ENERGY COST CONTROLS

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The retail food business is a complex affair. There are a lot of problems associated with this business, among them is the fact that there are a lot of different types of operators selling food, ranging from chains, independents, those in other types of direct food sales and even the fast food business.

In order to conduct business in the retail food trade one has to satisfy a lot of different requirements. These involve federal laws and codes as well as a large variety of state and local bureaus. All kinds of groups seem to be banding together to state in loud voices that they are being wronged for a wide variety of reasons. These things along with pressures have caused final of all problems--a profit squeeze. In fact at times it seems as if it is a game, and yet at other times it must appear to operators as if the opposition has an unfair advantage.

One of the adversaries has recently had a boost from high energy costs. Certainly high energy costs is adding to the profit squeeze. To begin with it is useful to look at the things commonly being done to try to control energy costs and minimize its destructive effect on the retail food business.

One of the most important things being done is not new although it is finally being generally accepted as the right thing to do from the standpoint of responsibility and energy costs. It involves a variety of ideas including:

1. Recovering heat that will otherwise be wasted from refrigeration equipment.

2. Flushing the aisles around refrigeration equipment that would otherwise be cold.

3. Using the cold air from the aisles to assist the air conditioning equipment.

An essential thing in order to control a heat recovery system is a sequence controller capable of regulating all of the functions as needed. An essential element in order to make the whole system work are the low returns that are accomplished. Still another way of accomplishing the low returns is to accommodate space for utilities and work space. An essential of the whole system is a humidity control that reduces the load on the refrigerators and saves significant amounts of energy.

The ordinary store without all of the things already described has cold aisles around the refrigerators all the time. Properly handled, the cold aisles are eliminated during the shopping hours, however, during the nonshopping hours the environmental control package does several things that deliberately creates a cold zone around the refrigerators, virtually acting as a night curtain and reduces the energy requirements used to operate them. The process of doing this is called night set-back. Another thing that the night set-back accomplishes is the blower motor. These usually involve a 7½ HP motor or larger or more than one. The heat that is recovered from the scheme already described is calculated and figured in as a credit to the heating needs of the store. In most stores, in most climates, the additional new heat required is very small or none is required at all.

The cooling recovered by the display cases is also calculated and figured as a credit to the air conditioning system. Again, it is easily shown that the quantity of air conditioning required is extremely small.

All of the ideas associated with heat recovery are commonly done today and the savings are dramatic. There are other dramatic savings. They involve operators doing "as good as they know how."

The easiest way to stop ordinary waste is through ordinary maintenance. Most refrigeration systems use air for cooling. If generous quantities of air do not get to the condenser or a refrigeration compressor system, the cost of producing the required refrigeration skyrockets. The condenser coils associated with refrigeration machinery should be cleaned regularly and thoroughly. Qualified people should be hired to repair and replace the few parts in refrigeration equipment that need maintenance. The same thing applies to the condensers on refrigeration machinery. All fan units must be in good operating condition. Qualified people should be directed to see that all of the wiring is tight. Proper people should be hired to make any necessary repairs to the refrigeration piping assuring freedom from leaks. Proper adjustment of the defrost controls according to manufacturers recommendations is also a must.

It should be noted by those responsible for the financial performance of a food store that the newer type of display cases consume less energy than those produced years ago. In fact, some of the early vintage of some of the vertical style of display cases may consume even larger quantities of energy, new equipment should be considered. A retailer through his own efforts can be a David slaying the Goliath of high energy costs. The design of open refrigerators is very specialized. They depend upon proper air flow that can be distributed in a variety of ways. Irregular loads interfer with air flow in the well type refrigerator. Voids in a display create poor air flow and, of course, stock-outs are detrimental to sales. Drafts caused from improper heating or cooling air are an enemy of efficient operation. Vertical open cases, too, are affected by improper air flow from store grills. A properly loaded display case produces not only inviting merchandise; but also the most efficient refrigerator operation. Those inviting pyramid displays do attract shoppers for canned goods, but in refrigerators such displays have disastrous effects on the refrigeration costs.

Aside from the operations there are things related to the building that can be done. These apply to retrofiting as well as to new construction. Sealing and insulating the building is the first and most important. Separating the sales area from the storage area is vital in order to reduce the need for heating and cooling of the area not devoted to sales. The use of vestibule doors is also vital in order to minimize the added cooling and heating needs and for comfort around the checkout counters.

The application of dock seals for the loading area adds an element of control to a location that usually wastes large amounts of energy. One of the innovations now available is a strip curtain that can be used to separate areas with different temperature zones. These strip curtains can be used in a lot of locations, including cutting and processing rooms and as an addition to any walk-in cooler door, which might otherwise be propped open.

There are a lot of new things on the scene in the way of controls to reduce energy costs for operating a retail food store. One such system involves a multiple function control system. Among other things it includes a store environmental controller, a temperature controller for all of the refrigerators, a defrost control to proportion the frequency based on need, and running time recorders that measure the on-time for many of the electrical loads in the store.

From the business standpoint an analysis is easily made to show the payback for such an investment based on energy savings alone. It can be seen here that the year's payback is very attractive. Yet another system commonly available is for hot water heating for the service hot water needs of the store. The hot water heater also pays for itself in a short period of time. With less than a year's payback, it appears to be a good investment.

Still other types of control devices monitor the electrical loads to the store and reduce the peaks, thereby sometimes reducing the electrical utility bill. While this is highly varied, the justification is totally dependent on the structure of the billings from the utility.

