operated with an adjustable temperature control so that the operator may adjust temperature slightly to best suit his requirements. The low-pressure control on the condensing unit should remain to act as a safety device and shut off the unit to prevent freezing of flowers. The turnover in stock displayed in a retail florist refrigerator should be about two to three times a week. The trend among florists today is toward larger display and storage refrigerators for modern merchandising and to handle increased volume of sales.

Biological Refrigerators

The vast increase in the use of vaccines has brought about a correspondingly increased use of biological refrigerators. They are now found in pharmacies, hospitals, physicians' offices and clinics, and medical laboratories. Most biologists' serums and vaccines require refrigeration for proper preservation and to retain highest potency. In hospitals and laboratories, the refrigerator temperatures should be 34 to 38 F. In other locations temperatures may be slightly higher. The refrigerator should provide low humidity and, of course, should not freeze.

Biological refrigerators to contain smaller inventories may be of the household type. Where extensive inventories are carried, commercial sizes from 16 to 35 cu ft are used. In either case, a good part of the interior behind the doors should be arranged with a series of stainless steel drawers. The drawers should be equipped with identifying name-card holders and the bottom of the drawers should be perforated for improved air circulation. The cabinets can be stainless steel, porcelain baked enamel, steel or aluminum or any combination thereof. Locking latches are required on the refrigerator doors by some operators.

In laboratories, a two-temperature refrigerator is sometimes desirable. This refrigerator should also provide freezing space.

Formula Refrigerators

In hospital nurseries, where a quantity of formulas is required, special formula refrigerators are being used. These are conventional small commercial reach-in refrigerators, with slight alterations. In these refrigerators, the bottled formulas are cooled down from sterilizing temperatures to 40 F in approximately two and one half hours. This necessitates the application of oversized cooling coils, and possibly oversized condensing units. The adjustable shelves in the refrigerator should be spaced to allow the storage of the standard sized bottle rack baskets to hold the formulas in bottles.

Blood Banks

Today, there are Blood Centers in all principal cities, usually under the auspices of The American Red Cross. The Blood Center solicits, collects and stores the blood needs of various types for the community. From this central bank, proper types of blood are supplied to the local hospitals, where similar refrigerators are used in the hospital laboratories. In smaller communities, the hospital blood refrigerator may be the bank for the community. In the larger veteran's hospitals, a blood bank is also desirable equipment. In a blood bank refrigerator, temperature must be maintained at 4 to 6 C (39 to 43 F).

Blood is stored in and disbursed from 600 cu cm bottles, the size of which is approximately 3⅞ in. diameter × 6½ in. height. Each bottle is properly labeled as to the type of blood and the date that the blood was taken. Plastic bags for blood storage are now under consideration and may be used in the future.

An alarm system for the refrigerated blood bank is essential in hospitals; this can be an audible or a visual alarm, or combination. In blood centers that are closed during the night, an alarm system can be devised and connected to the local fire department. A recording thermometer, mounted on the wall beside the refrigerator, provides operating data and thus affords additional protection.

Refrigerators for blood bank storage are usually one, two, or four door reach-in refrigerators with slight variations. A cylindrical refrigerator with revolving shelves is also very popular. All are the self-contained type and can be obtained in various finishes.

Bone Banks, Arterial Graft Banks

As these items require storage temperatures sometimes as low as −50 F, special heavily insulated chest type freezers are used. These must be custom-built to specifications.

Mortuary Refrigerators

The use of mortuary refrigerators has grown considerably during the last few years. Principal users are hospitals, medical schools, municipal and government morgues, Army, Navy, and Air Force bases and some mortuaries. By refrigeration, these cabinets prevent the action of autolytic enzymes and growth of bacteria which produce deterioration of the corpse. The mortuary refrigerator serves to hold bodies until identification can be made or verified, until relatives at distant points may arrive or until the pathologist performs an autopsy. Storage in the refrigerator is usually short term, normally 12 to 24 hr at 34 to 38 F. Refrigeration is obtained by means of a standard air- or water-cooled condensing unit, with a forced-air unit cooler type coil.

Mortuary refrigerators are built in various sizes and arrangements, the most popular being two- and four-cadaver self-contained models. In the former cabinet, there are two individual storage compartments, one above the other, with the condensing unit compartment above and indented into the upper front of the cabinet and with ventilation grills on the front and top of this section. The four-cadaver cabinet is equivalent to two two-cadaver cabinets set together, the storage compartments being two wide by two high, with the compressor compartment above. Six, and either-cadaver cabinets are built along the same lines. The two-cadaver refrigerator is approximately 38 in. wide × 94 in. deep × 77 in. high, and is usually built and shipped set up. Larger cabinets require knocked-down construction, for assembly at the point of use.

Remote mortuary refrigerators are built with a similar arrangement of storage compartments. In some instances, where space is limited, the cabinet can be built with storage compartments three high; however, the top compartment is rather inaccessible without special handling equipment. Stainless steel is usually applied to the exposed exterior of the mortuary refrigerator, although wood, porcelain, baked enamel on steel or aluminum, or a combination thereof may also be selected. The same material can be used for interior surfaces, as specified. The door openings into the storage compartments should be at least 26 in. wide × 22 in. high or larger. Each compartment contains a mortuary rack consisting of a galvanized iron pipe-frame carriage supporting a stainless steel tray. The carriage is telescoping, equipped with roller bearings so that it slides out through the door opening, and is self-supporting even when extended. The tray is removable.

