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A Survey of Labor Requirements in Six Texas Turkey Processing Plants

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CONTENTS

DIGEST

A survey was made during 1953 by the Texas Agricultural Experiment Station in six Texas turkey processing plants to determine the factors which influence labor efficiency. A small farm-dressing plant was included to show the differences in efficiency between small and large processing plants. These plants are referred to as plants A through F.

In the commercial plants the man-hours required to dress, eviscerate, package and pack 100 turkey hens varied from 15.7 man-hours in plant D to 26.6 in plant C. The time required to process 100 turkey toms varied from 20.9 man-hours in plant D to 38.4 in plant C.

Three plants used sub-scald temperatures, 138° F. to 140° F. for 30 to 75 seconds; one plant used semi-scald temperatures, 123° F. to 128° F. for 30 to 75 seconds; and another operated the scalder at 131° F. Because of the different scalding temperatures used in the several plants, the greatest variation in dressing efficiency occurred in the pinning job. Plant A, which used water at 131° F., and plant C, which used water at 126° F., required 15 and 22 pinners, respectively, as compared with 6 pinners required in plant D, 11 in B and 14 in E, where sub-scald temperatures were used.

The labor and equipment saved by sub-scalding (even though it may not be as desirable as semi-scalding) was enough to offset other advantages claimed for semi-scalding.

Some processors reduced labor requirements on manually-operated line pickers but this required more help for pinning than would be used to operate line pickers.

Plants A and E changed the position of the carcass on the shackle twice during the dressing operation, plant C once and in plants B and D it was not necessary to reverse the carcass. At least one additional worker was required each time the carcass was reversed. Three plants had separate eviscerating lines which required two extra men to remove the carcass from the dressing shackle and hang it on the eviscerating shackle. The use of the same line for both dressing and evisceration was a labor-saving procedure since the carcass did not have to be removed from the line between these operations and complete synchronization was achieved between the dressing and eviscerating lines.

Plant F dressed 5 hens or 4 toms per man-hour while plant D, the most efficient in dressing, processed 31.9 hens or 21.3 toms per man-hour.

The greatest variation in the methods used was in the eviscerating operation. During this operation, the position of the carcass was changed several times so that employees could work at maximum efficiency. In four plants, one man doubled back the neck and placed it in the shackle so that the body was in a horizontal position for easy removal of the viscera. In the fifth plant, the carcass came from the dressing operation hanging by the neck. One man placed the shanks in the preceding shackle so that the head and neck were fastened to one shackle and the shanks to another. In two plants, the neck and head were removed from the shackle, still attached to the carcass, and cut off at a later stage of the operation.

In plants with separate dressing and eviscerating lines, the most satisfactory method of shank removal appeared to be the use of a table with a knife bolted on one end and operated by foot power. Processors also might consider the use of small pruning shears so designed that necks and shanks can be cut off with one hand. This leaves the other hand free to hold the carcass while cutting.

The use of a gizzard skinner increased efficiency. In the most efficient plant using a gizzard skinner, 0.7 man-hour per 100 hens was required. In the plant without a gizzard skinner 2.8 man-hours were required.

Plant F eviscerated 5 hens or 3 toms per man-hour while plant D eviscerated 14 hens or 9 toms per man-hour.

The transfer operation between eviscerating and packaging gave processors some flexibility in the workers required for packaging and packing. The packaging and packing do not have to proceed at all times, at the same rate as the dressing and eviscerating lines.

Vertical trussing with a triangular parchment paper diaper-wrap around the hocks--fastened to the tailhead by a rubber band--appeared to be the fastest and most sanitary method of trussing. Chilled carcasses were harder to truss because the joints had become stiff.

Chilling with ice and water rather than with crushed ice eliminated most discoloration of carcasses. This was especially true in plants using sub-scalding.

Pallets reduced the number of men required to handle chill vats.

Overhead conveyor systems appeared to be the best method for draining water from chilled carcasses. The movement of these carcasses on the line helped to remove the water and also set a pace for the packaging and packing operations. The use of a compressed air hose with a nozzle to remove water from the body cavity appeared to have some possibilities.

In bagging, the most efficient procedure was to have one worker insert the carcass into the bag without using a funnel or chute. The use of an automatic shrinker eliminated one worker from the line.

One of the problems facing plants processing both chickens and turkeys was that of finding work for all their help during the time turkeys were being processed.

A SURVEY OF LABOR REQUIREMENTS IN SIX TEXAS TURKEY PROCESSING PLANTS

*G. J. Mountney and F. A. Gardner**

Texas turkeys have been dressed in processing plants since about 1900. Not much change in dressing methods occurred until after World War II when consumers began to demand ready-to-cook poultry. Texas processors were among the first to respond. Many plants had to be remodeled so that packaging and eviscerating operations could be added. Changes often were made by trial and error. Some operators had to make changes in accordance with the size and shape of buildings already constructed andold equipment already in use. In some cases failure to accept newer methods has resulted in higher processing costs.

New processing methods developed shortly after the change to ready-to-cook poultry. One of these, sub-scalding, was made possible because ready-to-cook turkeys could be packaged and sealed. Many processors began to scald turkeys at temperatures around 138° F. (sub-scalding) instead of the usual 128° F. (semi-scalding). The wrapping material substituted for the outer layer of skin which the higher scalding temperature removed. Some processors still using semi-scalding have built special equipment to scald the necks and hocks of the turkeys at higher temperatures.

During the 1953 turkey matketing season a survey was conducted in six Texas turkey processing plants to determine the methods used in processing Texas turkeys. These plants are referred to as plants A through F. Various jobs performed in the plants are listed and described. Areas in which further detailed study is needed are pointed out. Some of the factors influencing labor efficiency are discussed. Labor requirements for each job have been computed for use as standards with which other processing plants can compare the efficiency of their own operations.

Plant activities were broken down into four categories--dressing, eviscerating, packaging and packing. For purposes of comparison, each operation was further divided into various jobs. The labor factors were reduced to man-hours required per 100 bronze hen and tom turkeys, respectively.

One small farm processing plant (plant F) was included in the survey to show the difference in efficiency between a small farm plant and a large commercial operation. It is discussed separately. All other plants included in this study were large operations handling from 180 to 574 turkeys per hour.

