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PLANT REQUIREMENTS FOR MANUFACTURE OF SALTED PEANUTS

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
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FOREWORD

This brochure is one of a series of reports resulting from overseas technical inquiries on factory or commercial establishments, operation, management, and engineering. The report is designed to provide only a general picture of the factors that must be considered in establishing and operating a factory of this type. In most cases, plans for actual installations will require expert engineering and financial advice in order to meet specific local conditions.

Mention of the name of any firm, product, or process in this report is not to be considered a recommendation or an endorsement by the Agency for International Development, but merely a citation that is typical in its field.

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For further information and assistance, contact should be made with the local Productivity Center, Industrial Institute, Servicio, or United States AID Mission.

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SALTED PEANUTS

INFORMATION SUBMITTED:

I. Process Information

1. General

The processing of peanuts from the raw, unshelled product to a package of salted, shelled nuts, involves several basic operations. Although various types of equipment are available and several variations in operating technics are practiced in the industry, the process usually consists of these basic steps: shelling and grading the raw peanuts, roasting, cooling, blanching (removing the thin brown skins from the roasted nuts), frying in oil, cooling and salting, and, finally, packaging. These processes are shown in outline form in the flow chart in **Figure 1.**

There are two basic varieties of peanuts available for processing: the Spanish peanut and the Virginia peanut. The Spanish variety is very small in size and is usually salted without removing the thin brown skins from the nuts. These nuts are commonly distributed to the consumer in vending machines. Virginia peanuts, which are considerably larger in size, make up the bulk of the peanuts which are fried and salted in this country, and account for approximately 75% of the volume of peanuts so processed. Virginia nuts are usually divided into two groups based on size: the large or jumbo peanut, which runs 30 to 32 nuts to the ounce; and the small or No. 1 Virginia. In some cases, a third, medium-sized nut is cultivated.

The operations used to process Spanish and Virginia peanuts are essentially the same, except for the blanching operation which, as noted previously, is usually omitted when processing the Spanish variety. In addition, certain parts of the grading equipment will differ, depending upon the size peanut being processed.

This report will be concerned mainly with the salting of No. 1 Virginia peanuts.

2. Operations

a) Shelling

The raw peanut, as received at the processing plant, is first introduced into a peanut sheller which breaks open the outer shell and separates the peanuts. The sheller is a steel rectangular unit containing a rotating cylindrical grate within a cylindrical housing. The raw peanuts are fed to the top of the unit through a hopper. The shells are broken as the whole peanuts pass between the rotating cylinder and its housing and the shelled peanuts drop below through the grating. An exhauster or fan attached to the unit creates an air draft which carries away the lighter shell fragments, twigs, etc. A cyclone collector serves to separate this material from the air stream.

A shaker-grader unit is also required. This unit consists of a vibrating screen of specific size. The shaker may be installed separately from the sheller, but more commonly is mounted below the sheller. The shelled peanuts and other materials which are too heavy to be carried away in the air stream are allowed to drop from the sheller onto the shaker screen where the material is graded according to size. The clean, selected nuts are discharged through a spout at the front of the unit.

b) Roasting

The next steps in the process are preparatory to removing the thin skins from the shelled peanuts in the blanching operation. The first of these operations is roasting. Roasting (or toasting) serves several purposes. When the nut kernels are roasted, the meat of the nuts shrink slightly, thereby loosening the thin brown skins so that these skins may be removed easily by the blanching machine. Furthermore, roasting serves to develop the flavor and color of the peanut.

The standard peanut roaster is a gas-fired cylindrical machine which operates on a batchwise basis. Commercial units vary in size from 100 to 500 pound batches. The selected raw nuts, as obtained from the shaker screen, are introduced into the feed hopper of the roasting machine. The cylindrical basket containing the nuts is rotated at a rate of about 12 r.p.m. causing the nuts to be churned in an atmosphere of hot dry air. The operation takes 15-20 minutes per batch at a temperature of approximately 270-280° F. The larger units, however, are sometimes operated for 30-40 minutes per batch in the belief that slow roasting will better serve to bring out the full nut flavor. As the roasting process nears

completion, changes in color and flavor occur more rapidly. When the nuts have attained the desired degree of roasting, as determined by experience, the roasting operation is halted and the batch is emptied into a cooling unit.

