

Minster Presses keep lamination supply flowing at new Westinghouse Hermetic Motor Plant

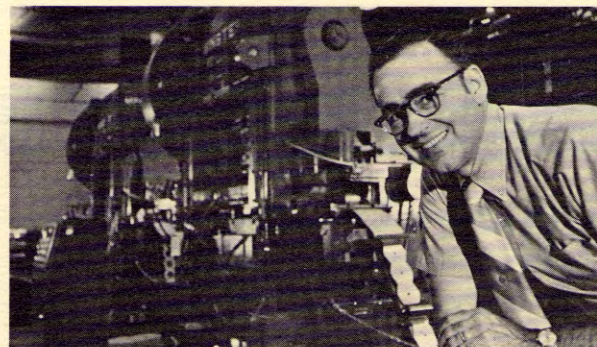
**2,000,000 PIECES PER 16 HR. DAY
IS PRODUCTION CAPABILITY.**

The hermetic motor is possibly the most critical part of refrigeration equipment and quality is an absolute "must." However, in a competitive business, productivity, or mass-production at lowest possible cost, is also essential. Combining the two ingredients was the task assigned in August 1967 to Mr. Ray Bernacchi, Manager, Manufacturing Planning for the new hermetic motor plant built by Westinghouse Electric Corporation, Small Motor Division in Athens, Tennessee. The result is the most advanced facility of its type in the world. A shining example of "planning for productivity," the plant went into operation on January 2, 1970.

Although following a basic size and design, the motors must meet several customer variations such as shaft hole size, slotting depth and configuration, mounting holes, leads etc. The product of this plant consists of the stator assembly, wound, with end turns laced and leads attached, and the die cast rotor assembly. Over forty different combinations are being made.

The many "firsts" in motor production technology which Mr. Bernacchi and his staff designed into this highly automated plant have resulted in significant labor and material savings. Since the laminations are so vitally im-

portant, let's put the spotlight on production methods and equipment used.



Mr. Ray Bernacchi, Manager of Manufacturing Planning for the Athens plant.