All plants except plant F had an overhead conveyor system. In each of the plants with overhead conveyor systems the time required for seven shackles (six shackle spaces) to pass a given point on the conveyor was determined by a stopwatch. At least three stopwatch readings were taken. The average of three readings was used as the speed of the line. Readings were repeated in each plant on two days. The number of carcasses removed from the line at the end of the dressing and eviscerating operations was also counted. The speed of the line in birds per hour was calculated from this information.

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Table 1 shows the number of workers employed by each plant in each of the four operations. Only those employees directly contributing to the processing of the turkeys were included. Personnel such as plant managers, foremen, USDA graders and veterinary inspectors, maintenance and clean-up men were classed as not directly contributing to the processing operation.

It is recognized that such variables as the competence of available personnel, both labor and supervisory, equipment used, procurement policy, live and dressed quality of the birds being processed and other factors affect labor efficiency. Insofar as possible, these variables were recognized in measuring labor efficiency.

Table 1. Total workers employed in each plant for each operation

Operation	Plant A	B	C	D	E	F
Dressing	30	21	28	18	23	4 1/
Evisceration	42	47	31	41	44	4
Packaging	10	13	7	12.5	13	
Packing	6	6	10	12	16	
Total	88	87	76	83.5	96	8

1/ Three men required when dressing toms.

Table 2 lists the labor requirements for each operation in each of the six plants. Man-hours used to dress, eviscerate, package and pack 100 turkey hens varied from 15.7 man-hours in plant D to 26.6 man-hours in plant C. The time used to process 100 turkey toms varied from 20.9 man-hours in plant D to 38.4 man-hours in plant C. More hens than toms were processed per hour because it was easier to remove their feathers and viscera.

Table 2. Man-hours required per 100 turkeys processed in six turkey processing plants

Operation	Plant A	B	C	D	E	F
			Hens			
Dressing	7.21	5.07	10.37	3.13	6.25	20.00
Evisceration	10.09	11.35	11.48	7.14	11.96	20.00
Packaging		4.59	1.94	2.78	4.71	No packaging
Packing		2.12	2.78	2.67	1.76	No packing
Total		23.13	26.57	15.72	24.68	
			Toms			
Dressing	7.21	5.07	15.56	4.70	6.25	25.00
Evisceration	10.10	11.35	17.22	10.70	11.96	33.33
Packaging			2.33	2.78	4.71	No packaging
Packing			3.33	2.67	3.41	No packing
Total			38.44	20.85	26.33	

DRESSING

The dressing operation included catching, hanging, killing, picking, pinning and other jobs but did not include the opening of the body cavity or the removal of the shanks.

Catching and Hanging

Catching the live turkeys to be hung on the shackles required two men in plant A, one man in plants B, D and E, and the equivalent of half a man in plant C. A special chute had been constructed in plant C, making it possible for one man to do the catching and hanging, Figure 1. However, plant C still was not the most efficient because its operating speed (180 toms or 270 hens per hour) was considerably lower than that of the other plants.

Table 3. Productivity of six turkey processing plants, dressing

	Plant					
	A	B	C	D	E	F
	Toms					
Operating speed, toms per hour	416	414	180	383	368	12
Toms dressed per man-hour	13.9	19.7	6.4	21.3	16.0	4.0
Scalding temperature used	131°F.	138°F.	126°F.	138°F.	138°F.	140°F.
	Hens					
Operating speed, hens per hour	416	414	270	574	368	20
Hens dressed per man-hour	13.9	19.7	9.6	31.9	16.0	5.0
Scalding temperature used	131°F.	138°F.	126°F.	138°F.	138°F.	140°F.

Plant A required the most workers in the jobs of catching and hanging because, in addition to hanging turkeys in the shackles, the men opened, emptied and removed the crates from the hanging area, Figure 2. Other employees brought the loaded crates to the killing line and loaded the emptied crates back on the truck. Greater speed in this job might have been achieved by using roller bearing conveyors to handle the crates. This method of operation is the most efficient, but procurement problems often made it difficult for other plants to adopt it. For this reason most plants kept their turkeys in pens before slaughter.

In plants B, C and D, the turkeys were removed from the crates upon delivery to the plant, and placed in pens. The turkeys were driven up a ramp into a catching pen alongside the line where they were caught easily and hung in the shackles. In plant E, the turkeys were placed in wooden batteries. The batteries were then rolled to the killing line and the turkeys removed and hung on shackles. Moving the turkeys in and out of batteries increased the chances for bruising them.

In some plants men were not busy all of the time between shackling; however, a certain flexibility had to be provided in case a turkey struggled or was hard to catch. Four plants used spring shackles and one plant used rigid grip combination chicken-turkey shackles. Three plants could not automatically alter the line speed; two plants could, but did not. The number of birds dressed per hour was altered by skipping shackles rather than by changing the speed of the line. Most processors believed that skipping shackles did not interrupt plant activity as much as changing the line speed. In several plants the number of birds dressed per hour was limited by the operating capacity of the eviscerating line.

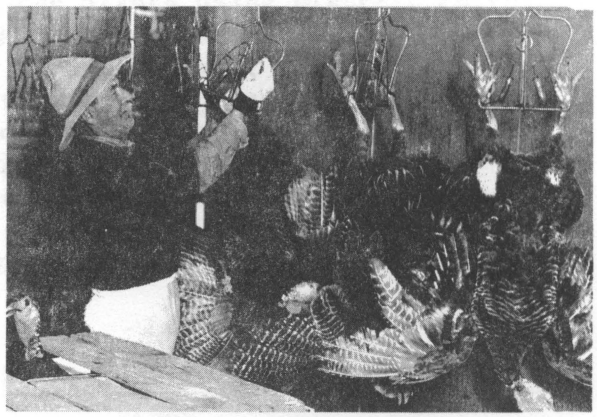

Figure 1. Method of catching and hanging turkeys in plant C.

Figure 2. In plant A, turkeys were caught and shackled directly from the crates.

Figure 3. Labor requirements for pinning are higher with semi-scald temperatures than with sub-scald temperatures.

