twice as much surface area as smooth-bore tubing and to provide a heat exchange capacity equivalent to that for metal. The 0.04-in. thick tubing is fabricated in 650 and 1,285-ft lengths with provisions for grommet-and-nipple (exploded view below) and threaded-adaptor connections to plastic or metal pipe. According to Drosbourn Agro-Drip Inc., Los Angeles, CA (213-234-1265), the ribbed heat-transfer tubing is more efficient when placed on (rather than buried within) the soil.

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<tr>
<td>40°C/104°F</td>
<td>7 to 22</td>
<td>52</td>
<td>118</td>
<td>7.3</td>
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<tr>
<td>50°C/122°F</td>
<td>7 to 22</td>
<td>44</td>
<td>110</td>
<td>11.7</td>
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<tr>
<td>60°C/140°F</td>
<td>7 to 22</td>
<td>37</td>
<td>103</td>
<td>16.5</td>
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<td>70°C/158°F</td>
<td>7 to 22</td>
<td>29</td>
<td>88</td>
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Rig Converts Waste Oil Into Additive for Diesel Fuel

Mobile blending unit receives spent crankcase oil from diesel-powered vehicles, reclaims the lubricant, and uses it—at rates up to 1-in-20 parts (or 5%)—to fortify “fresh” diesel fuel held in a storage tank. Fuel blended with oil has a higher BTU content and greater lubricity, and does not experience any change in flash point or cetane rating nor does it cause an increase in engine wear, smoke, or emissions, says the Racor Div. of Parker Hannifin Corp., Modesto, CA (209-521-7860). The used oil is drawn from a drain pan or other container, then blended with fuel pumped through a 25-ft hose from the bottom of a fuel storage tank. This mixture is filtered and cycled through a three-stage fuel filter/separator to remove water, dirt, rust, metal particles, sludge and algae from both the oil and stored fuel. The clean, blended fuel is then returned to the storage tank or to a vehicle’s fuel tanks through another 25-ft hose. Fewer vehicle fuel filter element changes and longer pump/injector lives are claimed because the filtration/separation process cleans the fuel before it reaches the vehicle’s tank. The mobile blender cart also can be used in a recycle mode.

Software Link Aids Spectrophotometric Food and Water Studies

Versatile software package (Data Leader) couples a moderate-cost spectrophotometer (DPL-1UVVIS) with an IBM personal computer for analyzing spectral data from food and other agricultural materials. According to the Scientific Instrument Div. of Beckman Instruments Inc., Fullerton, CA (714-571-4848), the system permits both qualitative and quantitative analysis of the color, vitamins, protein, and other nutrient contents in food, bulk produce, structures and minerals; concentration of substances and contaminants; gluten in flour and other materials; water quality; and more. Analytical data can be transferred to the IBM system. Data can be transferred to the IBM system. Data can be transferred to the IBM system. Data can be transferred to the IBM system.
Remote 'Stations' Track H₂O Levels

Remote tensiometers are now fitted with pressure transducers and onboard electronic devices so irrigation managers can "call up" water-suction readings (tensiometric data) via their personal computers. Developed by Irrimerc Co. Inc., Riverside, CA (714-689-1701), the complete system consists of tensiometer/transducer sensors; address modules that collect data from up to eight sensors; and a microprocessor data-collection unit for polling the address modules/sensors and reporting the data. Analog/digital data for actual soil/water-suction readings from any or all sensors are transmitted among system components by cable or infrared telemetry. Infrared links can also be used to report ambient temperature for frost control alerts, and to monitor irrigation reservoir levels as well as pumping plant operations. According to Irrimerc's William H. Pogue, data accuracy is enhanced by temperature compensated transducers having an accuracy of ±0.5% over a range of -40°F to +115°F. The system can also detect the presence of air bubbles or voids in any device, thus avoiding faulty data caused by entrapped air. All of the need to constantly check field instruments. Package dealers to protect components from the environment include a vapor barrier film and a sealer to prevent data losses due to moisture or freezing conditions.