Typically, the electrical demand level of electrical supply to a supermarket is uniform almost year round and certainly from night to day. Additionally, there is a great deal of variation among utilities in their billing structures. Some have little or no charge for the demand level and charge only for kilowatts. Others charge substantially for demand, in some cases the payback takes slightly more than three years.

Going back to the display refrigerators and the way that they fit into the store, take a look at the use of space by a narrow center aisle, open frozen food case of the well type. If the space occupied by the case and the aisle on each side of the case are counted, the case utilizes only 25 percent of the floor space for display. Similarly, a wide center aisle freezer utilizes the space more effectively, filling the area with 31 percent display. A well type frozen food case utilizes the floor space even better--37 percent. Back-to-back or jumbo island cases utilize 38 percent of the floor space for display. Three or four shelf verticle frozen food cases provide 57 percent display area as a ratio of floor space use. Glass door frozen food cases give 66 percent display area to floor space and finally a six shelf verticle open display provides for 70 percent display area compared to floor space.

There are other ways of analyzing display cases. Take for example, their cost of operation per linear foot. This comparison is no surprise for it shows an increasing cost as refrigerators get bigger and more vertical. When looking at the cost of operation, as a ratio of display area, the larger refrigerators look better. Comparing operating costs against cube diminishes the difference further. Finally, when cost of operation is analyzed on the basis of facings, the larger refrigerators come off very well indeed. Simpler refrigerators, well type, actually cost more per facing than do the vertical open styles.

Another way to analyze these refrigerators is by a return on investment analysis. It appears that the very least conclusion that can be drawn is that refrigerators are a good investment. Even so, some consumer types are drawing conclusions that large open refrigerators are energy wasters and poor investments which suggest that there should be some kind of reversion to closed refrigerators or to the past.

Recall that the supermarket energy study made in 1975 and 1976 identified the amount of energy by a food store. Their data calculates to an average of 93 KWH per sq. ft. of store per year. The energy is consumed by a lot of different items. But let's analyze the energy used for retailing on a large scale using Progressive Grocer's information shown here and project this with S.M.I.'s energy use information and rationalize the total energy used in the food system in the U.S. Taking the retail sales from Progressive Grocer and dividing them by the developed 105.7 billion KWH of electrical usage for retailing it computes to $1.45 of sales for each KWH for electrical energy. This produces a benchmark that can be used for comparison. Using a large 25,000 sq. ft. store with good sales and energy usage amounting to a high 100 KWH of electricity per sq. ft. per year, the sales per KW are shown. Regardless of the kind of equipment employed by this store, though there is high energy usage, the productivity with respect to energy is extremely high at $4.00 per KWH.

Analyzing a like store with a very low usage of 60 KWH per sq. ft. per year, and only $4 million in sales results in only $2.00 per KWH of energy usage. Still good in terms of the $1.45 average but poorer by comparison with a store that uses considerable more energy but produces good sales.

Taking another example of a small store with low energy usage and $700,000 in sales per year it's shown that the energy usage is just about at the national average. And finally taking a small store with very little energy usage put with sales of only $100,000 a year, it can be seen that the productivity with respect to energy is extremely poor. All of which seems to say something that a retailer instinctively knows--volume is the key to almost everything, including energy usage. It also suggests that the system can purify itself of those that are not responsive to the requirement to be a good businessman.

In the industry a lot is being said about conclusions that tend to be drawn by superficial things. As for example, the overall aura of the idea that frozens use more energy, yet a study conducted by Cornell University for the American Frozen Food Institute in a previous report made of a study conducted in Sweden shows that the overall process of canning certain foods uses more energy than the process of transporting, marketing and consumption of similar frozen food.

There are those who would threaten the use of open display cases, particularly the verticals, because of energy considerations. Yet, we've already shown that high energy usage and high sales produces excellent productivity.

There's been consideration to outlaw the use of fluorocarbons in all uses. This threatens the very guts of the retailing system. Yet a recent study in process by the Commercial Refrigerator Manufacturers Association shows that of the one billion pounds of fluorocarbon refrigerant produced today, an approximate nine million pounds is being consumed for food retailing. The threats suggest that there is a better more effective way, but no more effective way is immediately obvious. But what is obvious is that the game is on and that the players of the opposition seem to be doubled up. Even so, they still have every reason to believe that the retail food business can survive by recognizing the dilemma and acting at least in some of the ways suggested in this program.

Summary Statement about Electrical Usage Ratios

Electrical usage to sales ratio indicates that $153 billion food retail sales uses 90.1 billion KWH electrical usage costing $1.70 per KWH or $1.00 in sales takes 5300 BTU's.

A 25,000 sq. ft. store takes 100 KWH per sq. ft. or 2,500,000 KWH per year with $10,000,000 annual sales which computes to $4.00 per KWH.

A small store of 2,000 sq. ft. using 70 KWH per sq. ft. uses a total of 140,000 KWH per year with $100,000 annual sales, spends $.71 per KWH.

A small merchant selling on the street from a truck has sales of $100 per day and uses 10 gallons of gas per day or 13,900 BTU. Is this energy efficient?

National Energy Use Analysis

A *Store Population	B Approx. Ave. Sq. Ft. Sales Area (Est.)	C National Total Sq. Ft. A x B (000,000) Omitted	D Annual KWH Usage (000,000,000) Omitted
Supermarkets 32,700 1,000,000 + Sales	15,000	490.5	C x 91** 40.6
Superettes 12,000 1,000,000 to 500,000 Sales	7,000	84.0	C x 87** 7.3
Small Stores 111,600 Under 500,000 Sales	3,500	390.6	C x 80 31.2
Convenience Stores 27,400	2,400	157.8	C x 70 11.0
		Total	90.1

* From Progressive Grocer
** From SMI Energy Study