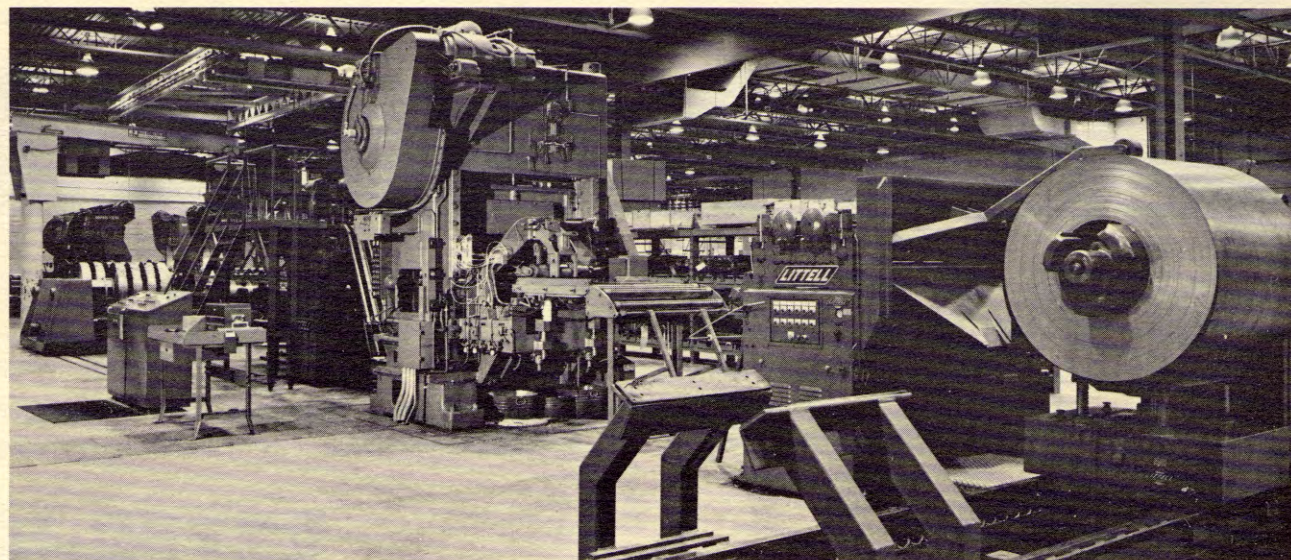
SCROLL SLITTING REDUCES MATERIAL WASTE

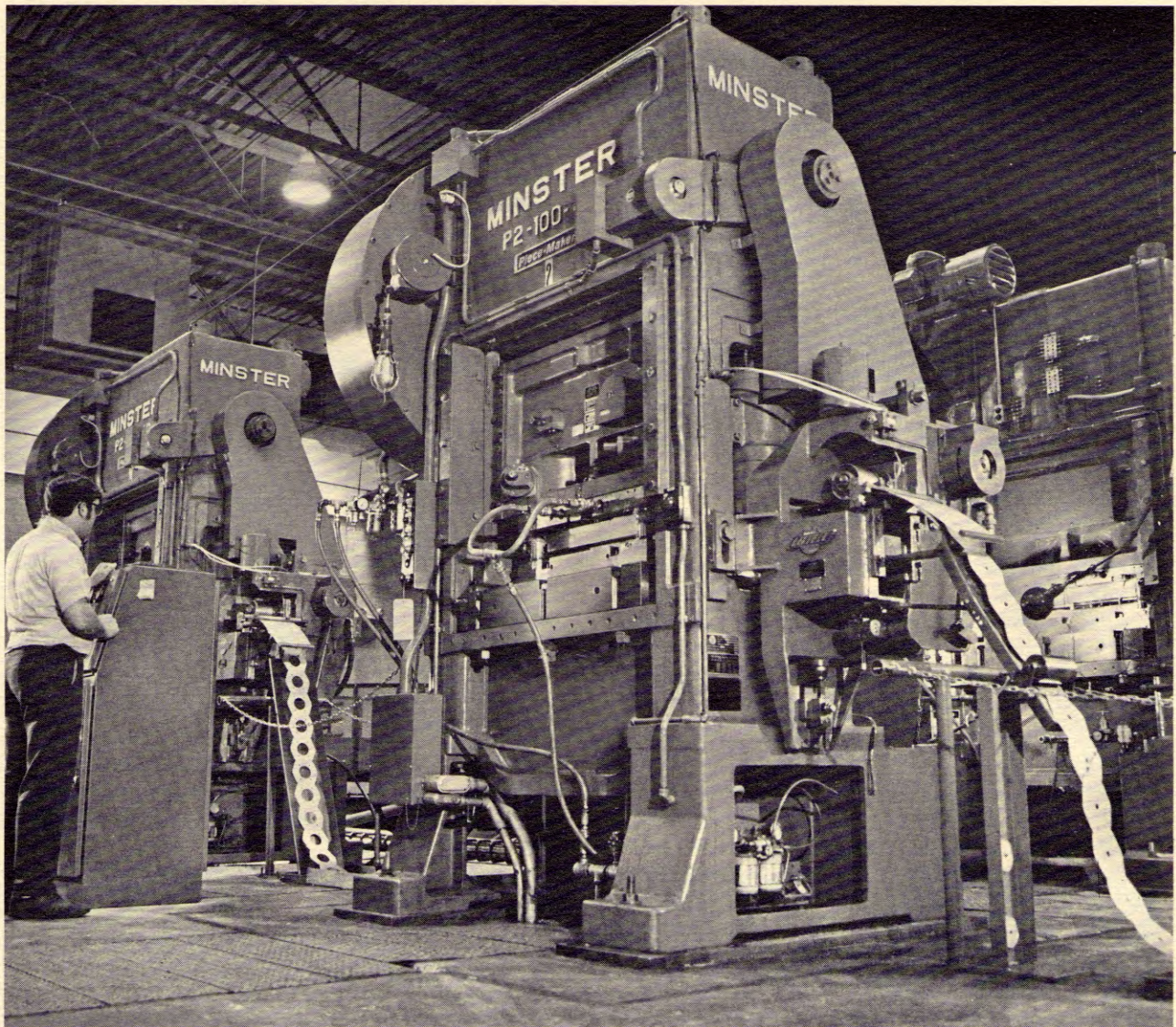
Westinghouse estimates that it saves approximately \$800 per day in material through the use of scroll slitting of coil stock. That pays for a scroll slitting line pretty quickly, since it adds up to \$200,000 on a 250 day work-year.