Killing

Two of the plants, C and D, used electric killing knives. Of the three plants using a conventional sticking knife, all cut the jugular vein, but only two of these pierced the brain. In the plants using electric knives, the death struggle of the birds was almost eliminated and the current relaxed the birds' muscles, facilitating the removal of wing and tail feathers. The plant which only severed the jugular vein had difficulty with toms because the birds struggled when stuck and sometimes dropped out of the shackles. During the agonal period, many birds splashed blood over their wing and tail feathers. The blood destroyed the salvage value of the feathers.

Plant A used two men for killing, the other four plants used only one man each.

Table 4. Dressing equipment used by five processing plants

	Plant				
	A	B	C	D	E
Killing knife	Sticking	Sticking	Electric	Electric	Sticking
Tank scalder	16'	16'	20'	16'	20'
Scalders	neck and hock	none	neck and hock	none	none
Number of roughers	1	1	2	2	2
Number of line pickers					
Single units		1	1	3	1
Double units	1	1			
Wing stripper	yes	yes	yes	yes	no
Number of washers					
Rubber finger type	2		1		
Spray type		2		2	none

Dry Feather Removal

Plants B, C and D removed and saved dry wing and tail feathers and plant E saved only the dry tail feathers. Plant E removed the wet wing feathers after scalding. In plant A, neither wing nor tail feathers were removed before scalding. Labor required for feather removal varied from one man in plant C to three in plant D. The salvage value of the feathers helped to pay the wages of the workers who removed them.

Scalding

Three plants used sub-scald temperatures (138° F. to 140° F. for 30 to 75 seconds); one plant used semi-scald temperatures (123° F. to 128° F. for 30 to 75 seconds); and another operated its scalder at 131° F. Three plants used 16-foot scalders and two plants used 20-foot scalders.

A problem occasionally encountered in sub-scalding was that of being unable to obtain complete removal of the cuticle or outer skin covering, especially from the backs and wings of the carcasses. Patches of the yellow outer skin remained attached to the carcass and created an undesirable appearance. Of the two plants using semi-scald temperatures, one used a hock scalder and the other used both hock and neck scalders.

Line Pickers

Labor required to operate pickers varied from three men in plants A, B and D to no labor requirements in plant E. However, plant E partially substituted hand pinners for line pickers. One man was required in plant C. In plants A, B and D, two men operated side-line pickers. It is harder to remove feathers from semi-scalded carcasses than from sub-scalded ones. Therefore, in plants using semi-scald methods a hock picker and sometimes a neck picker were required. One man in plant A operated a hock picker and one worker in plants B and D operated neck pickers. Primary wing coverts were removed by hand in plant E and were removed by mechanical wing strippers in the other four plants.

Pinning

The greatest variation in dressing efficiency occurred in the pinning job. The method of scalding and the number of feathers removed by the picking machine determined the number of pinners necessary. Sub-scald temperatures resulted in less labor required for pinning. Plant A, which used water at 131° F., and C, at 126° F., required 15 and 22 pinners, respectively, as compared with six pinners required in plant D, 11 in B and 14 in E, where sub-scald temperatures were used. Plant E used no manually operated line pickers.

Reversing

Turkeys were reversed on the line so picker fingers could remove the feathers from all parts of the carcass. Three plants required labor for reversing the carcasses during the dressing operation. Plants A and E changed the position of the carcass on the shackle twice during the dressing operation; plant C once and plants B and D did not change the position. At least one worker was required each time the carcass was reversed. This was one of the factors responsible for the high dressing efficiency in plants B and D.

Plant A reversed the carcass by hanging it from the neck just before moving through the hock scalder. The carcass was then reversed, the hocks scalded and picked, the shanks removed, the wings and neck pinned and the carcass washed. The carcass was then reversed and hung by the hocks. In plant E the carcass was reversed by hanging it by the neck after moving through a rougher and neck picker. It then passed through a second rougher and was again reversed to hang by the shanks. In plant C, where the carcasses were pinned while hanging by the neck, the carcass was reversed only once, just before entering the hock scalder.

Changing from Dressing to Eviscerating Line

Three plants had separate eviscerating lines which required two extra men to remove the carcass from the dressing shackle and hang it on the eviscerating shackle. In one plant, where the shanks were cut off while the bird was hanging in the dressing shackle (considered an eviscerating operation), an extra man was required to remove the shanks from the shackle.

EVISCERATING

In this study, the eviscerating operation included the removing of the viscera, head, neck, shanks and the cleaning, wrapping and insertion of the giblets into the body cavity, even though in a few plants some of these jobs may have been performed in the dressing room or during the packaging operation. The greatest variation in the methods used was in the eviscerating operation.

The use of the same line for both dressing and eviscerating was a definite labor-saving procedure since the carcass did not have to be removed from the line between these operations and complete synchronization was achieved between the dressing and eviscerating lines.

Table 5. Productivity of six turkey processing plants, evisceration

	Plant					
	A	B	C	D	E	F
	Toms					
Operating speed, toms per hour	416	414	180	383	368	12
Toms eviscerated per man-hour	9.9	8.8	5.8	9.3	8.4	3.0
	Hens					
Operating speed, hens per hour	416	414	270	574	368	20
Hens eviscerated per man-hour	9.9	8.8	8.7	14.0	8.4	5.0

Removing Legs

In plants B and D, which had separate dressing and eviscerating lines, the legs were removed when the carcasses were changed from the dressing to the eviscerating line by placing the carcasses on a table equipped with a home-made cutting device, Figure 4. In plants C and E, the carcasses were cut off the line at the shanks. In plant A, the shanks were cut off while the carcass was hanging by the neck in the dressing room, Figure 5. This probably is the best method of removing shanks because it eliminates one reversing job.

Positioning for Evisceration

During the eviscerating operation, the position of the carcass was changed several times so that workers could operate at maximum efficiency. One or more workers were required each time the position was changed. In four plants, one man doubled back the neck and placed it in the shackle so that the body was in a horizontal position and the viscera could be removed, Figure 6. In the fifth plant, the carcass came from the dressing room hanging by the neck. One man placed the shanks in the preceding shackle so that the head and neck were fastened to one shackle and the shanks to the other one, Figure 7. This method of positioning was necessary because of the type of shackles used. In two plants the neck and head were taken out of the shackle and removed from the carcass at a later stage of the eviscerating operation.

