Efficient Operation of Independent Grocery Stores in New Mexico

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Abstract

In rural New Mexico, the scarcity of grocery stores can create considerable challenges to getting healthy and affordable food. The lack of grocery stores creates a situation in which food choice is limited, and long driving distances to grocery stores are common. Having a grocery store in a community has many benefits beyond just convenient access to healthy and nutritious food. They also provide jobs, generate tax revenue, are active contributors to the broader quality of life in their respective communities, and even help attract new residents to the area. Unfortunately, though, many small grocery stores, particularly those in rural areas, are going out of business or are experiencing high operational costs that challenge their economic viability.

A team of faculty, staff and students from Engineering New Mexico Resource Network (ENMRN) at New Mexico State University (NMSU) and Manomet, Inc. a nonprofit organization has been helping independent grocery stores in reducing the operating cost of grocery stores while emphasizing the environmentally beneficial aspects of theses cost saving operational changes. This is accomplished by focusing on reducing energy and water consumption, reduction of solid and liquid waste and, air pollution. An in-depth report is then generated with estimated costs and benefits of the business's current practices and for ENMRN's recommendations and alterations. During the endeavor to improve the operations of eight locally-owned grocery stores throughout New Mexico, an annual total of $130,762.80; 450,147-kilowatt-hours (kWh); 1,071,575 gallons of water; 40.95 tons of waste; and 727.17 tons of carbon dioxide (CO_2) were saved across all stores.

Introduction

Since 2016, ENMRN has been conducting programs to aid in the environmental and economic performance of businesses, accomplished by their staff and students from NMSU. This results in a three-fold effect; reduction of harmful practices towards the environment, financial improvements of businesses, and wider distribution of valuable information.

Focusing on locally owned grocers, ENMRN advises them towards greener operations and improvements by reducing energy consumption and decreasing pollution generation. The suggestions given range from low-cost improvements; such as developing a maintenance schedule for a piece of equipment; to improvements that require a significant investment; such as replacing equipment with more efficient variants. No matter the suggestion, the result is the same; lowered energy usage, less pollution generation, and a more financially efficient business.

While benefits to the grocers are the main goal, there is an additional benefit from conducting these studies, and that's for the students. Students take part in site visits, all the way to final report construction for each business. Throughout the process, they learn to identify the vulnerabilities and flaws in business practices and how to overcome them, all while implementing the skills they have learned at NMSU.

In the end, ENMRN's studies accomplish quite a few feats. Lessening harmful impact on an environment, saving a business money, and educating both the present and future workers and business owners of how to help the environment.

Method

To begin a study, ENMRN will contact eligible local grocers, offering their services. Once a business has agreed to be assessed, a meeting time is arranged between ENMRN and the grocer for an on-site visit. The team will then spread out through the store, taking note of each aspect they can find, both current practices employed by the grocer and their utilities, focusing on factors that can improve energy usage, water usage, and solid waste generation.

To save a grocer energy, the team would take into account multiple facets including lighting, cooling, and general operation time. With regards to lighting, the store's overhead illumination set up and refrigerated display lighting would be evaluated by the model of bulb used, the type of bulb, and how long they are left on each day. Cooling can have many factors that could cause excess energy usage. These factors range from frost build-up within the machine to the doors of walk-in freezers being left open unintentionally; all leading to the unit having to cool excess air due to leaks. Additionally, features known as night curtains are taken into account. These curtains block out significant amounts of sunlight, thus reducing heat buildup within the store during hotter times of the day, thus reducing the use of the store's air conditioning system.

To reduce water usage, the team would take note of the toilets, type of soap used throughout the store, faucet types, and implementation of aerators on the faucets. Both toilets and faucets can vary on their water usage, therefore, they are checked for their model variant and performance. While not usually thought about, the type of soap used can also play a large role in water consumption, so it is important to be noted what type is present. Aerators attached to faucets are also quite important. They provide desired water pressure, while reducing the amount of water passing through a faucet, thus reducing the faucets water consumption.

To reduce solid waste generation, however, the process is not as straight forward. Depending on the grocer's location, and the services offered by nearby businesses, methods of waste disposal may or may not be available. For grocery stores, solid waste can be a multitude of materials. These include food, plastics, wood pallets, and metal cans. Most often, there are services in the grocery stores local community that has methods of disposing of these materials that do not involve landfills. Recommendations for these types of materials often include recycling or reusing. In the case of food, donating to food banks or local farmers; if available; are often recommended. Plastics, wood, and metal materials are recommended to be recycled or reused.