Cold rolled, low carbon steel used here has a nominal thickness of .018" or .0225". Coils weighing from 15,000 to 20,000 lbs. are 44³/₈" wide. An interlocking pattern is used to get nine coils from one big coil, with the outer shape of the lamination cut. (Straight edge slitting would yield only eight coils.) Scrap is held to an absolute minimum (see diagram on cover).

MASTER AND SLAVE

A 200 ton Minster Piece-Maker[®] lamination press is the "master" and the de-reeler, straightener, tension stand and re-reeler are "slave" to its speed and control. The press has a 2" stroke, and punches 4.8" of stock per stroke at a speed of 200 spm using one of three different carbide scroll dies.





Tandem press lines feature rotor press and stator press acting in unison to produce 31,000 laminations an hour.

AUTOMATED LAMINATION PRODUCTION ON TANDEM PRESS LINES

At present the Westinghouse plant has four tandem press lines. Each line consists of a double automatic centering reel, a 17-roll straightener and two Minster 100 ton P2 Piece-Maker lamination presses, each equipped with a roller gear feed.

Scroll cut stock leaving the straightener is fed into the first press which completes the rotor shaft hole, punching and slotting progressions and blanks the perimeter. The finished rotor lamination is pushed through the die and drops into a chute.

The material strip, now less the rotor lamination, drops to form a pre-determined loop and runs back up and is fed into the second press in the line. Here, holes and slots are punched and the remaining perimeter of the stator lamination is blanked by progressive die and pushed through, into a chute. Two operators handle the entire press complex from scroll line, through four

tandem lines and manual loading of parts onto conveyors.

SYNCHRONIZED PRESS SPEEDS

Since the presses run in tandem, their speeds are synchronized. The Minster Centralized Electrical Control Console has a logic system which reads the tachometer generator voltage off the "master" (rotor) press and forces the "slave" (stator) press to match it, thus synchronizing the speed of both machines. Normal variation in speed, as measured by a digital read-out, is less than \pm one stroke. However, safety circuits stop the entire line if a differential of six strokes should occur. The presses have a synchronized pre-set starting speed from which they automatically return to normal continuous production speed of 260 spm.

All drive, clutch stroking controls, die and strip protective circuits for both machines to run in tandem, as well as controls for operating each individual machine for die-setting or checking, are also contained in the centralized console.

VERSATILE CARBIDE DIES

The carbide progressive dies used for lamination production at Westinghouse are designed so that several die section changes can be made in stator and rotor specifications to meet customer variations. Cams in the dies allow changes to be made quickly without removing the dies from the press. As many as four changes in the stator and five in the rotor, may be made. Use of tandem press arrangement increases the versatility of these costly dies. Westinghouse schedules all lamination dies for grind after one million parts and feel that this gives them maximum die life since only .002" to .003" is removed per grind.

PRESSES DESIGNED FOR LAMINATION WORK

Minster designed its Piece-Maker Lamination press specifically for this type of stamping. To provide the degree of accuracy needed for high speed, precision progressive die blanking and punching, Minster builds the P2 Lamination press with even closer clearances than standard Piece-Maker presses. The extremely close fits of bearing and slide guiding surfaces, plus the very good slide to bed alignment and rigidity of the frame makes the press ideal for lamination work.