Big Baler Melds 27 Novel Features

They've been out fiddling with the world's largest, most powerful big balers and come up with a list of 27 novel features that they believe will propel the industry forward. Among the innovations: they include an automatic control system to automatically adjust the baler's settings based on changing conditions. They also have a new hydraulic system that provides more power and efficiency. The balers also have a new cab design that provides better visibility for the operator. They have also introduced a new deck system that allows for better distribution of the straw. They have also improved the safety features, including a new safety system to prevent accidents. They have also introduced a new engine system that provides more power and efficiency.
Grain Drill Fields Staggered Openers

Trash-clearing grain drill with adjustable hoe-type openers is built for seeding a 10-ft width in tough stubble or heavy residue. At least 20 in. of fore, aft, and lateral clearance among openers is obtained by mounting the drill’s 17, 12, 10 or 9 openers along three separate ranks. This arrangement provides a phased or staggered array of openers at row spacings of 7, 10, 12 and 13.3 in., while allowing all ranks to be tied together through a common linkage. Only one hydraulic cylinder applies machine-wide down pressure and thus controls the seed-placement depth for all openers. A 29-in. vertical clearance is also provided to facilitate work in minimum-till conditions with 15-in. wide, rigid (or optional spring-loaded) hoe openers and 26-in. diam press wheels. Numerous hopper shovels, and wheel options help adapt 9400 Series machines for grain, fertilizer, and grass seed. John Deere Des Moines Works, Des Moines, IA (515-289-3058).

Hay-Extruding Machines Boast Interchangeable Dies

Circular machine feeds hay, compresses it, then extrudes small packets of material from adult, feed, sawdust, compost materials, and other bindable commodities. Interchangeable dies and the four-pellet feature allow the machinery to produce packets ranging from 0.67-in. diam pellets to 1.25-in. cubes. Otherovel elements of the M160 cubing machine are a bell-mouth support ring with dust relief, an external greasing capability for the presswheel, and a fabricated cast one with only four impeller doors. The machine’s incline tray system consists of a 200-hp electric motor, helical-bevel gear, planetary gear reducer, flexible couplings, 40-in. diam drive shaft, and 445/60 (18)-in. extrusion die. The control system (optional) provides a digital readout of approximate data to extend 600 ft from vertical). Day Inc., by Montana Mfg Inc., of Mandan, ND (207-836-1919), the M160 cubing machine can be incorporated within a larger system for taking in raw materials and shipping out the cubed commodities.
Hybrid Valve Purges Aerial Spray Tanks

A three-port assembly is created by combining into one unit the functional elements of ball and venturi types of valves. The integrated package eliminates hardware elements, simplifies plumbing arrangements, and enhances valve capabilities. According to valve designer George S. Sanders, the unit’s most promising application is for emptying out the chemical tanks, fluid lines, and spray booms aboard agricultural aircraft. The fluid-inducing valve reportedly can purge all chemicals over an aerial job site rather than cause a plane to return to base with residual spray materials. Such wastes must be flushed out and stored for subsequent disposal. When devising the new valve, Sanders first aligned two cone-shaped elements within the overall structure of a two-way ball valve. This venturi-forming arrangement provides inlet and outlet ports, restricts the flow of a primary fluid, and creates at mid-valve a partial vacuum. Ported to the central area is a transverse or right-angle passage that allows a secondary fluid to join, mix, and escape with the primary fluid (Fig. 2). The venturi throat and secondary inlet are housed within a ball-like device, which can be rotated to seal off the transverse port (Fig. 3). The secondary passage leads to crop-spraying booms, lines, and tanks. Slipstream air is the valve’s primary venturi-directed fluid aboard an ag plane. This ram-fed air thus induces the tank-purging flow of chemical materials, reports Sanders. Agrinatics, Las Vegas, NV (702-336-3794).
Modular Drive Offers Lift/Pull Option

One major factory change—a brake for lifting objects versus a clutch for pulling loads—adapts a basic hoist/winch design for two main types of field applications. The 65-lb modular assembly is thus capable of vertical lifting and/or horizontal pulling operations for payloads up to 2,000 lb. An overall assembly can be mounted along horizontal (floor), vertical (wall), or upside down (ceiling) orientations. A sling-and-hook provision is used for attaching a payload to one end of a 50-ft-long wire rope. The cable’s other end wraps around a 3-in. diameter drum. This drum winds up or pays out the wire rope according to drive motions imparted by a helical/worm-gear type of speed reducer. The double-reduction gearbox is powered by a 1.2-hp electric motor that, in turn, is connected to 120-V supply lines. Also connected to the motor via 10 ft of cord is a pendant-type control featuring two momentary contact switches. One button changes the direction of travel; the other button turns the 417 Series hoist winch motor on and off. According to Thern Inc., Winona, MN (507-454-2996), the modular drive features a one-piece cast aluminum housing, water-tight construction, and white epoxy coating.

