BULK MILK DISPENSER REVIEW: A CASE STUDY AT NEW LONDON-SPICER HIGH SCHOOL

by

Katelyn J. Larsen

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Milk dispensers are often considered a thing of the past, a thing that baby boomers reminisce about. The United States' obsession with sanitation and grab and go packaging has converted the dairy industry from bulk dispensers to individual 8 oz cartons and bottles. However, a few schools across the county have begun switching back to milk dispensers as a way to reduce waste and be sustainable. New London-Spicer High School is the first public school in Minnesota to switch back to dispensers. This report discusses the background of the project, methodology, and results. Several aspects comparing the bulk milk dispenser system to the usage of milk cartons were examined: economic costs and benefits, lunchroom solid waste and recycling generation, energy consumption, water consumption, liquid milk waste, and staff and student labor. Results indicated that there were great environmental benefits associated with switching from milk cartons to milk dispensers: waste reduction, greenhouse gas reduction, tree conservation, and energy reduction. Additionally, there were nutritional benefits seen through increased milk consumption.

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Introduction

In the United States, K-12 schools produce a large amount of solid waste, including food waste. To save on disposal costs and protect the environment, schools have started recycling, composting, and waste reduction programs. Minnesota's solid waste management hierarchy states that reduction and reuse are preferable to recycling and composting (Minn. Stat. §115A.02 (b)).

Milk cartons are one of the commodities that every school has a high volume of. In some areas of Minnesota, schools are able to recycle their milk cartons. However, the infrastructure is currently not developed in every city. As a result, the majority of schools in Minnesota have no alternative to disposing their cartons in an incinerator or landfill. To combat this problem, the Recycling Association of Minnesota through the work of its Minnesota GreenCorps member, Katelyn Larsen, partnered with the Jeffers Foundation to establish a pilot study examining the costs and benefits of using bulk milk dispensers in lieu of milk cartons. Several aspects comparing a bulk milk dispenser system to the usage of milk cartons were examined: economic costs and benefits, lunchroom solid waste and recycling generation, energy consumption, water consumption, liquid milk waste, and staff and student labor. This report discusses the background of the project, methodology, and results.

Background

In late spring of 2013, the Recycling Association of Minnesota applied for and received a Minnesota GreenCorps member, Katelyn Larsen, to expand milk carton recycling to greater Minnesota as it was already highly developed in the metropolitan area. At the time, the work plan only included identifying barriers and solving critical aspects regarding food and beverage carton recycling. Upon beginning research, Larsen came across the Jeffers Foundation website

and its Waste Reduction Awareness Program (WRAP). One of the information sheets included benefits about using milk dispensers instead of milk cartons, one of them being waste reduction. In light of the training and education provided by the Minnesota GreenCorps program, Larsen decided to contact the Jeffers Foundation to find out more information regarding bulk milk dispensers. It was at this time she connected with Dar Fosse who had done preliminary research on the subject in Minnesota. His research indicated that bulk milk dispensers were not feasible at public schools in Minnesota because of the requirements for a reimbursable lunch meal. Under national requirements, schools are required to offer five food components for a reimbursable meal: fruit, vegetables, grains, meat, and milk. Under the offer vs. serve provision in the National School Lunch Program (1988), students in grades 9-12 must have the option of declining two of the five components (schools have the option of using the offer vs. serve provision for younger grades as well but typically prefer to serve those students). However, they must select at least 1/2 cup of vegetables or fruit. Thus, a student would be able to decline milk under the national requirements. However, even though a student can decline milk, it must be available as an option in order for the school to get reimbursed for lunches. If students take milk as part of their lunch, it must be at least 8 ounces and on the tray prior to reaching the cashier. The main concern with these requirements was spillage resulting from improperly balanced milk glasses traveling from the cashier to the table. These requirements along with the fear of more spills created a lack of interest among schools. However, Larsen and Fosse wanted to find a school willing to try out dispensers for a pilot project to further understand the costs and benefits.

In December of 2013, a group of people including New London-Spicer school district staff and students, Youth Energy Summit (YES!) coaches and coordinators, and staff from the Kandiyohi Recycling Center contacted Larsen to help sort out some milk carton recycling issues

the New London-Spicer school district was having. At the meeting, Teresa Copley, a YES! coach, introduced the idea of using bulk milk dispensers instead of milk cartons, and Larsen used this opportunity to indicate she and the Fosse were looking for a school to participate in a pilot study examining the costs and benefits of bulk milk dispensers in public schools. The New London-Spicer school district indicated it would be interested in participating in the pilot, and work began to figure out a way to make the project happen.

In order to conduct a pilot project, Fosse and Larsen first needed a statement from the Minnesota Department of Education (MDE) that bulk milk dispensers could be used in lieu of milk cartons. Larsen worked with the Minnesota Pollution Control Agency to communicate with the MDE, which issued a statement indicating that it did not have a preference of how milk was distributed to students as long as the requirements for a reimbursable lunch were met. This statement provided the direction Fosse and Larsen needed to establish a pilot project using bulk milk dispensers.

Methodology

Site Selection

The New London-Spicer school district served as an ideal candidate for the pilot project for several reasons. First, the location offered the opportunity to work with a school that was close to the metropolitan area while serving as an example for rural communities. Because rural communities are currently the population with the least amount of access to food and beverage carton recycling, the findings from the study would be most important to them if they want to reduce their solid waste. Second, the school administration and staff were excited about the project and were willing to take extra steps to collect measurements for the project. Finally, the New London-Spicer high school had a student driven YES! team that worked on various energy

conservation and environmental projects. The YES! team provided the peer education that was necessary for a successful pilot project.

Original plans consisted of conducting the pilot at both the middle/high and elementary schools. However, after site visits to both schools, project organizers concluded that the middle/high school cafeteria had the best physical setup for a pilot project. Additionally, funding only allowed for one school to serve as a pilot.

Materials and Funding

For a successful pilot project, several materials were required: bulk milk dispensers, bulk milk, tables for the dispensers, commercial dishwasher, dishwasher racks designed for cups, and reusable cups. Because the project was a pilot, the Jeffers Foundation and Recycling Association of Minnesota wanted to ensure there would not be a financial burden on the school district. This required finding funding partners. The Jeffers Foundation offered to purchase some items for the project, but its budget limited what it could purchase. Fosse made the initial connection with Silver King Refrigeration, one of the manufacturers of the bulk milk dispensers to determine if the company would be interested in supporting the project. Larsen followed up with Joe Rother, the Vice President of Sales from Silver King, and described the data that would be measured during the pilot. Silver King agreed to support the project in exchange for information on the results gathered from the project.