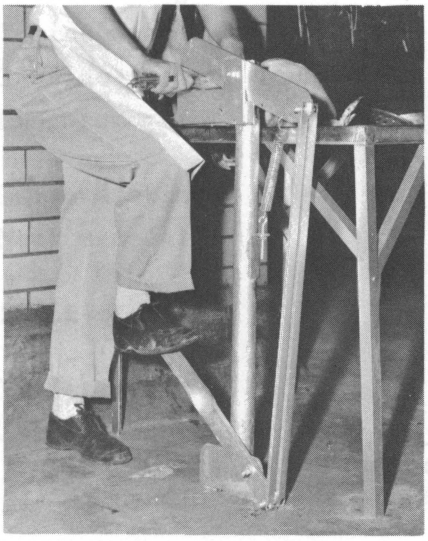

Figure 4. Method of removing shanks in plant D.

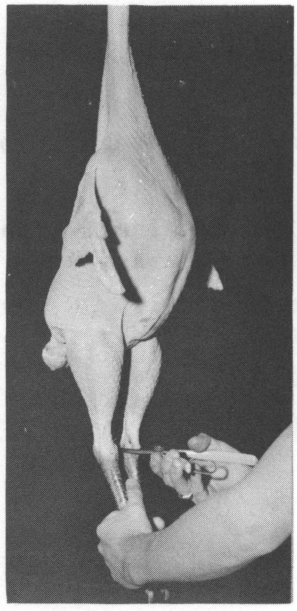

Figure 5. In plant E the shanks were removed with a small pair of pruning shears.

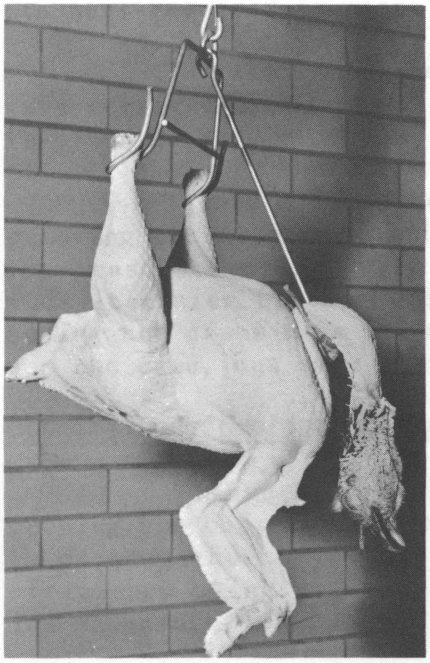

Figure 6. Positioning for evisceration using only one shackle.

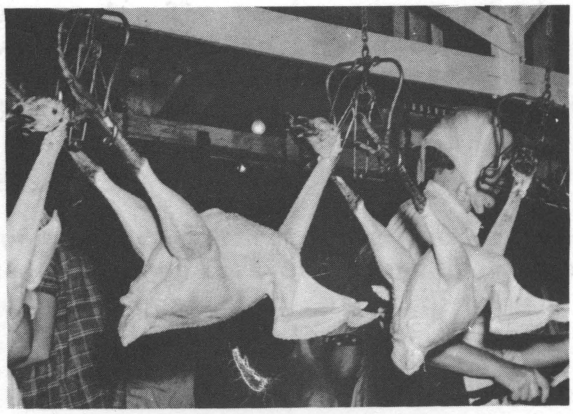

Figure 7. Positioning for eviscerating using two shackles.

Table 6. Eviscerating equipment used in five processing plants

	Plant				
	A	B	C	D	E
Eviscerating table	32'	24'6"	12' 1/	22'	22'6"
Inside washer	1	1	1	1	1
Outside washer, length	4'8"	8'	8'	8'	12'4"
Lung remover	Hand	Lynn remover	Lynn remover	Hand	Vacuum
Gizzard skinner	1	none	1	1	1
Neck removal	Pruning shears	Pruning shears	Pruning shears 2/	Pruning shears 2/	Knife
Shank removal	Pruning shears	Cutting table	Pruning shears	Cutting table	Pruning shears
Palletized	no	no	yes	yes	no
Automatic bag shrinker	none	none	1	1	none

1/ Plant C has no moving belt or pans.
2/ One handle attached to stationary pipe.

Removal of Crop and Windpipe

As the carcass moved over the eviscerating trough, the skin on the back of the neck was slit open and cut off at the base of the caruncles. The worker in plant C performing this job also cut the remainder of the skin loose from the neck. In four plants one worker cut the neck skin; two workers were required in plant E.

To tear loose and cut off the crop, gullet and windpipe two workers were required in plant C, three in plants A and B, four in plant D and six in plant E.

Plants A and B were the most efficient in the overall operation of removing the crop and windpipe with 0.7 man-hour, as compared with plant E, the least efficient, with 1.6 man-hours.1/ The tender tissue of the hens made it easier for workers to remove the crops than from the toms. In removing the crops from both hens and toms, the number of workers on the line was the same, but more shackles could be hung when processing hens, Table 5.

Opening Body Cavity and Removing the Oil Sac

Plants A, C and D used two workers for removing the oil sac and opening the body cavity, plant E used three workers and plant B one worker. In opening the body cavity and removing the oil sac, plant B was the most efficient, using 0.2 man-hour, and plant C was the least efficient, using 1.1 man-hours.

Viscera Removal

Four plants had either moving pans or belts synchronized with the line so that the viscera moved along with the carcass. One plant used eviscerating tables with no moving pans or belts. Labor requirements to remove viscera other than the crop and lungs varied from 0.5 to 1.7 man-hours.

1/ Reference to man-hours is in time used per 100 turkeys unless otherwise specified.

Man-hours required to remove the lungs varied from 0.2 in plant D to 1.1 in plant C. In plant E, the lungs were removed by a vacuum tube; 0.3 man-hour was required. In plant C two workers removed the lungs by hand. The high labor requirement for this job in plant C again was caused by the slow operating speed of the eviscerating line and the type of eviscerating tables used.