Carousel Takes Food Through Processes

Multiuse spiral conveyors offer to the food processing capabilities not being related with acute balls. Developed primarily for packaging applications, the spiral conveyors can provide an efficient means of modification or eschaton showers distributed made from engineered plastic components (left). The plastic food-handling curves are intended for the cooling, freezing, rinsing, cleaning, drying, holding, and holding applications that previously may have required a small or large bin. About one fifth the weight of comparable metal design, the plastic conveyors provide up to 65% open area and a low profile for easy accessibility. FDA-compliant for direct food contact, and comply with USDA specifications for cleanliness in place. That is the company’s next challenge: eliminating manual and repetitive handling. In the food industry, the use of continuous material support without multiple changing or effort positioning is crucial. Several potential applications of the belt application include low flow, for fractionation, vibration tests, and powder handling. Developed by KVP Systems Inc., Rancho Cordova, CA (916-268-5121), the unique conveying belt is built from food processing into.

Outstanding innovations for 1988
Turf Coring Machine Alters Hole Spacings

Variable core spacings and working speeds are featured in a riding turf aerator built to supplement walk-behind units. An 18-hp engine teams with a hydrostatic transmission to give the 1,200-lb machine an infinite number of travel speeds from 0 to 6 mph. Hydraulic devices and mechanical linkages also enable an operator to adjust the longitudinal core spacings from 1 to 5 in. during operation. These mechanisms control the reciprocating action of four chain-and-belt-driven rams—each fitted with three hollow tines located 2.5 in. apart. The reciprocating claw-like devices can thus make 11.5 to 57.6 holes/ft² as the tines punch into turf, remove sod plugs, and leave aeration holes across a 30-in. wide swath. Four sizes of tines (3/8, 1/2, 5/8 or 3/4-in. diam) are available for penetrating up to 3.75-in. deep. Developed by OMC Lincoln/Ryan, Lincoln, Nebraska (402-475-9581); the Model OA 30 can aerate from 5,025 to 28,125 ft²/h.

Wall Applied Version

Geosynthetic Filter Fabric

Plastic Drain Strips Cut Site-Related Costs

Wall-hung plastic strips are wrapped with geosynthetic fabric to establish drainage beneath an open foundation to prevent building wall in addition to channeling water away from foundation. The strips can also be installed vertically by cutting and moving gravel to receive them. This arrangement is designed to minimize drainage conditions, reduce gravel's materials, and alleviate potential surface erosion. Plastic sheeting strips for excavations drain have a polystyrene core with 2% antifus and a finished outer layer consisting of woven polyester filter fabric. Water enters the structure via pre-bored perforations throughout the geosynthetic material. A perforated pipe may be added to allow these to be used in cases where not all water may be drained off at any time. Plastic drain strips can't absorb water over a long period. For more information, contact W. Arnot, Arnot Corp., Swall City, CA 93668-7311.
Status-Tracking System Commands Growth-Inducing Equipment

Ten environmental factors and 35 equipment functions are the key input/output values for an integrated system configured to optimize growing conditions within greenhouses, mushroom chambers, and poultry houses. Data from up to 16 condition-revealing sensors are fed to the core of an IBM AT computer, compared with set-point figures, and processed via software. The system responds by issuing up to 31 relay-output signals within a network of actuators for equipment that controls the environmental conditions. Precision Growth Systems, Santa Clara, CA (408-727-0250).

