PROGRESS REPORT ON FREEMAN 1500 BIG BALER & ROADSIDER
PROBLEMS, SOLUTIONS & MACHINES

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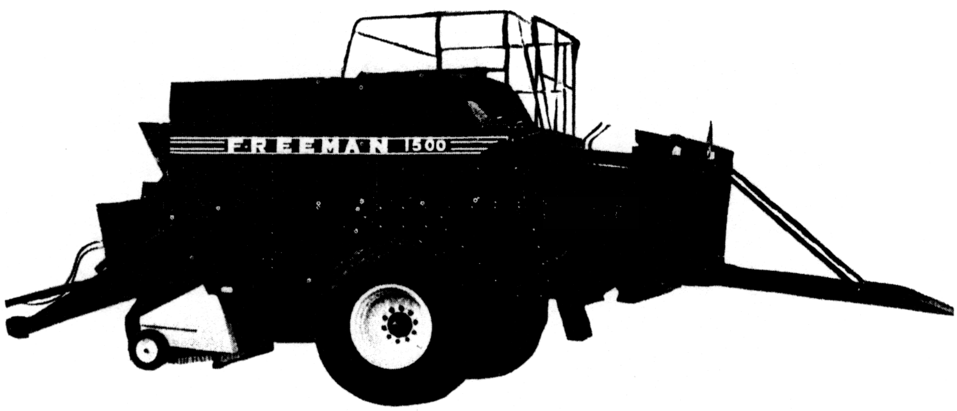
The autumn colors were resplendent, the fall rains more chilly and persistent than normal, as decision time arrived at the Freeman offices in Portland, Oregon. All throughout the preceding months there had been on-going efforts in this country and in Europe to evaluate the market potential and design criterial of a big baler. The farm machinery business was in the process of falling out of bed, interest rates were sky high and climbing, additionally economic forcasters had begun using the term depression in their dour sounding discussions of the subject. The future, as they say, was rather cloudy. None the less, hoping to be accused of great foresight in the years ahead, the decision was made to go ahead with it, to start the trip down what, we knew, was going to be a very expensive road toward what we hope will be a new and successful product. Project #79 thus came into being that October and three years later on October 31, 1983, Project #80-1500, the first production machine, was completed.



In retrospect, it seems almost like yesterday that this project began. Our first order of business then, was to set out the design criteria. What did we want the baler to do, how did we want it to do it, and finally, what should it look like? These are the criteria that evolved: A. That the machine should be energy efficient; B. That the bale should be of the highest quality in all crops; C. That the bale be sized to be as flexible as possible to accommodate the needs of the grower, the hauler, and the buyer for both storage and feeding purposes; D. That the machine be simple to operate, as productive as possible and as safe to work with as we knew how to make it; E. That it be durable and as wear free as possible and finally; F. That all the above be done profitably.

In order to fulfill these criteria, numerous decisions had to be made on how to drive the machine, on how big to make the bales, what to tie them with, as well as how the baler was to be fed. Was a tension control system needed, and, if so, what kind? Could we use wire to tie the bales? While many of these questions may seem simple, their answers often amounted to a design commitment that would have to be lived with for years, headaches and all.

To start with, after looking at the many options, it was decided that we would use a hydraulic system to drive the machine and it's subsystems. This gave us complete control of the bale building process, and, because the plunger could be made to move only when we wanted it to, energy could be conserved while better control could be achieved in building the bale. By a novel adaptation, a hydrostatic pump was paired to a regenerative circuit. This produced a controllable plunger and high hydraulic pressures, up to 5000psi allowing the use of components that were economically feasible as well as of such size to fit into the machine design. With an electrical displacement control, the squashplate in the hydrostatic pump could be used to finitely start and stop the plunger. By moving the squashplate from its neutral position to it's full open position, starting the plunger from zero to full speed smoothly was possible; and, from it full open position, moving the squashplate to its rest position would bring the plunger to a smooth stop. An added benefit was that the oil flow, when the squashplate was in neutral or at rest, stopped. The oil,at rest in the reservoir, cools rather than heats. Contaminant and entrain air, with the oil at rest, could more readly separate out for better oil integrity.

The regenerative, or rod displacement, circuit would enable the plunger to speed to and from its mission of compressing hay or straw and, upon reaching the material to be compressed, the plunger system pressure would increase to a fixed level, about 2000psi; a pilot operated valve would be shifted; and 80gpm from the rod side of the cylinder would be rerouted, unpressurized,back to the hydrostatic pump resulting in 80gpm on the piston side of the cylinder at between 2000psi and 5000psi acting on the piston surface pushing the plunger. A plunger force of up to 40 tons would be obtained and it could be stroked as often as 30spm.