The front of each storage compartment door bears a stainless steel or chrome plated name-card holder for identification. Some specifications call for a dial thermometer to be mounted on the exterior front of the cabinet to give the inside temperature reading. It should be remembered, that in many instances, the mortuary refrigerator will set against a wall on one side or the other. Under these circumstances, special consideration should be given to the swing of the doors to insure greatest accessibility. Wide-clearance hinges on the doors often solves this problem by allowing a full opening when the door is opened 90 degrees.

Mortuary refrigerators may also be built-in, so that only the front is exposed. If the refrigerator is self-contained and proper ventilation for the air-cooled unit is not possible, a water-cooled compressor should be used.

RETAIL BAKERY REFRIGERATION

Until the late thirties, refrigeration played an insignificant part in the typical retail bakery operation; a reach-in for storing perishable ingredients was about the extent of it. However, two major developments have occurred since to make this segment of the commercial refrigerator market highly attractive to the equipment manufacturer.

One of these developments has been an increased appreciation of the value of display in building sales volume, coupled with greater awareness of the dangers resulting from displaying certain bacteria-prone types of bakery goods, such as eclairs, cream puffs and other filled items, without adequate refrigeration. The modern refrigerated bakery case not only eliminates a definite health hazard when such goods are handled by the shop, but enables the operator to offer them throughout the year, instead of during the cool weather season as in the past.

The second important development was the discovery, through research, that when the shaped items to be baked are placed in a refrigerated space under proper temperature and humidity conditions, the raising action of the leavening agent is slowed down. Hence, the basic unit of refrigerated equipment employed in this process has been named *dough retarder*. It is a specialized adaptation of the familiar reach-in cooler. A variation of the standard walk-in cooler may also be used for this purpose. Both types of enclosure may be employed for low temperature requirements.

Dough Retarders

Like all manufacturers, the retail baker is constantly concerned with his costs of material, labor and fixed overhead. His four basic material costs for flour, shortening, eggs and sugar, have been sharply affected by the inflation spiral in common with all other commodities. The labor rise has been constant, and the shortage of skilled bakers has become increasingly acute. Overhead costs have followed the same trend. In recent years, the baker has been confronted by still another problem, arising from the desire of many American housewives to do their food shopping on Friday or Saturday of each week, which leaves him with the problem of too little work for his manpower during the earlier days of the week, and too much work during the brief rush period at the end of the week. There is usually little opportunity to obtain part-time help to handle the weekly peaks.

The dough retarder refrigerator and its more specialized counterpart, the bakery freezer permits the average baker to spread his work load over the entire week, by enabling him to make up items at the beginning of the week for sale during the weekend peak, and permitting him to make up one large batch of a given item for the entire week, instead of turning out several small batches of his daily production items. His refrigerators also permit him to offer a greater variety of ovenfresh products to satisfy his customers' tastes, thereby increasing sales volume. This fact, plus the obvious lowering of production costs, provides an excellent example to show how refrigeration, intelligently applied, can perform both as a production tool and as a selling vehicle with resultant increase in profits.

Bakery products are made up from scientifically computed formulas, in which the temperature and relative humidity under which the products are stored must be closely held in order to carry out the retarding process at the proper rate and prevent deterioration of the unbaked articles. The recommended temperature for a dough retarder is 36 to 40 F. The relative humidity should be in excess of 80 percent (never lower) in order to prevent crusting or other undesirable effects. Since the leavening action of certain doughs cannot be retarded successfully for greater periods than 36 to 48 hr, the baker, who uses a conventional dough retarder only, is thus limited to that extent in his efforts to minimize his weekly production and labor problems.

Bakery Freezers

The bakery freezer, is in effect, a form of extended dough retarder, because when it is used with unbaked products it completely stops the leavening action of the raising ingredients, and so provides an indefinite storage period. Thus it may be used in combination with the dough retarder at normal temperature as a supplementary production tool with consequent economies. When the freezer is used to store finished baked products, it again provides an extended storage period; this latter application, however, depends upon the type of bakery product to be frozen unwrapped. Generally, the baker prefers this method, because his saving in labor often will be nullified by the cost of wrapping.

Since a bakery freezer may be used for either the baked or unbaked product, the same basic features of design and construction required in the conventional dough retarder should be followed. The temperature in a bakery freezer should not exceed 10 F with not less than 70 percent relative humidity. Both the freezer and dough retarder should be equipped with refrigeration coils capable of supplying their specific temperature and humidity requirements. All forms of refrigerated bakery storage or processing equipment should be equipped with racks to hold the 18 × 26 in. bun pans, which are standard throughout the baking industry, and for which size pan most types of bakery equipment on the market have been designed.

The average baker prefers that his refrigerated equipment be completely automatic. Hence, it is essential for both a retarder and a freezer that the coils or plates employed in the heat transfer operation defrost and dissipate excess water automatically so that no particular attention is required of the user. Ease of cleaning is also an important consideration in determining what exterior and interior finish materials will be used. Pan racks should be readily removable. It is highly important, of course, that the equipment be able to meet the inspection requirements of health agencies applicable to all establishments that process raw materials into finished food products for public consumption.

Walk-In Bakery Retarders and Freezers

The information given on the so-called reach-in or cabinet type of bakery retarder and freezer holds true for the walk-in