c) Cooling

Each batch of roasted peanuts must be cooled before entering the blanching machine. The unit usually employed in the industry for this purpose is the cooling box. The cooling box is a shallow metal tray, with a perforated steel plate bottom, large enough to hold a batch of nuts from the roaster. The unit can be permanently mounted but more commonly is of the runabout type which is mounted on wheels and can be rolled, on tracks, between the roaster and the blancher. The cooler is attached to an exhauster fan which draws ambient air down through the bed of nuts. If the plant is located on two floors, the cooled nuts are dumped (by tilting the cooling box) into a hopper fixed in the floor and mounted above the blancher on the floor below. In a one-story plant, a bucket elevator is required to carry the product to the blancher hopper.

d) Blanching

The whole nut blancher is a machine which rubs the surface of the peanuts and loosens the thin brown skins. Air suction created by an exhauster fan carries away the loosened skins. There are two types of blanchers. The type formerly in general use consisted of a box containing a series of fine wire brushes revolving in opposite directions. The peanuts were poured into the top of the unit where they wereallowed to fall between the brushes which would then rub off the skins. The blanched nuts would then fall onto a picking table consisting of a moving conveyor belt where foreign matter could be removed. Dust and skins were removed by an upward current of air in the blancher.

In the modern blancher, the fine brushes are replaced by two grooved rubber belts or rolls which move close together in opposite directions. As the nuts are fed into the space between the belts or rolls, they are turned over and over and the skins are gently brushed off in an action very similar to that obtained when nuts are blanched by hand. The major advantages of the modern blancher are that it is easier to clean and a smaller percentage of the nuts are split as compared with the brush type of blancher.

As the peanuts leave the blancher, they are carried away by a moving conveyor belt which also serves as an inspection table. A shaker-sorter at the end of the belt separates the split nuts and hearts from the whole nuts. It is also common practice to employ a permanent magnet over the belt to remove tramp iron which may accompany the peanuts. In some modern plants, nuts leaving the blancher pass an electric eye which is sensitive to color and passes only white peanuts. Discolored kernels, stones and other foreign matter are rejected.

e) Frying

The blanched whole nuts, as discharged by the shaker, are next conveyed to a nut cooker or fryer where they are deep fried in an oil bath. The cooking medium is a vegetable oil such as coconut, peanut or babassu oil. Coconut oil is most generally employed because it is the least subject to rancidity of any oil in common use.

Peanut cookers may be continuous or batchwise in operation. The latter type is less expensive and is more widely used. It consists of a deep tank which contains the cooking oil. The oil is heated by gas-fired heating tubes spaced near the bottom of the tank. A batch of peanuts is loaded into a woven-steel screen basket which is lowered, by an overhead hoist, into the cooker

The cooking time and temperature may vary in practice. The temperatures employed range from 310-350° F.; cooking time takes from 13-15 minutes. The actual frying procedure also varies somewhat in practice. For example, the oil bath may be preheated to 350° F. before adding a batch of cool peanuts. The temperature of the oil will drop to about 280° F. and then gradually rise as the nuts are cooked. By the time the temperature reaches 325° F. the nuts will have been cooked sufficiently. Some producers use lower temperatures at some increase in cooking time. In some few plants, the nuts may be added to the cooker more slowly so that the temperature does not decrease too rapidly and less cooking time is required.

Most peanut cookers are gas-fired, although some electric models are in use. The temperature of the oil batch is usually controlled by a thermostat. A thermostat reduces the degree of fluctuation of the temperature during the frying operation.

Various sizes of fryers are available. Continuous models range in capacity from 750 to over 3000 pounds of peanuts per hour. Units which have a batchwise operation are available with a basket capacity of 125 and 250 pounds of peanuts.

It was originally a common practice to filter the oil at least once a week. Filtering is necessary primarily when a brush type blancher is used because nuts which have been blanched by brushes tend to be mealy and a sludge is formed in the oil. Meal on the nuts causes the oil to break down rapidly and so must be removed. However, when a modern blancher containing rubber rolls or belts is used to blanch the peanuts, very little, if any, sludge is formed in the oil and it has been found that the filtering step may be eliminated without adversely affecting the process.