Next, power was to be delivered to the hydrostatic pump through a PTO drive line coupled to a 450lb flywheel. Tractor power ranging from 120hp to 180hp was to be recommended. Four other pumps were to be used to operate respectively the pickup and feeder systems, the tension system, the knotter system, and the knotter lubrication system. The bale quality was to be assured by having sensors located atop the chamber, on both the right and left sides. Both sensors would have to make before the plunger stroked. The hay or straw would have to build up in the chamber enough to apply pressure on the sensors on top of the chamber to actuate and signal the plunger to stroke. While the chamber was filling, the plunger would remain at rest. Thus, each bale would be dense and fully packed, every time.

Wire proved unsuitable for this application so 300lb plastic twine was chosen to tie the bales. The 1500, as our big baler was to be know, would use six knotters and they would be driven hydraulically. Each knotter was to be equipped with an electronic sensor that would monitor every knotting sequence and sound an alarm should a miss occur, should the twine hang and not strip off the billhook, or should the knotter run out of twine. The luber pump would automatically lub each zerk on every knotter on every tying cycle, assuring maximum life and reliable operation of all the knotters. The pickup would be raised for road travel, and lowered for field work hydraulically, indeed it would be driven hydraulically. Should the pickup become clogged from overfeeding, the operator would simply reverse it, promptly unclogging the pickup without leaving the tractor seat. The bale tension would be controlled by the plunger. That's right, the plunger would control the bale tension through an ajustable valve which would dump tension pressure when the plunger reached an ajustable preset value. The bale weight and density, with this system, would remain consistent and would be maintained; every stroke insuring a bale of excellent quality, everytime.

And finally, all the motions needed to produce a bale, repeatedly and reliably, required a control device to synchronize those motions. The feeder, plunger and knotter system timing chores would be taken care of by an electronic panel which among other things, would prevent the plunger from advancing if the needle rack was not in home position, protecting the needles and the needle rack.

As you can see, building a new machine, with these and other innovative ideas, is a challenging task. In overcoming some of the difficult obstacles and problems encountered in developing the first hydraulically operated field baler, four different patent applica tions have been submitted to the U. S. patent office. The Twine Knotter Miss Sensor and the Automatic Twine Tension Control wi be available on our Model 330 and Model 200 balers to enhance their performance.

Did all the ideas and features described actually work? Did any of them end up on the production model? Yes, after hundreds of hours of field work in Oregon, Idaho, and California all those features and ideas described are a part the Freeman Model 1500. Along the way, we also developed a list of ideas and features that didn't work, but that's another story for another time. The Model 1500 weighs 18,5001bs, is 10ft wide and carries 90gals of hydraulic oil in the reservoir system. Two twine boxes carry 18 boxes of twine and access to the knotters is provided by a permanently mounted ladder located on the left side of the baler. A movable ladder is also provided for access to other service areas making the 1500 one of the easiest machines of its size to service. How big is the bale? The bale is four feet wide, eight feet long and thirty eight inches high. The bale length is ajustable and the bale is sized to load three high on hay trucks for maximum loading with hay and straw.

Having treated the bale quality, the bale size, and the energy conservation issues with the 1500 baler there remains one more major problem to be dealt with in terms of productivity, of labor expense, and of efficiency. That major problem is for all to see in the field after all those big balers have gone by leaving in their wake all those big bales. If the hay field is small, the bales are just inconvenient to move off the field to the stack yard. If, however, the field is large enough, and there are many fields and many big balers, the bale removal project becomes a big mess. The Freeman Big Bale Stacker was designed to treat that problem. With power steering, power brakes, an automatic transmission and a diesel engine the Big Bale Stacker hauls 6 Hesston bales or 8 Freeman bales quickly and dependably; moving more tons per hour than conventional stackers hauling conventional bales. How can it do that you ask? The Big Bale Stacker picks up 6 or 8 big bales about as quickly as a regular stacker picks up 6 or 8 regular bales, the difference being that the Big Bale Stacker, with 6 or 8 big bales, is loaded and on its way to the stack yard while the regular stacker needs 50 plus more bales before turning for the stack yard. The productivity increase over a crew using a front loader is tremendous. Indeed one man can run the baler then, after baling, run the stacker. Because there are fewer bales per acre to pick up with a big baler, they can weigh 1500lb each; and , because it takes only 6 or 8 bales to make a load on the stacker, roadsiding time is greatly reduced, labor efficiency is increased dramatically, and the fields are cleared of bales in a much more timely manner so watering can start. Both the Freeman Model 1500 and the Freeman Heavy Bale Stacker are now on the market. Ask your Freeman Dealer for price and delivery information.