New London-Spicer high school already had a commercial dishwasher on-site, so it did not need to purchase one for the pilot project. Therefore, the first step was to ensure that bulk milk could be provided to the school. Larsen worked with the food service staff at New London-Spicer as well as Kemps, the milk provider for the school, to determine whether bulk milk could be provided. Although New London-Spicer was part of a purchasing group, Kemps indicated the

middle/high school could receive bulk milk for the pilot, and it would not affect the rates for the other schools in the group. The bulk milk available from Kemps included 2% white, white skim, and chocolate skim. The National School Lunch Program (1988) states that schools are required to offer at least two varieties of milk. Low-fat milk (1%) has to be unflavored while milk with no fat (skim) can be flavored or unflavored. Previously, New London-Spicer was serving 1% white and white skim at breakfast while serving chocolate skim and white skim at lunch time. With the dispensers, the school decided to offer chocolate skim and white skim for both breakfast and lunch in order to meet requirements of the National School Lunch Program.

Larsen also worked with the food service staff to determine the average milk consumption of each variety while New London-Spicer used milk cartons. On average, the school sold 436 chocolate skim milks, 15 1% white milks, and 193 white skim milks per day. This averaged to be 27.25 gallons of chocolate skim milk, .94 gallons of 1% white milk, and 12.06 gallons of white skim milk per day. Each bag of bulk milk held five gallons. In order to ensure a smooth lunch process, it was estimated the school needed six bags of chocolate skim and two bags of white skim. In other words, the school required four dispensers holding two bags each. Silver King agreed to donate four two-valve dispensers to the school for the success of the pilot project.

With the dispensers and bulk milk covered, funding needed to be provided for the reusable cups, dishwasher racks, and tables for the dispensers. Because the dispensers did not have the technology available to dispense a pre-set amount, it was important to find reusable cups that had a visible mark at 8 oz. For several weeks, the team did not have any luck in finding a suitable cup. However, after communicating with an online retailer, Larsen received a

sample cup with vertical ridges. Upon conducting an experiment, she figured out that the vertical ridges conveniently stopped at 8 oz. Figure 1 shows the sample cup.

Figure 1. Sample cup with line drawn at 8 oz.

The sample cup was called the Cambro NT12. Upon conducting online searches, Mike Fairbourne, Jeffers Director and Vice President of the Jeffers Foundation, found a similar cup called the Cambro LT12152 on the Webstaurant store website priced at $38.10 for 36 cups. The Jeffers Foundation was able to purchase 900 cups for a total cost of $1,051.69.

Next, Fairbourne worked with the New London-Spicer school district to purchase dishwasher racks for the reusable cups. As a school district, New London-Spicer was able to receive better bids than the Jeffers Foundation. The school received a bid for a rack dolly and 9 dishwasher racks with 16 compartments for a total of $470.69; the Jeffers Foundation covered the expenses. However, after the school received the dishwasher racks, it determined it needed larger racks to process more dishes in a short period of time. A new bid was created for 16 dishwasher racks with 25 compartments, which increased the bid by $263.95.

The final step in purchasing materials included finding suitable tables for the dispensers. Minnesota health codes stated that the dispensers needed to sit on stainless steel or NSF 35 laminate for sanitation reasons. The tables also needed to be deep enough to allow a tray to be set down and strong enough to support the dispensers. After researching various options, the Jeffers Foundation purchased two 30" x 72" stainless steel tables on wheels rated to hold at least 1000 lbs each for a total of $755.65 including shipping.

Total capital costs, with an estimated price of the dispensers, came to $10,241.98. Once all capital materials were purchased and confirmed, Larsen, Fairbourne, and the New London-Spicer school set a kick-off date of April 8, 2014. The pilot project ran through the end of the school year.

Data Collection

While Fairbourne, Rother, and Larsen were working on the material aspect of the bulk milk dispenser pilot, the New London-Spicer middle/high school collected pre-dispenser data. Data regarding milk consumption, staff and student labor, milk waste, and lunchroom trash and recycling generation were collected for a period of four weeks to establish a baseline. Energy consumption and water usage were estimated separately. Appendix A shows the completed worksheets.

The New London-Spicer middle/high school collected data for another four weeks for the same categories after the dispensers were installed. In addition to the previous categories mentioned, staff also tracked the number of dishwasher loads of cups per day. Appendix B shows the completed worksheets.

Limitations. There were several limitations within the data collection procedure. First, Larsen initially planned to track energy consumption of the milk cooler and commercial

dishwasher through the use of a watt-meter. However, the school moved the milk coolers from the kitchen area to the cafeteria, and they were not plugged in all day. One of the coolers was plugged in from 6:30 am on Monday to 1:30 pm on Friday while the other cooler was plugged in 7:00am-1:30 pm daily. Because the watt-meter did not have memory function, the school could not easily keep track of the energy consumption of the milk coolers. Therefore, energy consumption was estimated for each cooler using the number of hours they were plugged in and the wattage required. This did not capture the start-up energy from each unit, however. Additionally, the commercial dishwasher was hard-wired into the building, so a watt-meter could not be used for that configuration either. To estimate energy consumption for the dishwasher, Larsen calculated an average based on four months of the entire building's energy using measurements from the high school's electricity bills. Because the milk dispenser pilot was the only major change during that time, a change in the school's average energy consumption would likely indicate it was caused from switching to bulk milk dispensers. However, the figure encompasses all electricity in the building, including heating and cooling, so it should be used with caution.

Second, calculating water usage from the commercial dishwasher became a complex operation, and the staff did not have time to record everything required. Fairbourne and Larsen knew water usage would increase with the switch to bulk milk dispensers, but it was unknown how much it would increase and how much it would cost. To make these observations, Larsen obtained the school's water bill before the switch to milk dispensers and calculated an average based on four months of data to establish a baseline. Then, she obtained the water bills after the switch to milk dispensers to determine the increase. The figures used only included the water

used inside the building; the school had a separate line item for irrigation used on the school grounds.

Third, a few of the categories from the data collection worksheets were incomplete. For example, on the pre-dispenser worksheets, the trash and recycling volume and milk waste averages were based on 11 days versus 18 days due to missing data. All other data was averaged over 18 days due to a couple of snow days during the data tracking period. On the post-dispenser worksheets, there were a few categories (number of white milks, number of dishwasher loads of cups, and liquid milk waste) only recorded for 19 days instead of 20, so the averages might not be as accurate for those categories.