Clipping, Trimming and Washing Giblets

After being removed from the carcass, the giblets were moved to tables alongside the eviscerating line, trimmed and washed. In some plants, chutes from the eviscerating table transferred the giblets to the side tables.

Four plants used gizzard-skinning machines. The time required to clip, trim, clean and wash the gizzard and neck in plants using these machines varied from 0.7 man-hour in the most productive plant to 2.2 in plant C. In plant B, where this job was done by hand, 2.8 man-hours were used. Eight workers removed gizzard linings by hand in this plant, as compared with one worker in each of the other four plants. Plants B and D used giblet-washing machines.

Washing Body Cavity

One worker in each plant washed the inside of the body cavity by inserting a spray washer into it. Differences in man-hours required for this job again were attributable to the operating speed of the plant. The outside of the carcass was washed by an automatic water spray in all five plants.

Wrapping and Inserting Giblets and Necks

Labor requirements varied from a low of 0.5 man-hour per 100 hens in plant D to a high of 2.8 per 100 toms in plant C. In all five plants, the giblets were wrapped. In plants C and D, the necks also were wrapped.

Removing Carcass from the Line

After the viscera were removed and the carcass washed, the carcass was removed from the conveyor line and moved along a table for grading and trussing or was dropped directly into a chill vat. In one plant, the carcass was removed from the line by cutting it from the shanks when evisceration was completed. Additional labor was required to remove the shanks from the shackles.

Trussing

Four plants trussed the carcasses immediately after evisceration and one (plant B) trussed them after chilling, just before packaging. Before trussing the chilled carcasses it was necessary to break the stiffness of the joints. Four plants used string to truss the legs and one used rubber bands; two used a triangular paper diaper over the hocks, Figure 8. No difficulty was noticed in the rubber bands coming off in the chill vats or in keeping the water from draining from the carcass before packaging. The use of a rubber band and a triangular paper diaper appeared to be the most satisfactory method of trussing.

Grading, Inspecting and Trimming Damaged Parts

Two plants, B and C, had no employee specifically designated to cut off damaged parts. In these two plants, the man-hours used were entirely for grading. In plants A, D and E, in addition to the grader, one worker was employed to inspect carcasses and trim damaged parts. All plants had one worker whose main job was to grade turkeys. In plant A, the grader also removed the carcasses from the chill vat; in plant E, he removed the carcass from the line, inserted the neck in the body cavity and placed the turkey in the chill vat.

Icing Carcasses and Handling of the Vats

Labor requirements to ice vats varied from 0.5 to 1.2 man-hours. Labor requirements to crush ice varied from 0.2 to 0.6 man-hour. One plant with a flake ice machine eliminated this job. In several of the plants when only crushed or flaked ice was used, an air pocket formed around the warm carcass and caused discoloration.

Three plants used only crushed or flaked ice for chilling and two plants used crushed ice and water with compressed air. Two plants used pallets for moving the chill vats; vats in the other plants were on casters.

PACKAGING

The packaging operation included all jobs from the time the carcasses were removed from the chill vats through the shrinking, weighing and labeling of the individually packaged carcasses. Since the carcasses were stored in chill vats before packaging, the operating speed of the packaging and packing operations generally is not the same as the dressing and eviscerating operations.

In plants A and B, the efficiency of packaging and packing varied widely during the times that observations were being made. Therefore, only the figures on the packaging of hens for plant B are reported.

Removing Carcasses from Chill Vat, Draining and Drying

Three plants had overhead conveyor systems for exclusive use in draining. One of these used a compressed air hose with a nozzle to blow the water from the body cavity. This plant also had one worker who wiped some of the moisture from the outside of the carcass with a cloth. The two plants without overhead conveyor systems hung the carcasses on poultry racks to drain and air dry. Of the four plants in which data were collected for toms, labor requirements varied from 0.3 to 0.7 man-hour. In the three plants for which figures are available for hens, man-hours varied from 0.2 to 1.1.

Removing Carcasses from Drain Rack or Line

The worker designated to remove the carcass from the line usually performed some other job such as inserting giblets or, as in plant B, breaking the stiffness of the joints for trussing. (In plant B, the carcasses were chilled before trussing.)