The frying oil must be changed before it becomes rancid. If peanut oil is used, a kettleful of oil will be discarded once a week. When the cooking medium is coconut oil, a kettleful is usually discarded every 2 - 3 weeks. When sound whole nuts are used in the process there is practically no absorption of the oil by the nuts. The oil has to be discarded because degradation of the fats gradually takes place as a result of constant heating. Spent oil from the fryer is usually collected and sold to soap manufacturers.

The cooking operation is complete when the nuts are of the proper light brown color, as determined by experience. In a batch cooker, the basket containing the nuts is lifted out of the tank and held momentarily while the oil drains off.

f) Cooling and Salting

The salting operation is another portion of the process that is subject to some variation in technic in the industry. Some producers apply salt to the oil-fried nuts before cooling, and some, after cooling. A commonly employed unit is the cooling and salting table. The table consists of a tray with a perforated bottom similar to the cooling box used after the roasting operation, except for the fact that it is mounted in a fixed position. An exhauster fan attached to the unit draws air through the nuts and thereby cools them.

Salt can be shaken over the nuts with a sieve or sprinkled by hand. The nuts are then stirred or raked so that the salt is evenly distributed. The amount of salt used ranges from 1 - 2 1/2 pounds per 100 pounds of peanuts. In some larger plants, the nuts and salt are dumped into drums which are revolved until the salt and nuts are thoroughly mixed. The cooling table is made with a tilting device so that the salted nuts can be dumped into drums for temporary storage or directly into the hopper of a packaging line.

g) Packaging

The packaging of salted peanuts is subject to a wide range of possibilities. Typical packages include small consumer packets of glassine, cellophane or plastic films, glass jars and vacuum-sealed tins. In smaller plants, the small consumer packets are filled by hand, using a cup to measure out a given quantity of nuts. The larger plants use automatic bag-filling machinery. Vacuum-sealed tins of the type used to package coffee and air-tight glass containers are finding greater use as peanut packages because they are better able to hold the flavor of the products for longer periods of time.

From the nature of the inquiry, it is apparent that the prospective producer is interested in packaging his product in small cellophane or poly-

ethylene packets. Automatic packaging machinery is recommended for this purpose. A typical unit which is widely used in the industry for this purpose is the "Stokeswrap" packaging machine made by the Stokes and Smith Company of Philadelphia, Pa. This machine continuously takes a web of film, forms a bag by wrapping the film around a forming device, fills the bag with a measured volume of nuts and heat seals the two ends and back of the bag. A typical unit, with two adjacent filling lines, is capable of forming 20,000 to 25,000 packets per day. These machines are priced in the neighborhood of $12,000.

3. Product Preservation

All nut products have a relatively short fresh-storage life as a result of their high oil content. The degradation of the oil content is hastened by high processing and storage temperatures and exposure to air and light. The fresh-life of processed nuts is extended by the use of proper packaging and a low storage temperature. The development of rancidity has been further retarded by the addition of certain antioxidants to the product during processing.

An antioxidant called "Tenox", manufactured by the Eastman Chemical Products Company, is an example of the products developed for extending the fresh-life of many types of nut products. The antioxidant may be introduced directly in the cooking oil, or salt containing the antioxidant may be used in the salting operation. In the case of the Tenox products, the recommended use level is 0.05% Tenox 6 in the cooking oil or salt. A second technic involves the use of a spray of Tenox 4 diluted with oil, applied directly to the raw nuts before they are processed. In this case, the recommended level is 0.025%.

When an antioxidant is added to the cooking oil, some loss of the additive takes place as a result of steam distillation. It is therefore recommended that 0.05% Tenox be added to the oil every 8 hours. Alternatively, half of this amount may be added every 4 hours.