Finally, several field trips took place over the second data collection period, so the averages obtained from that time period are presumed to be low. For example, the entire sixth grade class was away on a field trip one day, which also happened to coincide with an unofficial 'senior skip' day, so the number of students eating breakfast and lunch that day was greatly reduced.

Results

Results were obtained for the following categories: milk consumption, cost of milk, energy consumption, overall electricity cost, overall water usage and cost, labor, and waste and recycling generation. Figure 2 shows the results of milk consumption.

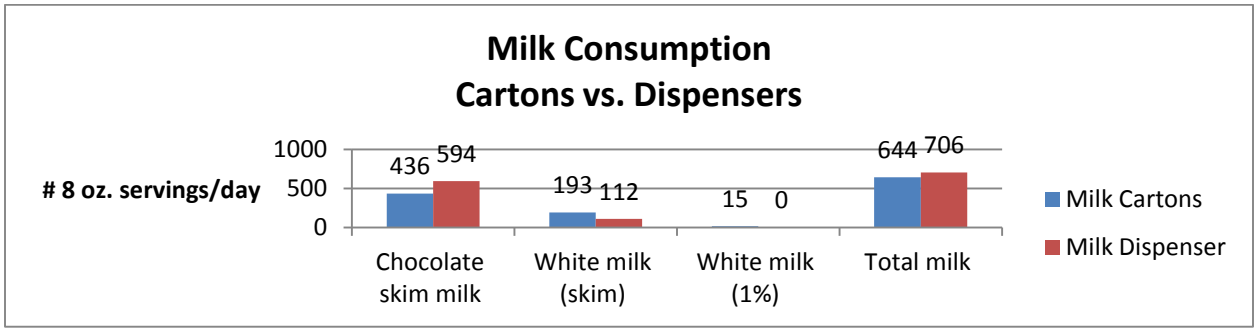

Figure 2. Milk consumption in a milk carton vs. milk dispenser scenario.

Even though the school had several low attendance days during the post-dispenser data tracking period, milk consumption increased. It's likely that the milk dispenser milk consumption average would have been higher if the school experienced normal attendance on all days during the data period. Yet, given the low attendance days and projecting each scenario over one school year, New London-Spicer would consume 659 more gallons (10,540 milk cartons) with dispensers in place, which is equivalent to 0.78 gallons (12.5 milk cartons) per student. Possible reasons for increased milk consumption include colder milk from higher quality refrigeration, the availability of chocolate milk at breakfast, and easier drinkability.

While milk consumption increased, energy consumption decreased. Figure 3 shows the result.

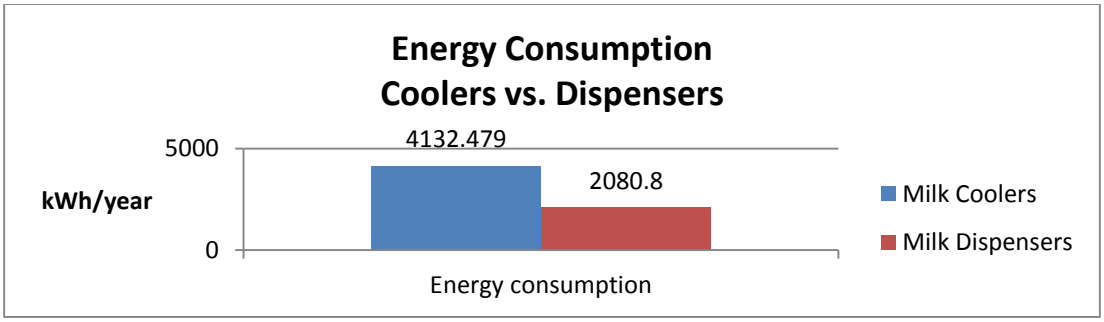

Figure 3. Energy consumption comparing milk coolers to milk dispensers. Energy estimate does not include start-up energy as watt-meters could not be used. The school went from using two milk coolers to four milk dispensers.

Projecting the data received to a school year, New London-Spicer would produce 2051.679 less kWh. According to the Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator, New London-Spicer would reduce greenhouse gas emissions by 3,368 miles/year from an average passenger vehicle, carbon dioxide emissions from 1,520 pounds of coal burned, and carbon sequestered by 36.3 tree seedlings grown for 10 years. One possible reason for the reduction in energy is the milk dispensers each consumed 1.3 amps while the milk coolers each consumed 7.8 amps. Thus, even though the milk dispensers were plugged in longer

(four dispensers at a total of 409 hours per week compared to two milk coolers at a total of 135.5 hours per week), the milk dispensers required less energy to run (four dispensers at a total of 61.2 kWh per week compared to two milk coolers at a total of 121.5 kWh per week). Additionally, the milk coolers were 1994 models while the milk dispensers were 2014 models, which could explain the differences in energy efficiency.

As might be expected, staff labor increased after moving to dispensers. Figure 4 shows the result.

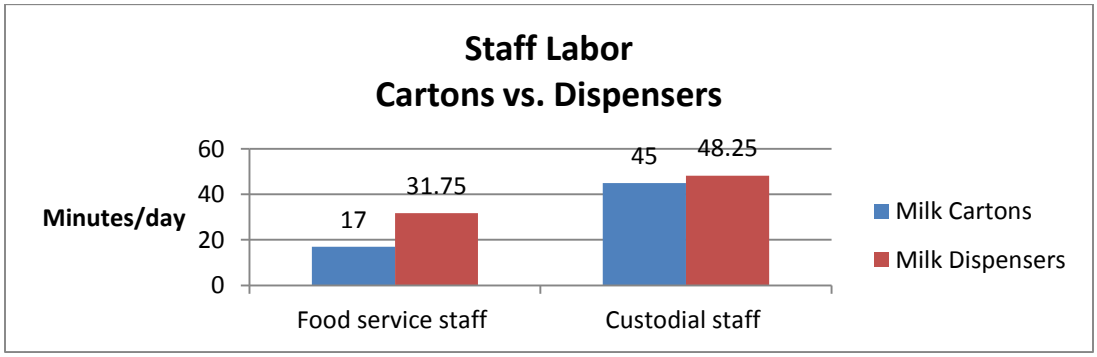

Figure 4. Staff labor: comparing milk cartons to milk dispensers.