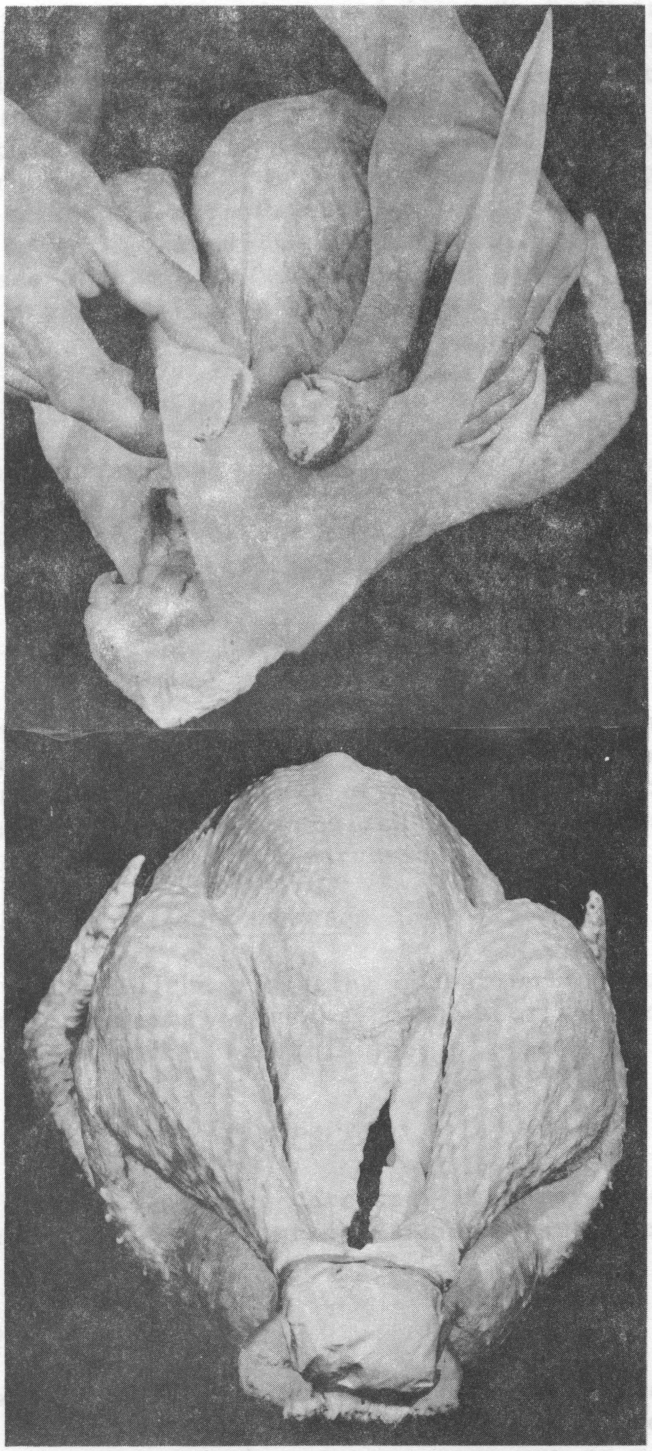

Figure 8. Two plants used a diaper truss. Top--the hock joints are wrapped in parchment and the flap is folded over. Next a rubber band is placed around the parchment and the tail-head. Bottom--finished appearance of the diaper truss.

Preparing and Inserting the Carcasses into Plastic Bags

Generally, the neck was inserted into the body cavity, the giblets into the crop cavity and the neck skin was folded over the back. In one plant the tailhead was broken with pincers so it would not tear the plastic bag. In plant B, one worker placed the carcass in a three-sided, stainless-steel funnel and then inserted it into the open plastic bag which was held by the next worker on the line. In plant C, one worker placed the carcass in the funnel and also held the plastic bag. In plant E, the procedure was the same, but there were two units in operation. In plant D, one worker placed the carcasses in the bags without using a chute. In the plants for which figures are available, labor requirements varied from 0.5 to 1.0 man-hour.

Removing Air from Plastic Bag and Banding or Tying

When the carcass was bagged, the next operator removed the air with a vacuum pump. The bag was sealed with a rubber band, a metal fastener or by tying a knot in the end of the bag. Rubber bands were used by plants A, B, D and F; plant C used metal fasteners. Occasionally plant E sealed bags by tying the ends.

Shrinking

Next, the bag was shrunk by passing it through a hot water bath on a conveyor belt or by dipping it into a hot water bath. Two plants had automatic shrinkers; three used tanks of hot water. In the two plants with automatic shrinkers no labor was required for this operation. One man in each of the three plants dipped the carcasses.

Weighing and Labeling Packaged Carcasses

The last step in the packaging operation was weighing and marking the weight on each individual carcass. Man-hour varied from 0.2 to 0.7. Plants B and C used one worker for this job; plants D and E used two.

PACKING

Packing included sorting carcasses into weight classes, assembling and labeling boxes, packing the turkeys and removing them from the packing room.

Sorting Carcasses by Weight

In plants B and D, the carcasses were sorted on a metal-top table and were removed immediately by the packers. Plant C used a bin instead of a table. In plant E, the sorted carcasses were put on wooden freezer racks and immediately placed in the freezer.

Assembling Empty Boxes for Packing and Labeling

All four plants employed the equivalent of two men in this operation. In plant D, one man assembled boxes full time, one man half-time and another man spent approximately half his time delivering the empty boxes to the packing room. Two workers assembled boxes in plant E. About 4 hours

were required to set up a day's supply of boxes. In plant C, one worker assembled the boxes and another pasted labels on them. Cardboard boxes were used in two plants and wooden boxes in one. In plant E, cardboard boxes were used for hens and wooden boxes for toms.

Table 7. Productivity of four turkey processing plants, packaging[1/]

	Plant			
	B	C	D	E
	Toms			
Operating speed, toms per hour		300	450	276
Toms packaged per man-hour		42.9	36	21.2
	Hens			
Operating speed, hens per hour	283	360	450	276
Hens packaged per man-hour	21.8	51.4	36	21.3

1/ Data not available on hens and toms for plant A and on toms for plant B.

Packing Carcasses, Lining and Sealing Boxes

In this job, one worker was required in plant B, three workers in plant C and four in plants D and E. In all plants except E each worker performed a different part of the job. In plant E, there were four men, each of whom did his own lining, packing and closing of the box.

Table 8. Productivity of four turkey processing plants, packing[1/]

	Plant			
	B	C	D	E
	Toms			
Operating speed, toms per hour		300	450	470
Toms packed per man-hour		30	37.5	29.4
	Hens			
Operating speed, hens per hour	283	360	450	913
Hens packed per man-hour	47.2	36	37.5	60.9

1/ Data not available on hens and toms for plant A and on toms for plant B.

Recording and Stamping Weights on Boxes

Plants B, D and E required two workers each for this job; plant C required one. This job included adding the individual carcass weights and stenciling the total weight, number and sex on the boxes.

OTHER FACTORS INFLUENCING PRODUCTIVITY

Some of the plants studied also processed chicken broilers. Labor requirements generally are greater for processing broilers than for processing turkeys. Therefore, in these plants, there were sometimes more workers on the turkey processing line than were actually required.

PLANT F

Plant F, the farm-dressing plant, dressed five hens or four toms per man-hour as compared with plant D, the most efficient plant in dressing, which processed 31.9 hens or 21.3 toms per man-hour. Plant F used four workers in the dressing operation with hens and three with toms; plant D had 18 workers in each.

When dressing toms, one man caught, hung and killed the birds. Two men were required to do these same jobs when dressing hens. The turkeys were caught from a pen, hung on a rope and then placed in a burlap sack with their heads sticking out so they could be killed. After killing, the sack was removed and the carcass placed on the floor until scalded. After scalding, the neck, wing and tail feathers were removed by hand and the remaining feathers were removed with a picking machine. The carcass was then placed in a tub of warm water awaiting evisceration.

Plant F eviscerated five hens or three toms per man-hour, as compared with plant D which eviscerated 14 hens or 9 toms per man-hour. Four men were required in plant F for evisceration, 41 in plant D.

