

times required in various rooms used, depending upon the method practiced.

The pre-chilling method results in a minimum of drip of moisture and fat, therefore, reduced shrink. In addition to the room conditions shown, air velocities up to 500 fpm past the product is the practice. After chilling, the smoked meat is transferred to the hanging room until needed for wrapping and shipping. Where more rapid cooling of the product is desired blast chilling with forced circulation at high velocities and lower air temperatures is employed.

Some plants do not pre-chill but move the smoked meat directly from the smokehouse to wrapping and packaging room. The product arrives with an internal temperature of 90 F to 130 F and is cooled to 50 to 55 F in 16 to 24 hr.

Cook-before-eating type hams and picnics reach a minimum internal temperature of 140 F in the smokehouse. A temperature of 137 F is required for the destruction of possible live trichinae and, consequently, the meat must not be kept in the incubation range of 50 to 105 F for any great length of time. They reach the chill or storage room at 110 F to 130 F and are chilled to an internal temperature of 55 F to 60 F, after which they are stored at 45 F db, 70 percent relative humidity.

Ready-to-eat hams and picnics come out of the smokehouse at an internal temperature of 155 F and reach the chill or storage room at 120 to 140 F. They are chilled to an internal temperature of 45 F in about eight hours and are stored at 45 F db, 70 percent rh.

Wrapping rooms are generally held at 45 to 50 F db, 70 percent rh. Lower temperatures tend to reduce worker efficiency and output.

Smoked meat storage rooms may be maintained at a temperature of 45 to 50 db or at 28 to 32 F db, depending upon handling conditions. Storage temperatures required must be such as to prevent condensation forming on the product after it is moved out of the storage room.

A storage room temperature of 45 to 50 F db is used where delivery from the plant to the retail outlets is made within a short period of time. Storage room temperatures at 28 to 32 F db are used when the product is transferred to points considerably removed from the plant, and this transfer is made through controlled, low humidity rooms, docks, cars, or trucks, where the dew point of the air is below that of the product during shipment and delivery.

Bacon usually reaches a maximum temperature of 125 F in the smokehouse. As most of the smoked bacon presently produced is packaged as sliced bacon, it may be transferred directly to the chill room if it has been skinned before smoking. If the bacon is to be skinned after smoking, it is usually allowed to hang in the smokehouse vestibule for 2 to 4 hr until it drops to a temperature of 90 F before skinning.

Bacon is usually molded and sliced at temperatures just below 32 F. Chill rooms are usually designed to reduce the internal temperature of the bacon to 26 F in 24 hours or less, requiring a room temperature of 20 to 24 F db. A tempering room (also serves as storage for stock reserve) held at the exact temperature at which bacon is sliced is often used.

Bacon molding can be done either after tempering, in which case it is moved directly to the slicing machines, or it may be molded after the initial hardening, and then transferred to the tempering room. In the latter case, care should be taken that none of the slabs are below 24 F so the product will not crack during the molding operation. Bacon that has been cured by the pickle injection process generally shows less pickle pockets if molded after hardening and placed no more than eight slabs high on pallets and held in the tempering room in this manner.

In any of the rooms mentioned the air distribution must be uniform. The air supply from floor-mounted unit coolers should be delivered through slotted ducts or by means of closed ducts supplying properly spaced diffusers so directed that no high-velocity air streams impinge on the product itself in order to minimize shrink. The exception would be in blast chill rooms where high air velocities are needed but the product is subjected to the condition for only a short time.

Refrigeration may be supplied by floor or ceiling mounted type units or wall coils. The units may be of dry coil type in which the refrigerant temperature is maintained above the frost point, or brine spray, water defrost, or hot gas defrost may be used where the refrigerant temperature is lower.

FRESH PORK HOLDING

Fresh pork cuts are usually packed on the pork cutting floor. If they are not shipped the same day that they are cut and packed, they should be held in a cooler having a temperature of 26 to 28 F.

The types of product usually held in this cooler are pork loins, spare ribs and pork shoulders. Loins are individually wrapped in wax paper and packed in fiber boxes ranging in weight from 60 to 70 lb. Pork shoulders are also individually wrapped and packed in approximately 50 lb fiber boxes. Spare ribs are usually packed in 25 lb fiber boxes with a wax paper liner.

Refrigeration for this cooler can be provided by either cooling units or direct expansion coils. Coils should be placed so that defrosting operations can be performed without interfering with the product.

Most packers, however, prefer to use forced air cooling units for this type of service. Cooling units will provide better air circulation, more uniform temperatures throughout the room, minimize ceiling condensation caused by air entering doorways, due to traffic, from adjacent warmer areas, eliminate necessity of coil scraping or drip troughs if hot gas defrost is used.

Cooling units may be dry type with hot gas defrost, or wetted surface with brine spray. Units should be provided with air diffusers to prevent direct air blast upon product. Unless room shape is unusually odd, discharge duct work should not be required.

Since the product is boxed and wrapped and the holding period short, it is felt that humidity control is not too important. For automatic temperature control the fans of the unit may be controlled, on and off, thermostatically. With a direct expansion coil the liquor supply should be controlled by a solenoid shut off valve in series with the fan control. A thermal expansion valve should be provided for liquor control. If a flooded coil is used it is also advisable to use a solenoid shut off valve in series with the fan system to prevent liquid spillover into the suction because of leaky float valves in the accumulator.