Custodial staff time only increased by a few minutes per day. However, conversations with the head custodian indicated he preferred milk dispensers to milk cartons. Before switching to milk dispensers, custodial staff time included cleaning up spills, arranging milk cartons on a drying rack to be recycled later, ensuring milk coolers were plugged in and stocked, and unloading milk cartons into a receptacle outside to be recycled. After dispensers, custodial staff time included loading bagged milk into dispensers, arranging empty cups in dishwasher racks, carrying full dishwasher racks to dishwashing window, carrying clean dishwasher racks full of cups to student line, and cleaning up spills. It is unknown where the additional time came from after switching to dispensers, but conversations held with the head custodian indicated cleaning up spills was not a large time commitment in either case.

Food service staff time increased by 14.75 minutes per day. When the school had milk cartons, food service staff were responsible for purchasing and storing the milk, getting the milk coolers into place, and sanitizing the milk coolers. With the dispensers in place, food service staff were still responsible for purchasing and storing the milk, but they had the added responsibilities of washing cups daily and sanitizing four dispensers weekly.

Although staff labor increased, conversations that took place with various staff members indicated they enjoyed seeing students drinking more milk with dispensers in place, and they were not bothered by the fact that they had to wash around 37 extra racks per day.

While staff labor increased slightly, the effect on student labor was negligible. Neither system caused an undue burden on students. This can be seen in appendices A and B where student labor was recorded as 0 for each day.

Waste generation showed decreases in both liquid milk waste and lunchroom waste when switching to milk dispensers. Figure 5 shows the results.

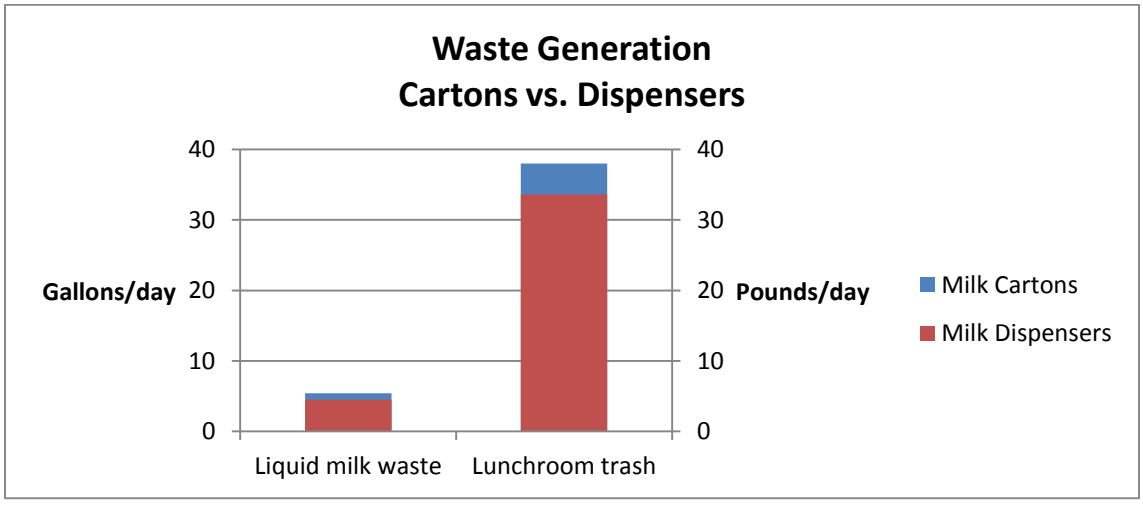

Figure 5. Waste generation during milk carton and milk dispenser phases.

Prior to switching to dispensers, the middle/high school wasted an average of 5.4 gallons of liquid milk waste per day. With dispensers in place, that amount dropped to an average of 4.5

gallons per day. When compared to consumption rates, students wasted 13.42% of what they took when using milk cartons and only wasted 10.20% of what they took when using milk dispensers. Thus, while consumption increased, the amount wasted decreased.

Figure 5 also shows that the middle/high school reduced lunchroom waste by 4.4 lbs/day by switching to milk dispensers. However, these results are inconclusive as pre-dispenser data was incomplete in this category and needed to be averaged over 11 days while post-dispenser data was averaged over 20 days. The resulting waste difference is too minimal to be considered conclusive.

As indicated earlier, the school also tracked recycling data. Before milk dispensers were installed, the school collected an average of 82.5 pounds of milk cartons for recycling per day. During the baseline data tracking period, the volume of other drink containers for recycling was not measured, but conversations with staff indicated there was no change in the amount of bottles and cans after the switch to dispensers. Staff further mentioned that if anything, the number of bottles and cans might have reduced as a result of more students drinking milk (see section on milk consumption). After the installation of dispensers, staff tracked bottle and can collection for recycling and noted it was an average of 1.25 pounds per day. While a direct comparison of recyclables cannot be made due to the different materials tracked, it can be said that bottle and can collection was minimal for both periods due to the majority of students opting for milk. One reason for minimal can and bottle collection is that milk is included in the price of lunch. Therefore, unless students brought cans and bottles from home, they would need to purchase these items a la carte at school.

Although the school's recycling rate decreased dramatically after switching to dispensers, it was not able to reduce recycling pick-ups or costs as a result of being locked into a contract.

However, New London-Spicer will be in a good position to re-negotiate services and costs when the current waste hauling contract is over, potentially saving the school money in the future.

Another crucial aspect for understanding the success of the pilot project was to understand the economic costs and benefits associated with both milk cartons and milk dispensers. The costs for milk, electricity, water, and waste/recycling were examined. Figure 6 shows the comparison of monthly costs between using milk cartons and milk dispensers.

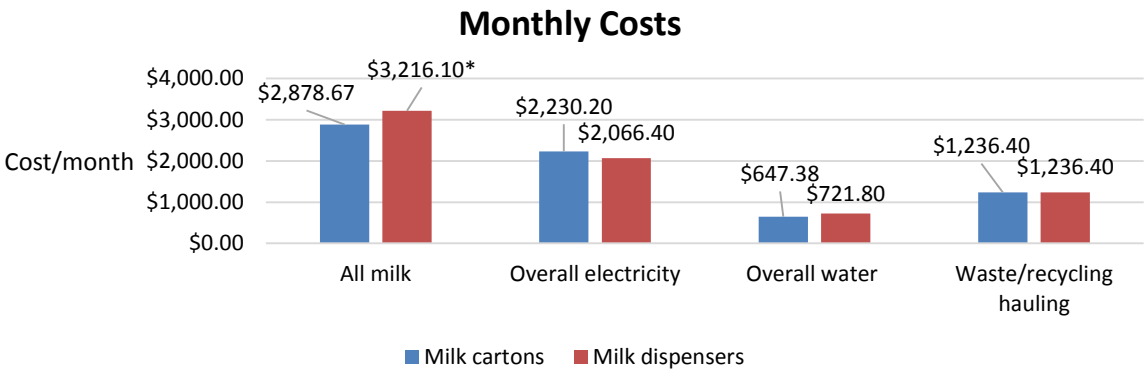

Figure 6. Monthly costs associated with milk cartons vs. milk dispensers. * indicates an adjusted price of milk based on an increase in the cost of milk of $.004 per 8 oz. during the pilot.