Recently some stabilized liquid shortening products have been developed which can be used as the cooking medium in place of the cooking oil. Since these products are already stabilizied, no antioxidant additives are required. A typical product is "Frymax", produced by the Proctor and Gamble Company. The stability of the shortening has been shown to be extended to the finished peanuts. However, since these new shortenings are relatively recent developments, it is recommended that the inquirer use coconut oil containing an antioxidant as his cooking medium.

II. Equipment

1. Plant Layout

A suggested layout for a salted peanut plant is shown in Figure 2. The proposed layout is designed for a two-story building. The equipment can also be installed in a one-story building provided additional bucket elevators are employed where appropriate. The peanut sheller, which is not shown in the drawing, can be located convenient to the roaster.

2. Equipment Specifications

The equipment specifications, catalog numbers and cost figures shown below were obtained from a proposal supplied by the Bauer Bros. Company of Springfield, Ohio, who manufacture all of the pertinent processing equipment except for the fryer. Peanut fryers of many types and capacities are manufactured by J. C. Pitman and Sons, Inc., Concord, New Hampshire. The weights shown below are the approximate shipping weight of each unit; the costs include export crating and are f. o. b. Springfield, Ohio.

a) Shelling

One (1) No. 402 peanut sheller including 16"x6" face drive pulley for operation at 275 r.p.m.; average capacity - 1 ton per hour; weight 1400 lbs. Price - $880.00

One (1) 5 h.p., 1000 r.p.m. motor for driving sheller; weight, 195 lbs. Price - $275.00

One (1) 5 h.p. magnetic starter; weight, 13 lbs. Price - $38.00

One (1) No. 242 - 48" x 10' single shaker-grader with perforated steel sash, side spout and 16" x 4" face drive pulley; weight, 2500 lbs. Price - $1,571.00

One (1) 2 h.p., 1000 r.p.m. motor with starter; weight, 220 lbs. Price - $292.00

One (1) No. 25 exhauster with one L-3303 Aspirator, discharge pipe and piping; weight, 770 lbs. Price - $655.00

One (1) 5 h.p. motor drive for exhauster including starter; weight, 285 lbs. Price - $260.00

Total Cost for Shelling Equipment - $3,971.00

b) Processing

One (1) No. 380 bucket elevator, 16' 2 1/2" high, with 1/2 h.p. motor and starter, 375 lb. receiving hopper No. L-3559 and discharge spout; weight, 2025 lbs. Price - $1,131.95

One (1) No. 322 Radiant Ray Roaster with 3/4 and 1/4 h.p. motors, charging hopper and controls; capacity - 3 bags or 375 lbs. of peanuts per batch or approximately 1400-1500 lbs. per hour; weight, 3040 lbs. Price - $4,049.00

One (1) No. 332 thermo color control with indicating dial, signal lights and motor controlled valve (the color control registers and controls the temperature and color of the peanuts during the roasting operation); weight, 300 lbs. Price - $862.00

One (1) No. 325 tilting type cooling car with track, air box, rails, piping and one No. 25 exhauster fan with drive, 3 h.p. motor and starter; weight, 1600 lbs. Price $1,557.45

One (1) No. 21831 - PL baffled hopper for storage and curing, including a 4" diameter L-2476 gate valve and 4" magnetic separator; weight, 960 lbs. Price - $372.50

One (1) No. 346 whole nut blancher with two 1/2 h.p. motors and starter, cyclone collector and No. 238 permanent magnet; weight, 2175 lbs. Price - $2,787.00