While the carcass was in the tub of water in the dressing room, the neck and shanks were removed with a knife. Then the carcass was placed in a chute which dropped the carcass into another tub of water in the eviscerating room. The carcass then was placed on the eviscerating table, the neck and viscera removed and the body cavity washed. The giblets were trimmed, washed and placed in the body cavity. Finally the carcass was placed in a chill tank. All turkeys processed in this plant were sold ice packed.

CONCLUSIONS

This study has shown certain areas in which some processors can increase the efficiency of their plant operation. These are:

Arrange the duties of each worker on the processing line and operate the dressing eviscerating lines at such a rate of speed that each worker is employed at maximum productiveness. When a line operates at too slow a speed, all workers are not fully employed; too fast a line requires extra employees, some of whom will not be employed at maximum productiveness. Among the six plants studied, the optimum operating speed appeared to be somewhere around 380 toms or 575 hens per hour.

Greatest efficiency can be achieved by catching turkeys directly from the crates immediately after unloading from the truck, and then hanging them on the line. A roller bearing type conveyor would assist in moving the loaded crates into the hanging area and the empty crates back to the truck. This arrangement is not desirable or possible in some plants because of procurement and feeding problems. In such operations, the method in which turkeys are held in holding pens and then driven to a small catching pen appears to be the most satisfactory.

It might be possible in some plants to increase efficiency by rearranging the height of the pen, moving the door of the pen closer to the conveyor and installing a chute from the catching pen to the shackles, Figure 1. The use of wooden batteries apparently is not too satisfactory

because turkeys must be handled twice. The size and positions of the battery doors make it easy to bruise turkeys when taking them in or out of such batteries.

An electric knife has the advantage of immediately stunning the turkey and relaxing the bird's muscles eliminating the brain piercing when the conventional knife is used. This makes it easy for the next operator to catch the bird and remove the wing and tail feathers while they are still clean and dry.

The labor and equipment saved by sub-scalding, even though in certain respects it may not be as desirable as semi-scalding, is enough to offset other advantages claimed for the semi-scalding. In the most efficient plant using semi-scalding, 15 pinners were used; in the most efficient plant using sub-scalding, 6 were used. When semi-scalding, hock and neck scalders are required. The disadvantage of sub-scalding seems to be that it does not always remove all of the outer skin, especially on poorly fleshed carcasses.

Some processors cut down labor requirements on manually-operated line pickers, but more help is then required for pinning than would be used to operate line pickers.

The number of times a carcass is positioned for feather removal and evisceration greatly influences labor requirements. One reason for high efficiency in plants B and D was the fact that they did not reverse carcasses during the dressing operation. Reversing can be cut down by performing as many operations as possible on the carcass while it is in one position. To accomplish this it is sometimes necessary to do certain eviscerating operations, such as removing shanks, while the carcass is still in the dressing room. Each time the position of the carcass is changed one or more extra men are required.

By using the same shackles for dressing and eviscerating, one or more men can be eliminated. In the two plants where only one line was used, two fewer workers were required. Complete synchronization also was achieved between the dressing and eviscerating lines. The rigid grip type shackles seem to be best adapted for a combination dressing and eviscerating line.

In plants with separate dressing and eviscerating lines, the most satisfactory method of shank removal appears to be the use of a table with a knife bolted on one end and operated by foot power, Figure 4. Processors also should consider the use of a small pair of pruning shears so that an employee can use it to cut off necks and shanks with one hand. This leaves the other hand free to hold the carcass.

The use of a gizzard skinner increases efficiency. In the most efficient plant with a gizzard skinner, 0.7 man-hour per 100 hens was required. In the plant without a gizzard skinner, 2.8 man-hours were required.

The transfer operation between eviscerating and packaging gives processors some flexibility in the workers required for packaging and packing. Packaging and packing do not have to proceed at the same rate as the dressing and eviscerating lines.

Vertical trussing with a triangular parchment paper diaper-wrap around the hocks--fastened to the tailhead by a rubber band--appeared to be the fastest and the most sanitary method of trussing. Chilled carcasses are harder to truss because the joints have become stiff.

Chilling with ice and water rather than with crushed ice prevented discolorations on carcasses, especially in plants using sub-scalding.

Pallets reduced the number of men required to handle chill vats.

Overhead conveyor systems appeared to be the best method for draining water from chilled carcasses. The movement of these carcasses on the line helped to remove the water and also set a pace for the packaging and packing operations. The use of a compressed air hose with a nozzle to remove water from the body cavity appears to have some possibilities.

In packaging, the most efficient procedure was to have one worker pick up and insert the carcass into the bag without using a funnel or chute. The use of an automatic shrinker eliminates one worker from the line.

APPENDIX

Table 9. Percentage of total man-hours required in the various turkey processing operations[1/]

Operation	Plant B	Plant C	Plant D	Plant E
		Toms		
Dressing		40.5	22.5	23.7
Evisceration		44.7	51.4	45.4
Packaging		6.1	13.3	17.9
Packing		8.7	12.8	13.0
		Hens		
Dressing	21.9	39.0	19.9	25.3
Evisceration	49.1	43.2	45.4	48.5
Packaging	19.8	7.3	17.7	19.1
Packing	9.2	10.5	17.0	7.1

1/ Data not available on hens and toms for plant A and on toms for plant B.