The highest shift in price was seen in the cost of milk most likely due to increased consumption. However, this cost is offset by milk revenue, which is explained below. As expected, the price of the overall electricity decreased during the pilot study due to the reduction in energy requirements from the milk dispensers. Yet, more money was spent on water during the pilot study, which was also expected due to the increased number of dishwashing loads. The waste and recycling hauling bill stayed the same during the pilot project because the school was locked into a contract and had no room to negotiate despite reducing the number of containers it needed for recycling. If the school continues to use milk dispensers, it may be in a position to renegotiate its hauling fees when the contract with the current provider is over.

For the cost/benefit analysis, the only incomes that were examined were federal and state reimbursements for lunches and breakfasts, paid student breakfasts and lunches, and paid a la carte milk. A true cost accounting would also show revenue sources for the schools' electricity, water, and waste/recycling hauling fees, but these were not readily attainable. However, because the highest shift in price was in the cost of milk when switching to dispensers, this category's revenue was the most important to understand. Figure 7 shows the monthly revenue received during the pilot study.

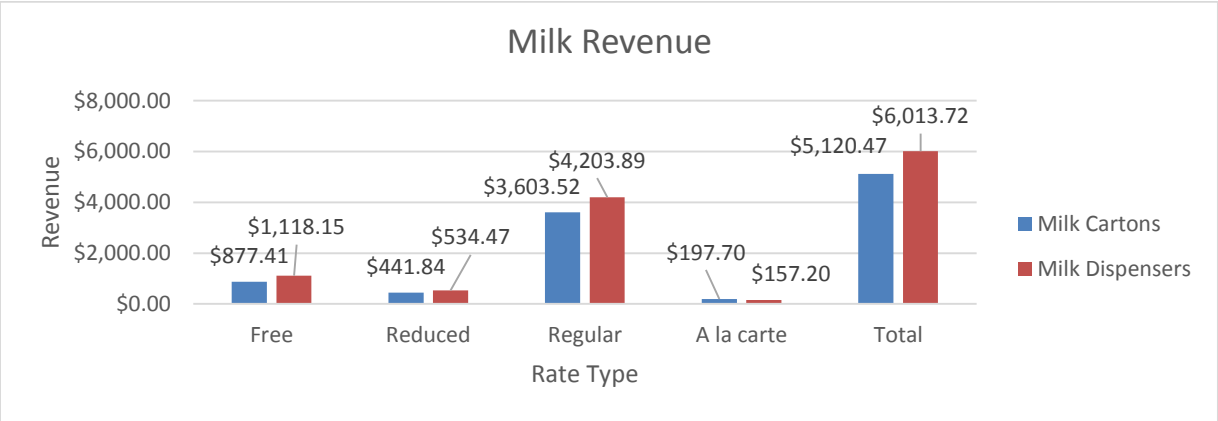

Figure 7. Monthly revenue associated with milk cartons vs. milk dispensers.

The figures in Figure 7 are estimates based on revenue sources and an a la carte milk price of $0.30. Federal and state reimbursement reports to schools do not indicate an amount that would be applicable to each meal component. Rather, reimbursements are received in a lump sum broken down into different rates for free, reduced, and regular meals. Thus, these figures represent the portion of revenue from breakfasts and lunches that go toward the purchasing of milk. They were calculated by determining all of the income received for each meal type and figuring out how much revenue could go toward purchasing milk by using the a la carte milk price of $0.30. For example, NLS received $5,294.70 in total payments for free lunches during the baseline data period. Total income per free lunch was $2.78. By applying a

cost of milk of $0.30, 10.8% of the meal revenue could be directed towards milk purchasing. Therefore, $571.83 of $5,294.70 could be applied as milk revenue from free lunches.

According to Figure 7, each category saw an increase from the baseline data period to the post-dispenser data period with the exception of a la carte milk. Total monthly revenue increased by $893.25 during the pilot study, which is due to more breakfasts and lunches being purchased. The reason for more breakfasts and lunches being purchased remains unknown.

Figure 6 showed an increase in cost of milk when switching to milk dispensers. However, Figure 7 showed an increase in milk revenue when switching to milk dispensers. Examining this category more closely, which can be seen in Figure 8, monthly net revenue increased by $555.82 after switching to milk dispensers.

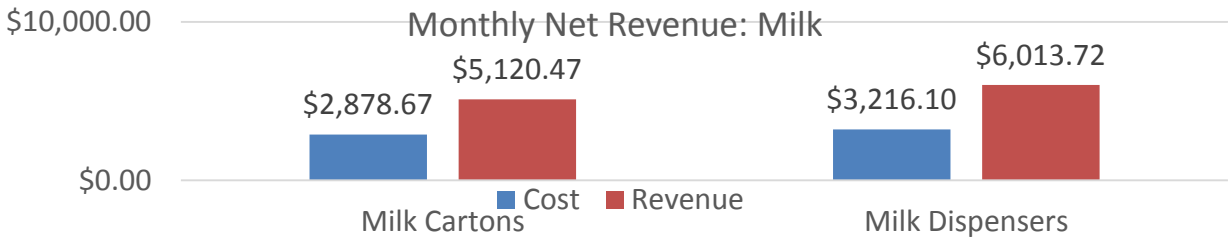

Figure 8. Monthly net milk revenue associated with milk cartons vs. milk dispensers.