Since the product entering the room is at or near the holding room temperature, the product refrigeration load is small. The refrigeration load consists chiefly of room, equipment, and occupant heat gains.

BACON SLICING AND PACKAGING ROOM

Bacon should enter the slicing room chilled to a uniform internal temperature. This internal temperature will range from 26 to 32 F depending upon the individual packer's temperature standard. Internal temperatures below 26 F tend to cause shattering of the product during the slicing operation. Internal bacon temperature above 32 F causes improper shingling from the slicing machine.

The slicing and packaging room temperature and air move-

Meat and Fresh Fish

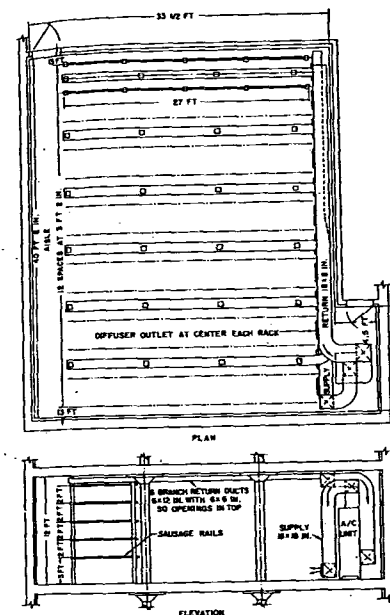


Fig. 8 . . . Sausage Dry Room

ment usually are the result of a compromise between the creature comfort demands of the operating personnel and product requirements. The room temperatures most commonly employed are 48 to 52 F db.

An objectional amount of condensation on the product may occur. To guard against this it is advisable to maintain the coil temperature slightly below the temperature of the bacon entering the room in order to keep the dew point of the room air below the product temperature. Exposure of the product to the room air should also be for the shortest time possible.

Adequate exhaust ventilation should be provided to remove the smoke and fumes from the sealing and packaging equipment.

Refrigeration for this room may be supplied by forced air units or ceiling coils of the finned type.

Forced air units may be floor or ceiling mounted, dry or wetted coil.

Dry type coils should be provided with defrost facilities, if the coil temperatures are to be maintained at a temperature more than several degrees below freezing. Air discharge and return should be evenly distributed, using ductwork if necessary. Noticeable drafts on personnel should be avoided. To accomplish this, air velocities in the occupied zone should be in the range of 25 to 35 fpm. The temperature differential between primary air and room air should not exceed 10 F if personnel comfort is to be seriously considered. To provide optimum comfort conditions and also control dew point, re-heat coils are necessary.

Where ceiling heights are adequate, multiple ceiling type units can be used to advantage in minimizing the amount of ductwork required.

Automatic temperature and humidity control of cooling units is desirable.

Finned type ceiling coils should be provided with drip troughs with suitable drainage. This type of refrigeration provides the most draft-free conditions. However, it is difficult, if not impossible, to maintain the dew point of the room air low enough to approach the product temperature. There are some installations that are operating with relative humidities between 60 to 70 percent which evidently are not having product condensation problems.

One method of control consists of individual coil banks, connected to common liquor and suction headers. Each bank is equipped with a thermal expansion valve. The suction header is provided with a manually operated back-pressure valve. Thermostatically controlled solenoid shut-off valves in both suction and liquid header, are both controlled by a single thermostat. This arrangement provides a simple automatic defrosting cycle.

SAUSAGE DRY ROOMS

Refrigeration or air conditioning is an integral part of year round sausage dry rooms. The purpose is to produce and control the air conditions for the proper removal of moisture from the sausage.

Dry sausage is manufactured in a wide range of varieties. This type of sausage is in general uncooked and its keeping qualities depend on curing ingredients, spices and removal of moisture from the product by drying. In general, this sausage is of two distinct types, one variety being smoked and the other not smoked, sometimes known as the Italian type.

The USDA Meat Inspection Division regulates the minimum temperature and period of time that the product must be held after stuffing and prior to release, depending on the method of production. The dry room temperature shall not be lower than 45 F, and the length of time the product shall be held in the dry room and prior to release is dependent on the diameter of the sausage after stuffing and on the method of preparation used.

After stuffing, the sausages are held at a temperature of 60 to 75 F and 75 to 80 percent rh in the sausage green room to develop the cure. The sausages that are suspended from sticks at the time of stuffing may be held on the trucks or railed cages or transferred to racks in the green room. Sausage in 3 1/4 to 4 in. diameter casings are generally spaced in 6 in. centers on the sausage sticks. The length of time the sausage are held in the green room will depend on the method of preparation, the type and dimensions of the sausage, the individual operator, and may vary from two to ten days.

The varieties of sausage which are not smoked are then transferred to the sausage dry room (Fig. 8) and those which are to be smoked are transferred from the green room to the smokehouse and thereafter to the dry room.

It is recommended that conditions under which the product is most favorably processed in the dry room are from 45 to 55 F db and 70 to 74 percent rh. Some favor the lower range of temperature (45 to 50 F) for the unsmoked varieties of dry sausage, with the higher range (50 to 55 F) for the smoked varieties.

The drying period under optimum conditions is dependent on the percentage of drying particularly suited to the trade demand. A moisture removal of 20 to 30 percent in 30 days, which is considered a medium dry product, 30 percent in 60 days and 35 percent in 75 days, described as a fully dry sausage is typical of a sausage referred to as salami.

In the processing of dry sausage, the moisture can only be