Table 10. Man-hours required per 100 turkeys dressed in six turkey processing plants

Job	Plant A	B	C	D	E	F
	Toms					
Catching	.48	.24	.27	.26	.27	
Hanging turkey on shackle	.48	.24	.27	.26	.27	8.33
Killing	.48	.24	.56	.26	.27	
Removing feathers - scalding to be included in plant F	.48	.48	.56	.78	.54	6.67
Operating pickers	.48	.48	.56	.52		5.00
Reversing	.48		.56		.54	
Operating hock scalder and picker	.48					
Operating wing picker	.24	.24	.56	.26		
Operating neck picker		.24		.26		
Pinning - including removal of garter feathers	3.61	2.67	12.22	1.84	3.82	5.00
Removing carcass from line		.24		.26	.54	
Total	7.21	5.07	15.56	4.70	6.25	25.00
	Hens					
Catching	.48	.24	.19	.17	.27	5.00
Hanging turkey on shackle	.48	.24	.19	.17	.27	
Killing	.48	.24	.37	.17	.27	5.00
Removing feathers - scalding to be included in plant F	.48	.48	.37	.53	.54	4.00
Operating pickers	.48	.48	.37	.36		3.00
Reversing	.48		.37		.54	
Operating hock scalder and picker	.48					
Operating wing picker	.24	.24	.37	.17		
Operating neck picker		.24		.17		
Pinning - including removal of garter feathers	3.61	2.67	8.14	1.22	3.82	3.00
Removing carcass from line		.24		.17	.54	
Total	7.21	5.07	10.37	3.13	6.25	20.00

Table 11. Man-hours required per 100 turkeys eviscerated in six turkey processing plants

Job	Plant A	B	C	D	E	F
Toms						
Removing legs and hanging carcass on line	.24	.49	.28	.52	.54	.83
Slitting neck skin	.24	.24	.56	.26	.54	
Removing crop and windpipe	.72	.72	1.10	1.05	1.64	3.34
Cutting out oil sac	.24	.12	.56	.26	.27	1.67
Placing in position for evisceration 1/	.24	.24	.56	.26	1.10	.83
Opening body cavity	.24	.12	.56	.26	.54	.83
Removing viscera	.96	.49	1.67	1.05	.54	3.33
Removing lungs	.49	.49	1.10	.26	.27	1.67
Clipping, trimming and washing heart and liver	.72	.63	.33	.52	.54	4.17
Clipping, trimming, cleaning and washing gizzard - includes neck washing	1.68	2.75	2.17	1.05	1.64	6.67
Cutting off head and neck	.72	.72	.83	.52	.54	3.33
Washing body cavity	.24	.24	.56	.26	.27	5.00
Wrapping giblets and neck	.24	.72	1.67	.52	.54	
Removing carcass from line	.24	.24	.28	.13	.11	
Inserting neck and giblets	.72	.72	1.10	.26	.35	.83
Trussing	.72	1.45	1.67	1.05	1.64	.83
Grading, inspecting and cutting off damaged parts	.72	.24	.56	.78	.35	
Icing birds and handling vats	.49	.49	1.10	1.17	.54	
Crushing ice for chill vats	.24	.24	.56	.52		
Total	10.10	11.35	17.22	10.70	11.96	33.33
Hens						
Removing legs and hanging carcass on line	.24	.49	.19	.35	.54	.50
Slitting neck skin	.24	.24	.37	.17	.54	
Removing crop and windpipe	.72	.72	.74	.70	1.64	2.00
Cutting out oil sac	.24	.12	.37	.17	.27	1.00
Placing in position for evisceration 1/	.24	.24	.37	.17	1.10	.50
Opening body cavity	.24	.12	.37	.17	.54	.50
Removing viscera	.96	.49	1.11	.70	.54	2.00
Removing lungs	.48	.49	.74	.17	.27	1.00
Clipping, trimming and washing heart and liver	.72	.63	.22	.35	.54	2.50
Clipping, trimming, cleaning and washing gizzard - includes neck washing	1.69	2.75	1.44	.70	1.64	4.00
Cutting off head and neck	.72	.72	.56	.35	.54	2.00
Washing body cavity	.24	.24	.37	.17	.27	3.00
Wrapping giblets and neck	.24	.72	1.11	.35	.54	
Removing carcass from line	.24	.24	.19	.09	.11	
Inserting neck and giblets	.72	.72	.74	.17	.35	.50
Trussing	.72	1.45	1.11	.70	1.64	.50
Grading, inspecting and cutting off damaged parts	.72	.24	.37	.52	.35	
Icing birds and handling vats	.48	.49	.74	.79	.54	
Crushing ice for chill vats	.24	.24	.37	.35		
Total	10.09	11.35	11.48	7.14	11.96	20.00

1/ Includes placing neck in shackle, removing neck from shackle and reversing.

Table 12. Man-hours required per 100 turkeys packaged in four turkey processing plants[1/]

Job	Plant B	Plant C	Plant D	Plant F
Toms				
Removing carcass from chill vat, hanging to drain and dry body cavity		.33	.22	.72
Removing carcass from drain rack or line		.33	.11	.39
Preparing and inserting carcass into plastic bag		.68	.67	.72
Removing air from plastic bag		.33	.67	.72
Banding or tying end of bag		.33	.67	.72
Shrinking bag				.72
Weighing and labeling packaged carcass		.33	.44	.72
Total		2.33	2.78	4.71
Hens				
Removing carcass from chill vat, hanging to drain and dry body cavity	1.06	.28	.22	.72
Removing carcass from drain rack or line	.35	.28	.11	.39
Preparing and inserting carcass into plastic bag	1.06	.54	.67	.72
Removing air from plastic bag	.71	.28	.67	.72
Banding or tying end of bag	.71	.28	.67	.72
Shrinking bag	.35			.72
Weighing and labeling packaged carcass	.35	.28	.44	.72
Total	4.59	1.94	2.78	4.71

1/ Data not available on hens and toms for plant A and on toms for plant B.

Table 13. Man-hours required per 100 turkeys packed in four turkey processing plants[1/]

Job	Plant B	Plant C	Plant D	Plant E
Toms				
Sorting carcasses by weight		.33	.22	.85
Assembling empty boxes for packing and pasting labels when required		.67	.67	.43
Lining boxes, packing carcasses and sealing boxes		1.33	.88	.85
Recording carcass weight and stamping total weight on boxes		.33	.45	.43
Removing packed boxes		.67	.45	.85
Total		3.33	2.67	3.41
Hens				
Sorting carcasses by weight	.35	.27	.22	.44
Assembling empty boxes for packing and pasting labels when required	.71	.56	.67	.22
Lining boxes, packing carcasses and sealing boxes	.28	1.12	.88	.44
Recording carcass weight and stamping total weight on boxes	.71	.27	.45	.22
Removing packed boxes	.07	.56	.45	.44
Total	2.12	2.78	2.67	1.76

1/ Data not available on hens and toms for plant A and on toms for plant B.

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