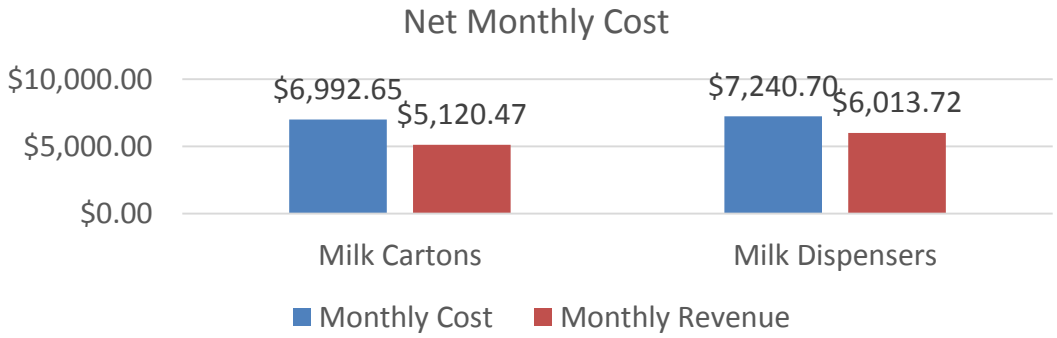

Figure 9. Net monthly costs associated with milk cartons vs. milk dispensers.

Figure 9 shows the net monthly costs associated with milk cartons and milk dispensers. Although the monthly costs are still higher with milk dispensers, New London-Spicer tightened the gap by $645.20 per month. Over an entire year, that figure would equate to a savings of $5,806.80. These numbers only account for costs of milk, electricity, water, and waste/recycling and all revenue sources of milk. In order to show a true net monthly cost, knowledge of all revenue sources for electricity, water, and waste/recycling would be required. However, these figures were not attainable for this report.

The figures presented above do not include the start-up capital costs involved in switching to milk dispensers. Once capital costs and monthly costs are combined, the switch to milk dispensers may not be financially feasible. However, there are ways in which schools can reduce capital costs. For example, New London-Spicer already had a commercial dishwasher installed, so it did not need to purchase or lease one. Additionally, schools may be able to lease dispenser equipment from the dairy, which would reduce upfront costs dramatically. Furthermore, some schools may have equipment that can be used to hold dispensers, which would eliminate the need to purchase additional tables. Schools also have the ability to raise funds to cover expenses through grants and other fundraisers, which can also lower a school's financial burden.

Moving Forward

The pilot study at New London-Spicer showed that there are great environmental benefits associated with switching from milk cartons to milk dispensers: waste reduction, greenhouse gas reduction, tree conservation, and energy reduction. Additionally, there are nutritional benefits seen through increased milk consumption. Given these results and Minnesota's commitment to reduce waste, it may be advisable to expand milk dispensers in more schools in Minnesota.

Expanding the use of milk dispensers to more schools could have positive impacts on the economics of individual programs. For example, the dairy industry has invested a lot of resources into streamlining the milk carton filling process to the extent that it is cheaper to provide individual cartons of milk than bulk milk. If demand from schools switches to bulk milk in the future, this could drive the cost of bulk milk down.

In addition to potential cost savings from bulk milk, one category that is often overlooked in terms of potential savings is the waste and recycling hauling. In Minnesota, schools are considered commercial entities, which requires them to pay the 17% solid waste tax each time their dumpster is pulled. Several metro counties also impose an environmental tax on waste in addition to the 17%. These taxes are designed to incentivize commercial entities to recycle more since the taxes do not apply to recycling. However, recycling comes at a price as well. Therefore, any time schools are able to engage in waste reduction, it is always preferable from an economic and environmental perspective. Under state law, waste haulers are required to charge by volume or by weight. Thus, schools have significant negotiating power in the form of less pickups and smaller dumpsters when they reduce waste and recycling volumes. However, it may be necessary for schools to wait until the current contract is over before negotiations can occur.

Conclusion

The results from the pilot at New London-Spicer high school indicated that switching to milk dispensers involves great environmental and nutritional benefits. However, there are also several costs associated with moving to dispensers as a result of higher water usage and upfront capital costs. Yet, economic benefits and costs will vary at each school that switches to dispensers. For example, a school with a high efficiency dishwasher may not experience the same increases in water usage that New London-Spicer did. Additionally, a school with high

efficiency milk coolers may not see the same energy savings when switching to dispensers. Furthermore, the price of milk will vary between dairies. New London-Spicer belonged to a purchasing co-op, so its cost of milk might be lower than a school outside of a purchasing co-op. Schools that lease equipment from dairies may have higher milk costs but lower capital costs. Nevertheless, while the economic costs and benefits will vary, the environmental benefits will remain the same. Trees will be conserved, greenhouse gas emissions will be less, and waste will be reduced.

References

National School Lunch Program, 7 C.F.R § 210. (1988).

Appendix A. Completed pre-dispenser weekly data tracking worksheets

Pre-Dispenser Data (February 19-March 18)

Instructions: Record the following information to the best of your ability. At the end of the four week period, please send the worksheets to Katelyn Larsen via email (katelyn@recycleminnesota.org) or mail (2250 Wabash Ave St. Paul, MN 55114).

Week 1 (February 19-February 25)

	Wednesday	Thursday	Friday	Monday	Tuesday
# of chocolate milk served	466	450	NS	458	442
# of white skim milk served	194	230		97	208
# of 1% white milk served	11	10		12	9
Energy use for milk carton cooler (kwh, read from Kill-A-Watt) Note: only take one reading of this at the end of one week on Tuesday February 25					
Labor (food service staff mins) Ex. Purchasing cartons, unloading/stocking cartons in coolers, washing dishes, anything food service staff does in relation to milk cartons	15	15		15	15
Labor (custodial mins) Ex. Time spent cleaning up spills, disposing of cartons, emptying liquid milk waste, monitoring carton recycling during lunch, unloading/stocking cartons in coolers, anything custodial staff does in relation to milk cartons)	45	45		45	45
Labor (student hours) Ex. Time spent opening cartons for recycling (may want to have YES! Students estimate this)	0	0		0	0
Cartons thrown due to expiration dates	0	0		0	0
Dishwashing (# of loads)	130	128		110	117
Milk waste (volume) Ex. # gallons or liters	5 gallons	5.5 gallons		6 gallons	5 gallons
Garbage (volume received during breakfast & lunch)	50 gal	60 gal		45 gal	50 gal
Recyclables (volume received during breakfast & lunch)	105 gal	105 gal		100 gal	105 gal

Week 2 (February 26-March 4)