Heat-Sensitive Probe Checks Out Process Materials

Thermocouple probe and digital instrument are combined in an integral design claimed to achieve 1.5% level sensitivity when measuring process temperature under rugged field conditions. Available in both 3G and 9G types with either surface or needle-type probe, the Atkins 300 series unit is rated for -10.0°F to 200°F over a full range of -70°F through 200°F. The surface probe version gets a 2% reading in 1 second on metal surfaces, whereas needle probe models have a 0.4% reading within 5 seconds on liquids such as milk, juice, water, and chemicals. Many critical temperature measurements in process and production operations can also be made of pulp, fruit, vegetable, paper, wood, food and milk products, oil, and equipment or machinery. Unit is powered by a 9V battery able to generate a strong signal from the type J thermocouple, operating as a high-accuracy device with a backlit display, both point-and-shoot-type from -70°F to 300°F. The instrument is battery operated and has a digital display that indicates battery voltage, current, and remaining life. It can be configured with an optional cold proof and battery protection against radio frequency interference and other electrical noise and absence of exposed adjustable parts. Consequently, the calibration-grade thermocouple probe is ideal for external and extending probes to a wide range of processes, machinery, and equipment. Rugged enough to stay in a tool box or three pockets, one-hand operation is enabled by holding the probe into recessed channels along the instrument's side. Atkins Technical Inc., Gainesville, FL (904-378-4455).

Outstanding innovations for 1988
Tough Plastic Tub Helps Tend Animals

Seamless 5.6 ft³ tub is rotationally molded from high-density polyethylene to carry feed, veterinary, and other animal-tending supplies. Mounted on a tubular steel frame with 10-in.-diam rear and 6-in.-diam caster wheels, the 41-in. long by 19-in. wide Chore-Cart can haul, dump or weigh many types of cargo. A battery-operated electronic scale can give the weights for a full load of feed, an entire litter of pigs, and of each pig or each scoop of feed removed from the cart. Agri-Plastics Inc., Goshen, IN (219-533-0497).

Toolbar Tows & Tilts Soil-Finishing Tools

Helical-coil firming elements are mounted ahead of spring-loaded leveling tines along the three-section frame of a soil-finishing rig for seedbed preparation. Built in 10-ft increments for working widths of 30 to 70 ft, the towed cart-like frame is equipped with full-width soil-packaging units formed into 12-in.-diam coils from 15-in.-diam bale stock. An alternative size consists of 11½-in.-diam bales formed into 19½-in.-diam coils. Each 5½-in.-pitch coil gives a packer unit to fit on or under a shaft with tapered rollers through which a towed bar is attached to the toolbar frame for applying the coil. A bolt attaches the frame to a flat, four-wheel tractor from which the coil with harrow sections are suspended by multi-link chains for soil smoothing and seedbed leveling. Sections are offered in feet or fly-in configurations with either straight or turn-bar rollers. All mounting options enable the packer and harrow sections to match their orientation according to field conditions or terrain contours. In addition, the frame's suspension frame can be rotated 90° to an 18-in. height, then lowered in full width or extended to 64½ in. A multi-link chain can be added to the frame to hold down the coil. Soil-cement, compost, till hydrates, and soil structure soils. Precise, narrow, plastic-leaf meter are in use. North Red Wattle Co. Ltd., Yorkton, SK. (306-783-8886).
Universal Structure 'Frames' Vital Life-Controlling Functions

A central management system relies on a personal computer for controlling environmental conditions and operating essential processes within agricultural structures. Embodied in the PMS 2000 system is a universal framework—compatible computer, basic architecture, modular hardware, and expandable software—allowing the system to be adapted for plant and animal production facilities that vary in type, size, number, and sophistication. The framework includes microprocessor-based data-gathering panels, relay control units, motor control units, and many other devices. These are integrated so the system can monitor conditions, sound alarms, issue reports, generate graphs, and control functions according to basic operating parameters and programmed instructions. But an overall shell-like structure can also be customized for specific applications and/or changing situations. For example, relational logic, sensor types, and input modules can be modified according to different plant and animal requirements, and to embrace new production technologies. Systems of this type are now used in applications ranging from highly complex egg-laying facilities to very demanding mushroom-growing operations, report Joseph Baum and Alfred M. Capbell, co-founders of Automated Environments, Inc., Locke, NY (607-658-4812). They say future systems will help to facilitate profit by incorporating animal, plant, and animal production data, with market analysis, optimizing algorithms, and export systems.

Input devices for control types include a proportioner designed for electronic components, decision tables, and a modern direct current motor control system. The PMS 2000 system can be operated from a single source computer, offering a complete control unit before a worker