The slide has a "no-clearance" adjusting screw lock-up arrangement. Secondary combination worm gear-nuts are used to pull and lock all thread clearances out of the press connection screws.

Another special feature of these presses is the Minster Die-Flote® or floating arrangement in bed and bolster for easy positioning of bolster and dies.

ROLLER CAM FEED ASSURES ACCURACY

A roller cam feed with complete rotary motion and a positive, single roll feed drive fixes the feed length on these Minster presses. It can be arranged for 4.200" to 10.4" feed length and holds feeding accuracy at $\pm .003$ " at 1500" per minute feed rate. Note—The guaranteed accuracy takes into account material variation and flatness. Most times the feed is capable of producing a feed length accuracy less than 0.001".

AUTOMATIC PARTS HANDLING

Manual handling of laminations is virtually eliminated in this plant and there is a noticeable absence of fork lift trucks. Rotor and stator laminations leave the presses in chutes which come down from the press bolster, under the press bed and across the floor in back of each tandem press line. The chutes are side by side at the end of the stator press, then curve around and raise to a level near that of the chute at the press blank-thru station. The weight of the laminations force them to seek their own level and flow up the inclined chute area to an unloading station.

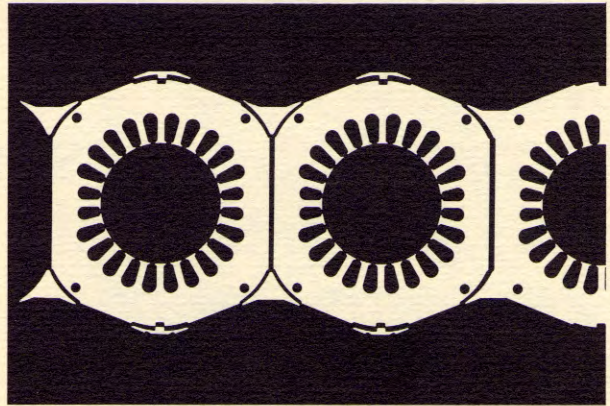
Laminations are manually loaded on racks which are then carried on a merry-go-round conveyor to a shunting point where they are conveyed to the annealing ovens.

Scrap from the press operations drops into under-floor vibrating conveyors which carry it to a central point and up into an elevated hopper above a rail spur outside the building. When a car is placed in position, this is indicated on a control console near the scroll press. The press operator fills the car to weight by automatic controls without visual contact.



View from back side of a tandem press line shows how laminations flow through chutes from presses to unloading station.

Stator perimeter scrap loss is held to a minimum by use of interlocking scroll pattern.