	Wednesday	Thursday	Friday	Monday	Tuesday
# of chocolate milk served	371	380	390	464	442
# of white skim milk served	171	180	165	199	213
# of 1% white milk served	10	7	14	13	7
Labor (food service staff mins) Ex. Purchasing cartons, unloading/stocking cartons in coolers, washing dishes, anything food service staff does in relation to milk cartons	15	15	25	15	15
Labor (custodial mins) Ex. Time spent cleaning up spills, disposing of cartons, emptying liquid milk waste, monitoring carton recycling during lunch, unloading/stocking cartons in coolers, anything custodial staff does in relation to milk cartons)	45	45	45	45	45
Labor (student hours) Ex. Time spent opening cartons for recycling (may want to have YES! Students estimate this)	0	0	0	0	0
Cartons thrown due to expiration dates	0	0	0	0	0
Dishwashing (# of loads)	122	127	125	125	118
Milk waste (volume) Ex. # gallons or liters	5 gal	4.5 gal	5.5 gal	6 gal	6 gal
Garbage (volume received during breakfast & lunch)	50 gal	50 gal	55 gal	65 gal	70 gal
Recyclables (volume received during breakfast & lunch)	100 gal	100 gal	105 gal	105 gal	105 gal

Week 3 (March 5-March 11)

	Wednesday	Thursday	Friday	Monday	Tuesday
# of chocolate milk served	455	454		459	450
# of white skim milk served	205	208		202	204
# of 1% white milk served	18	24		18	19
Labor (food service staff mins) Ex. Purchasing cartons, unloading/stocking cartons in coolers, washing dishes, anything food service staff does in relation to milk cartons	15	25		15	15
Labor (custodial hours) Ex. Time spent cleaning up spills, disposing of cartons, emptying liquid milk waste, monitoring carton recycling during lunch, unloading/stocking cartons in coolers, anything custodial staff does in relation to milk cartons)	45	45			
Labor (student hours) Ex. Time spent opening cartons for recycling (may want to have YES! Students estimate this)	0	0		0	0
Cartons thrown due to expiration dates	0	0		0	0
Dishwashing (# of loads)	127	125		129	148
Milk waste (volume) Ex. # gallons or liters	5 gal	6 gal			
Garbage (volume received during breakfast & lunch)	40 gal	44 gal			
Recyclables (volume received during breakfast & lunch)	100 gal	105 gal			

Week 4 (March 12-March 18)

	Wednesday	Thursday	Friday	Monday	Tuesday
# of chocolate milk served	458	346	467	463	438
# of white skim milk served	213	273	206	192	107
# of 1% white milk served	10	16	22	18	27
Labor (food service staff mins) Ex. Purchasing cartons, unloading/stocking cartons in coolers, washing dishes, anything food service staff does in relation to milk cartons	15	15	25	15	15
Labor (custodial hours) Ex. Time spent cleaning up spills, disposing of cartons, emptying liquid milk waste, monitoring carton recycling during lunch, unloading/stocking cartons in coolers, anything custodial staff does in relation to milk cartons)					
Labor (student hours) Ex. Time spent opening cartons for recycling (may want to have YES! Students estimate this)	0	0	0	0	0
Cartons thrown due to expiration dates	0	0	0	0	0
Dishwashing (# of loads)	126	120	124	123	118
Milk waste (volume) Ex. # gallons or liters					
Garbage (volume received during breakfast & lunch)					
Recyclables (volume received during breakfast & lunch)					

Appendix B. Completed post-dispenser weekly data tracking worksheets

Post-Dispenser Data (April 21-May 16)

Instructions: Record the following information to the best of your ability. At the end of the four week period, please send the worksheets to Katelyn Larsen via email (katelyn@recycleminnesota.org) or mail (2250 Wabash Ave St. Paul, MN 55114).

Week 1 (April 21-25)

	Monday	Tuesday	Wednesday	Thursday	Friday
# of chocolate milk served	560	496	560	570	480
# of white skim milk served	180	120	120	130	120
# of chocolate milk bags thrown (empty)	6	8	7	8	8
# of white skim milk bags thrown (empty)	1	2	0	2	1
Time dispensers are plugged in (ex. 12:00am-12:00pm); if plugged in all the time, write 24 hours	4/17.5 hrs	4/24 hrs	4/24 hrs	4/24 hrs	4/13 hrs
Labor (food service staff mins) Ex. Purchasing bulked milk, unloading/loading bags in dispensers, washing dishes	30	30	30	30	40
Labor (custodial mins) Ex. Time spent cleaning up spills, emptying liquid milk waste, unloading/loading bags in dispensers, wiping down milk dispensers	40	40	45	50	1 hr
Labor (student hours) Ex. Time spent dispensing milk (may want to have YES! Students estimate this)	0	0	0	0	0
Bulked milk thrown due to expiration dates	0	0	0	0	0
Dishwashing (# of loads)	57	53	57	57	
Time required for washing cups (commercial dishwasher)	No added labor time				
Milk waste (volume) Ex. # gallons or liters	4 gal	5 gal	4.5 gal	5 gal	3.5 gal
Garbage (volume received during breakfast & lunch)	50 gal	60 gal	55 gal	55 gal	45 gal
Recyclables (volume received during breakfast & lunch)	2 gal	0	0	2 gal	4 gal

Week 2 (April 28-May 2)

	Monday	Tuesday	Wednesday	Thursday	Friday
# of chocolate milk served	640	600	600	620	660
# of white skim milk served	30	120	100		160
# of chocolate milk bags thrown (empty)	9	8	9	6	8
# of white skim milk bags thrown (empty)	1	0	2	1	2
Time dispensers are plugged in (ex. 12:00am-12:00pm); if plugged in all the time, write 24 hours	4/17.5 hrs	4/24 hrs	4/24 hrs	4/24 hrs	4/13 hrs
Labor (food service staff mins) Ex. Purchasing bulked milk, unloading/loading bags in dispensers, washing dishes	30	30	20	30	40
Labor (custodial mins) Ex. Time spent cleaning up spills, emptying liquid milk waste, unloading/loading bags in dispensers, wiping down milk dispensers	45	1 hr	1 hr	45	45
Labor (student hours) Ex. Time spent dispensing milk (may want to have YES! Students estimate this)	0	0	0	0	0
Bulked milk thrown due to expiration dates	0	0	0	0	0
Dishwashing (# of loads)	30	32	31	31	30
Time required for washing cups (commercial dishwasher)	No added labor time				
Milk waste (volume) Ex. # gallons or liters	5 gal	5 gal	5 gal	5 gal	4.5 gal
Garbage (volume received during breakfast & lunch)	45 gal	50 gal	55 gal	50 gal	55 gal
Recyclables (volume received during breakfast & lunch)	3 gal	2 gal	3 gal	2 gal	2.5 gal