After spending the day gathering as much information as possible from the grocer, the real work begins; report construction. In the reports that ENMRN returns to the businesses they assess, all of their information is compiled and evaluated. Focusing on lightbulbs, the team would show the benefits of replacing all those fluorescent bulbs with light emitting diodes (LEDs) by using the properties of a suitable replacement as comparison. This comparison would include the price for both types of bulbs, the electricity usage for each type of bulb, the carbon emissions generated by the power consumed by each type of bulb, an estimated cost to replace all existing bulbs with the recommendation, and an estimated annual cost savings from implementing the change.

A similar approach would be taken for replacing the toilets. If the existing fixtures are not classified as low flow, the would be compared to a low flow variant. To be classified as a low flow variant by the U.S. Environmental Protection Agency (EPA), a fixture must consume 1.28 gallons per flush (gpf) or less. A comparison between the existing model, and a suitable replacement would be conducted, their annual water consumption would be estimated and the total water saved would be calculated. Following this would be the annual money saved if the change was implemented.

Solid waste reduction follows a different process. Depending on the method of disposal, recommendations would be made on how to improve the waste stream. In the case of the aforementioned deli section, if all their unsellable food is simply sent to a landfill, an estimated amount of waste would be used to generate figures illustrating that waste's impact on the environment. When food is sent to a landfill, it decays and rots in the sun, all the while releasing CO_2 into the atmosphere. This estimate would be illustrated and a list of alternative solutions would be generated. ENMRN would look for local organizations or businesses that offer services that have alternate methods to dealing with such waste, and their information would be passed on in the report.

Additionally, ENMRN encourages any suitable practices that the grocer may have been executing prior to the study. For instance, if the grocer's bakery was donating bread to a local food bank as opposed to throwing it away. The team would gather an estimate of the total weight of bread sent to the food bank, and calculate the CO_2 that would have been emitted if it were sent to a landfill. Illustrating the impacts of the less desirable method of disposal provides quantifiable and tangible feedback for the charitable action, reinforcing and encouraging the action into the future.

These suggestions are merely a handful of examples that ENMRN often make to businesses. Once all research has been conducted and evaluated, the official report is constructed. A walkthrough of each calculation and reasoning for each recommendation is described, supporting evidence or encouragement for actions are supplied.

Case Results

As stated prior, through ENMRN's assistance, eight local grocery stores were able to save $130,763 annually. These savings were achieved in different ways, using alternate means depending on the business that was assessed.

In the case of one such business, it was estimated to reduce the amount of solid waste it sent to landfills by a staggering 36.7 tons. Due to the various materials that any grocery store generates on a daily basis, there were a multitude of ways that this grocer was able to make use of. Of course, being a grocery store, the largest source of waste was food. While these foods are not suitable to sell, they are still suitable to be eaten, generally. It was recommended that this grocer, instead of throwing the food away, donate it to their local foodbank or local farmers. This allowed the food to still serve its purpose as opposed to sitting in a landfill decaying. Other solid waste sources were also contributors to this reduction, but all resulted in the same recommendation, recycle or reuse.

When considering water consumption, another business was estimated to save 283,705 gallons. Higher than average water consumption is to be expected from a business that deals with food; the water is needed to make sure goods are clean and ready to be sold. Sometimes, though, they forget that there are other sources that use water that should be monitored, such as in the restroom. In this particular business's case, they did not have all low flow variant toilets. These toilets were the sole contributor to water savings, but the act of replacing them had a tremendous impact.

Delving into energy consumption, a grocer was estimated to conserve 190,488 kWh, just in one year. Due to the sheer size of this establishment and consumer demand, it warranted having multiple walk-in freezers. Unfortunately, freezers are one of the largest consumers of energy, especially in the warm desert environment of New Mexico and people had a tendency to leave the doors to these walk-in freezers open. This resulted in costly energy consumption as the coolers attempted to cool excess air that was simply escaping through the open door. In an effort to correct this issue, ENMRN recommended the employment of door alarms that would trigger when the doors were left open for excess time. While being the largest contributor to energy consumption, other suggestions were made regarding power; such as unblocking air curtains, or replacement of light bulbs with LEDs. These and other suggestions contributed to such an impressive reduction in power usage.

Conclusion

Ultimately, ENMRN worked closely with these eight grocers to ensure they were able to achieve as efficient of operation as possible. Additionally, the businesses themselves reduced their contribution to sources of pollution and helped conserve resources. With their considerable annual savings, they will be able to operate more efficiently and ideally continue to serve their local community. Independent grocery businesses like the ones that participated are vital connections to ensuring rural New Mexico communities have access to healthy foods and strong futures for their residents, so helping them achieve more efficient practices is paramount to their communities.