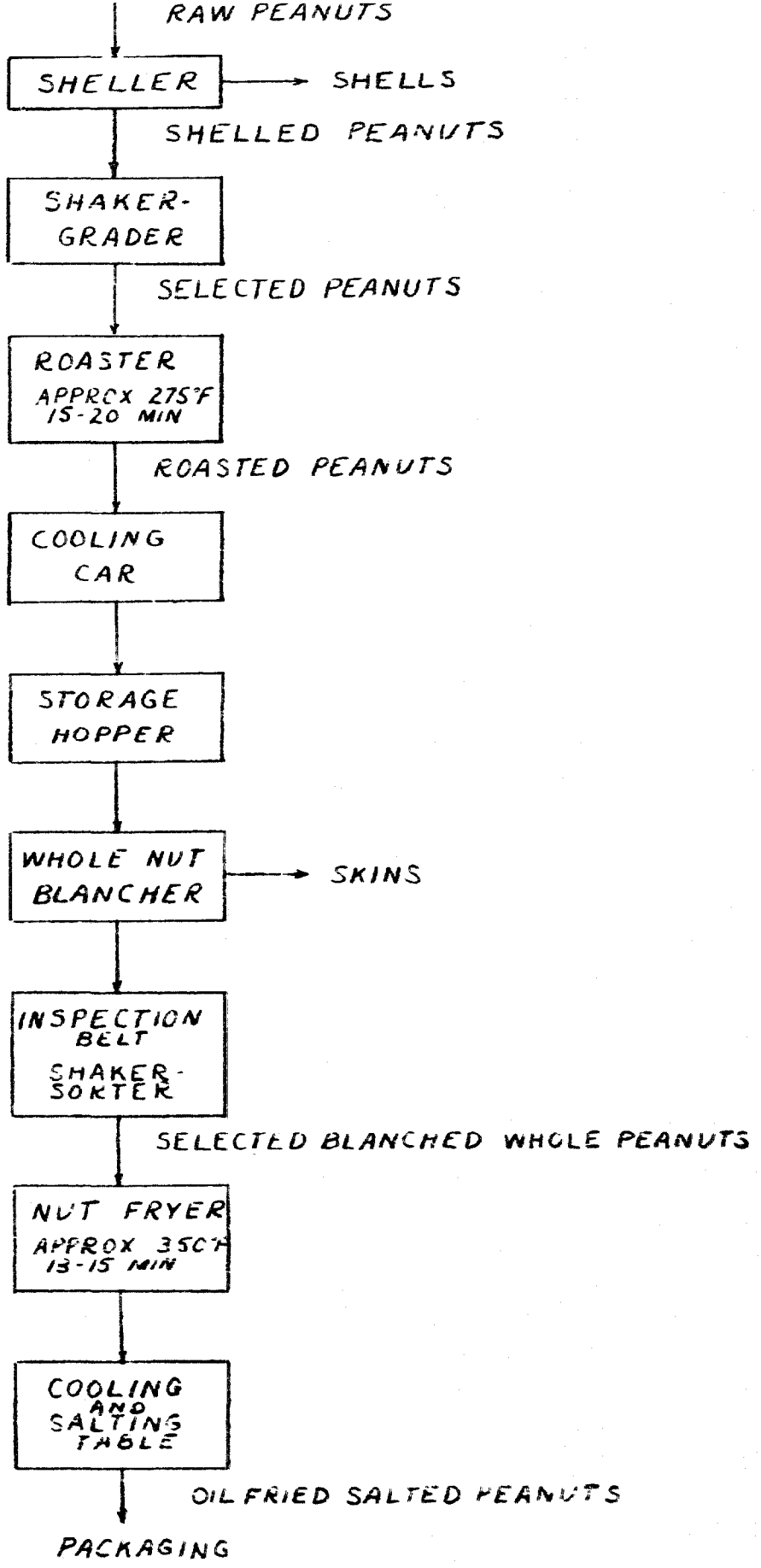
One (1) Model 24x54 Pitco Nut Frialator with stainless steel fat container for oil frying of whole peanuts; capacity, approx. 250 lbs. per batch or approx. 1000 lbs. per hour; weight, 1500 lbs. Price - $1,650.00

One (1) No. 329 cooling table, tilting type, stainless steel built-in oil filter, for oil-fried nuts, with adjustable air control cooling valve; weight, 1150 lbs. Price - $1510.00

One (1) No. 25 exhauster for use with cooling table with drive, 3 h.p. motor, control and discharge pipe; weight, 800 lbs. Price - $564.25

Total Cost for Processing Equipment $14,484.15

The over-all capacity of this plant is approximately 1000 pounds per hour.



NO.	REVISIONS	DATE
3		
2		
1		

PROCESSING OF OIL FRIED SALTED PEANUTS

FOSTER D. SNELL INC.