KEY CONSIDERATIONS IN SELECTING MINSTER PRESSES

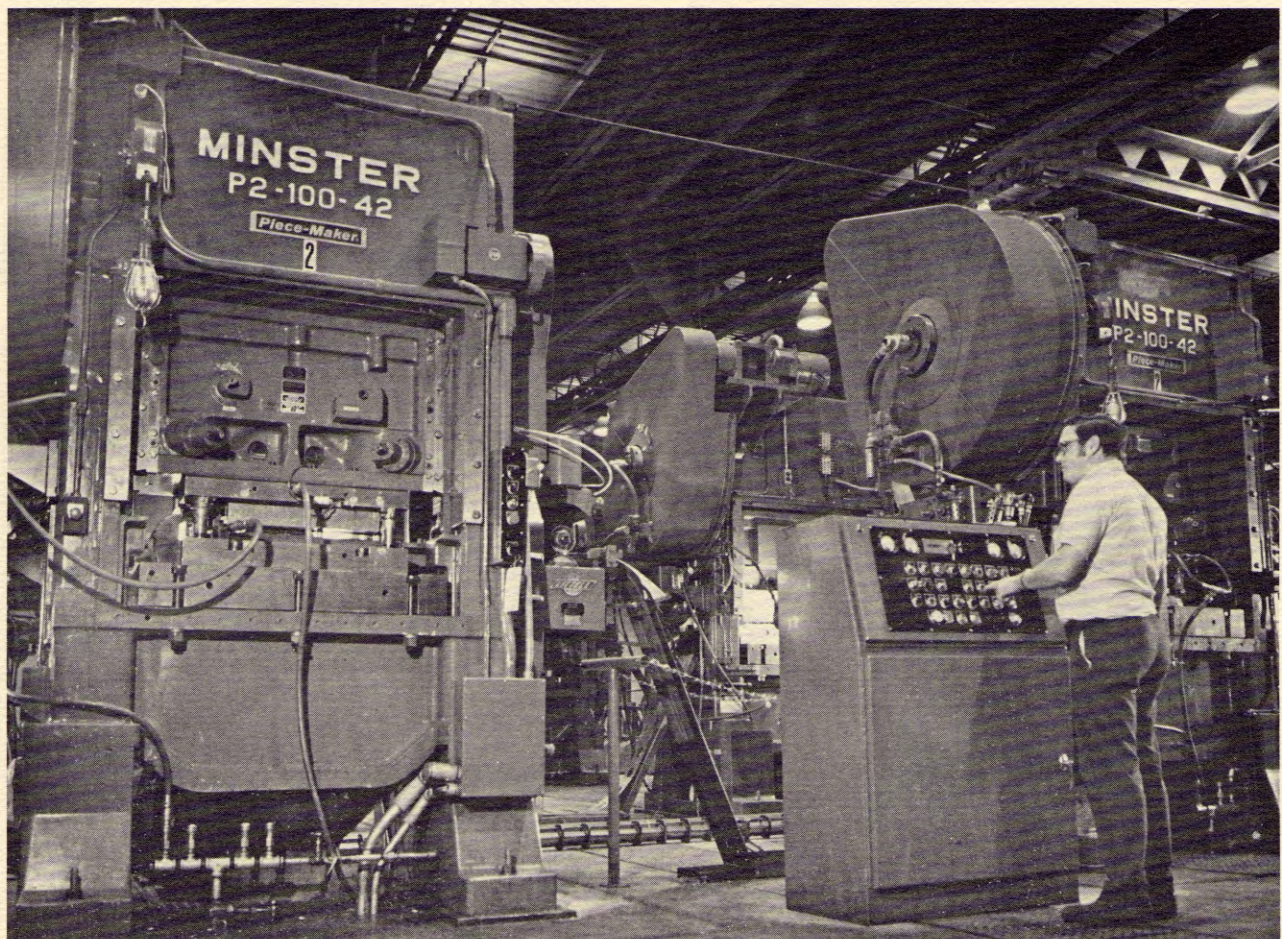
Due to a desire to standardize on one brand of press equipment for the plant, a careful analysis of available equipment was made and competitive proposals secured.

Comparisons were made on a number of key points. Minster rated high in past press performance in other Westinghouse motor plants where maintenance was low and retention of precision was good. Minster also rated high in overall quality of machine design and construction. Minster's record of field service back-up and their ability to work closely with Westinghouse and other suppliers in pre-installation system try-out were also reasons why Minster Piece-Maker Lamination presses were selected.

PEOPLE MAKE THE DIFFERENCE

The finest facilities are worth little without the interest, ability and initiative of the people who use them. Westinghouse is proud of the men and women who work in the Athens, Tennessee plant. All have responded well to the training programs and they take pride in their work and the quality of their product.

The plant has been designed for productivity and it is a fine place to work. It is spacious, brightly lighted, color-coded by department and scrupulously clean. The entire operation is a tribute to Westinghouse management and to Ray Bernacchi and his associates.



Minster Centralized Press Control Console contains all operating controls and speed synchronization system for a tandem line.