**Q 3: Which Is Better—Vacuum or Gas Packaging?**

*A 3:* The question is not which one of these types is better but rather which one is better suited for a given packaging assignment. Both vacuum and gas packaging do provide a means for increasing the shelf life of the packaged product. The vacuum package affords protection through removal of most of the oxygen surrounding the product. It is erroneous to assume that all the oxygen has been removed from the package. The amount of residual air will depend on several factors: equipment, maintenance of the equipment, the product, the speed of operation, package design, etc.

Each piece of equipment has some inherent limitations. It is best to consult the equipment manufacturer regarding the machinery specification. Can the equipment do the job? One must realize that no machine can run at 100% efficiency. The equipment must be rated appreciably better than the minimum acceptable performance level. It is also well to remember that neglect of maintenance will lead to rapid deterioration of equipment performance. Such equipment needs to be serviced periodically—on a preventive maintenance schedule—and spare parts must be stocked to avoid lengthy shutdowns.

Packaging machinery is normally rated for optimal operating efficiency. Thus a machine rated to package bacon at 90 packages/min. (ppm) should not be operated at 120 ppm. A cycle of about one-third of a second is allowed for evacuation of the package during normal operating speeds. If the speed is increased to 120 ppm, then the evacuation cycle is diminished to less than a quarter of a second. This time interval is inadequate to fully remove the air from the package. The resultant package would appear to
be a "leaker" (as if air had seeped back into the evacuated package) and suffer diminished shelf life.

The product may benefit from either vacuum or gas packaging—but not all products are suitable for either of these packaging modes. A soft, fluffy bread or cake would be compressed into a flat, inedible glob in a vacuum package. On the other hand, franks can be given added shelf life by this packaging method. This, however, does not hold true for all franks. Poorly formulated hot dogs contain a large amount of air. In a rapid packaging cycle, the air within the package is evacuated in a fraction of a second. But within a few minutes, the empty space is filled with air which has slowly oozed out of the franks. The package looks like it had never been evacuated. The product as formulated is just unsuitable for vacuum packaging.

Package design may determine the success of its evacuation. An oversized package, for example, requires the evacuation of an excessive volume of air. Tight control on the product size can often accomplish down sizing of the package and result in a better vacuum performance.

DEGREE OF VACUUM

Evacuation—removal of air—may take place to a greater or lesser extent by design. For example, vacuum packaging of angora sweaters can reduce space requirements by more than 50%. However, a very high degree of evacuation is not really required for this particular application. The normal food pack requires a vacuum level of 28" of mercury (711 mm). Extremely high vacuum levels, demanding an almost absolute 0% of residual oxygen, are rare. However, modern packaging developments have addressed this particular problem with two independent solutions. Higher vacuum levels—or lower residual oxygen—can be obtained by the use of backup pumps. This system of placing two (or more) pumps in series on a vacuum line has been employed for some time in the electronics industry. It permits both faster and better evacuation. A still newer approach involves the scavenger package, discussed in reply to Q 4.

GAS PACK

The gas package accomplishes the same end as evacuation, replacing the atmosphere with an inert gas. It should be noted, however, that some gas packages retain a considerable amount of residual oxygen. This is attributable to the type of gas packaging machinery employed. In some equipment the gas flushing operation "sweeps" an inert gas through the package—relying on the sweeping action to replace the atmospheric oxygen. This process, especially at high speeds, may leave considerable quantities of oxy-