STR. ____ CHK. ____ DATE ____ SUPERSEDES ____
FIN. ____ APPD. ____ SCALE ____ SUPERSEDED BY ____

FIGURE 1

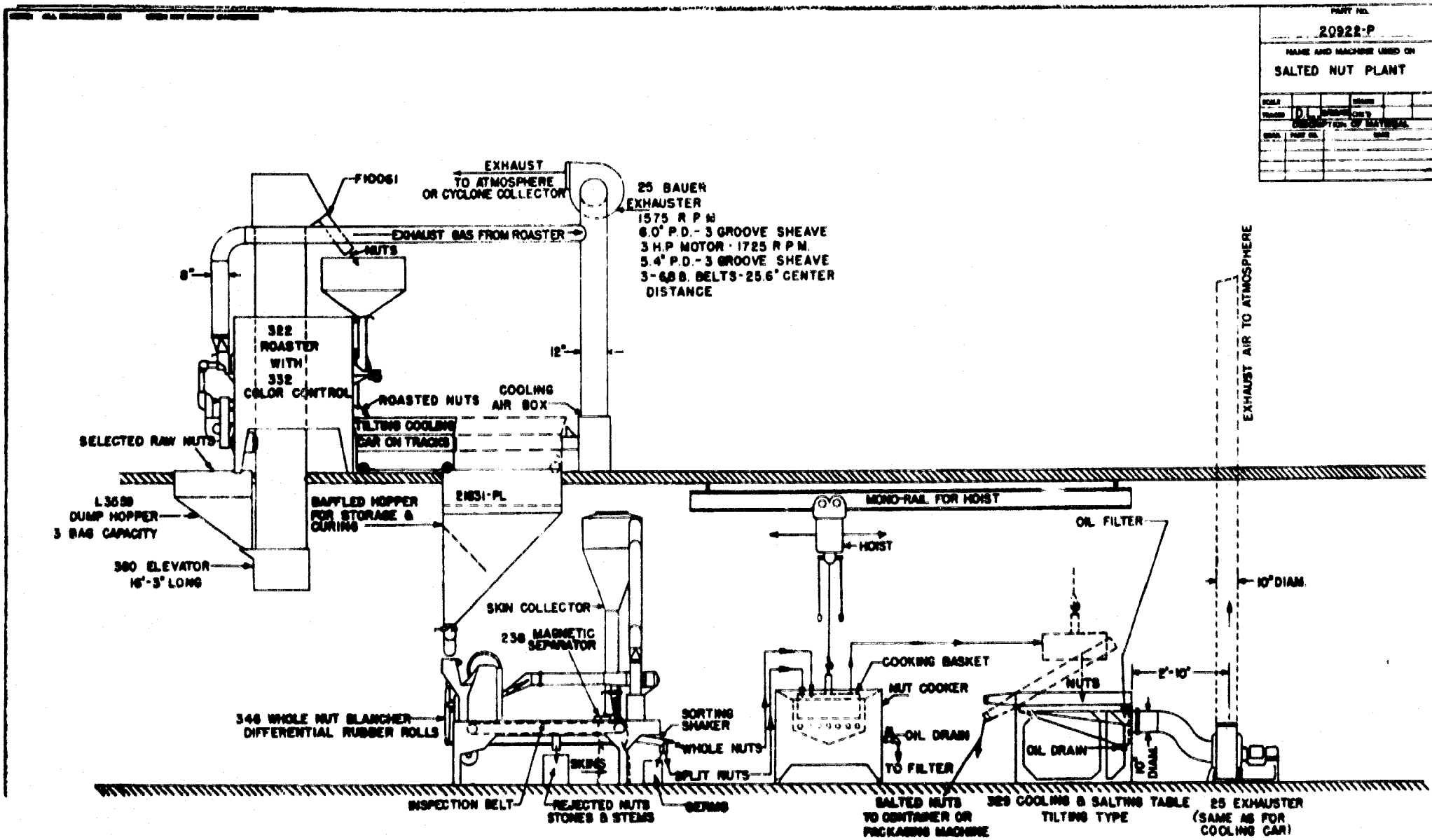


FIGURE 2

EQUIPMENT LAYOUT FOR PROCESSING BLANCHED OIL-FRIED PEANUTS