Week 3 (May 5-9)

	Monday	Tuesday	Wednesday	Thursday	Friday
# of chocolate milk served	600	620	600	600	240
# of white skim milk served	60	80	160	133	80
# of chocolate milk bags thrown (empty)	9	8	8	8	5
# of white skim milk bags thrown (empty)	2	2	1	1	2
Time dispensers are plugged in (ex. 12:00am-12:00pm); if plugged in all the time, write 24 hours	4/17 hrs	4/24 hrs	4/24 hrs	4/24 hrs	4/13 hrs
Labor (food service staff mins) Ex. Purchasing bulked milk, unloading/loading bags in dispensers, washing dishes	30	30	30	30	40
Labor (custodial mins) Ex. Time spent cleaning up spills, emptying liquid milk waste, unloading/loading bags in dispensers, wiping down milk dispensers	1 hr	45	45	45	45
Labor (student hours) Ex. Time spent dispensing milk (may want to have YES! Students estimate this)	0	0	0	0	0
Bulked milk thrown due to expiration dates	0	0	0	0	0
Dishwashing (# of loads)	30	31	31	30	30
Time required for washing cups (commercial dishwasher)					
Milk waste (volume) Ex. # gallons or liters	5 gal	4.5 gal	4.5 gal	4 gal	
Garbage (volume received during breakfast & lunch)	40 gal	40 gal	45 gal	45 gal	25 gal
Recyclables (volume received during breakfast & lunch)	1 gal	1 gal	2 gal	0	0

Week 4 (May 12-16)

	Monday	Tuesday	Wednesday	Thursday	Friday
# of chocolate milk served	774	800	780	560	520
# of white skim milk served	167	74	100	120	80
# of chocolate milk bags thrown (empty)	6	8	7	8	7
# of white skim milk bags thrown (empty)	1	2	1	1	2
Time dispensers are plugged in (ex. 12:00am-12:00pm); if plugged in all the time, write 24 hours	4/17 hrs	4/24 hrs	4/24 hrs	4/24 hrs	4/13 hrs
Labor (food service staff mins) Ex. Purchasing bulked milk, unloading/loading bags in dispensers, washing dishes	30	30	30	30	45
Labor (custodial mins) Ex. Time spent cleaning up spills, emptying liquid milk waste, unloading/loading bags in dispensers, wiping down milk dispensers	1 hr	45	45	40	45
Labor (student hours) Ex. Time spent dispensing milk (may want to have YES! Students estimate this)	0	0	0	0	0
Bulked milk thrown due to expiration dates	0	0	0	0	0
Dishwashing (# of loads)	30	31	30	25	25
Time required for washing cups (commercial dishwasher)					
Milk waste (volume) Ex. # gallons or liters	5.5 gal	3.5 gal	4 gal	3.5 gal	4 gal
Garbage (volume received during breakfast & lunch)	45 gal	40 gal	55 gal	50 gal	40 gal
Recyclables (volume received during breakfast & lunch)	0	2 gal	2 gal	2 gal	1 gal

Appendix C. How to switch to dispensers in your school

In order to switch a school from using milk cartons to milk dispensers, there are several tasks that need to be researched and accomplished. This how-to guide will instruct you on the general steps needed to switch to using milk dispensers. Please keep in mind that your school might require fewer or more steps than what is outlined here. Work with your administrators to determine your school's specific needs.

1. **Find out which company supplies milk to your school and inquire to find out if it offers bulk milk.** To meet federal guidelines, there must be at least two varieties. If the milk is flavored, it must have no fat content. If the milk is white, it can be low-fat (1%) or no-fat (skim).
    a. If your milk supplier does not offer bulk milk, inquire to find out if there are any dairies in your area that supply bulk milk. When your school's contract is up, you can switch to a dairy that offers bulk milk.
    b. Work with your dairy to negotiate bulk milk prices. You may be able to negotiate lower prices, especially if you can show that consumption would increase.

2. **Find out if your dairy leases dispensers to schools.** Most dairies lease milk coolers to schools, and they might have a dispenser option as well that could keep capital costs down.

3. **Determine how many dispensers your school needs.** A five gallon bag holds the same amount of milk as 80 milk cartons. It's helpful to maintain a record of the number of milk cartons taken during each lunch period or have an idea of the number of students that go through each lunch period. It's helpful to have enough dispensers available to avoid changing bags in the middle of a lunch period. However, if the school is particularly large, it might be necessary to change bags during lunch periods, especially if the school is constrained in space and funds.

4. **Consider how the school wants to pay for capital costs.** If the school does not want to pay for all costs out of pocket, consider applying for grants or fundraising to help offset these costs.

5. **Determine the items the school needs to purchase.** At a minimum, the school needs reusable cups, milk dispensers, tables for dispensers to sit on, and dishwasher racks for the cups.
    a. If the dispenser does not dispense a preset amount of 8 oz, look for reusable cups that have visible lines at 8 oz. One solution is the Cambro NT12. If you find other suitable cups online, ask for a sample cup. Most companies will be willing to provide one sample cup so you can determine if it meets your needs.
    b. Consider how the school wants to pay for these capital costs. If the school does not want to pay for all costs out of pocket, consider applying for grants or fundraising to help offset these costs.

6. **Track baseline measurements for energy consumption, solid waste, and water usage.** In order to see your progress once the dispensers are in place, it's important to know where your school was at before using dispensers. Without this information, it is difficult to understand the environmental impact your school's decisions have. A general period of three to four weeks is recommended.

7. **Provide education to staff and students.** In order to ensure a smooth transition, make sure students and staff are aware of the changes occurring in the lunchroom.
    a. Provide signage before the switch and on the day of the switch
    b. Consider making a short video and broadcasting it on the school's television network
    c. Consider having students provide peer education

8. **Have a designated container for students to pour out unconsumed milk.** This can be in the form of a bucket, trash can, sink, etc. Keeping this milk out of the trash will help keep trash bags lighter. If the school previously recycled milk cartons, the same container can be used.

9. **Make sure students and staff understand the process for returning used cups.** It may be helpful to have students and staff place the cups directly into the dishwasher rack to save time for the custodial and food service staff.

10. **Track measurements for energy consumption, solid waste, and water usage with dispensers in place.** Track the same data that you tracked for baseline measurements. Use the same period of time (three to four weeks) and compare your results when the measurement period is over.

11. **Share your success.** Once you have compared your baseline and post-dispenser results, share them in a school newsletter or other media. Others will want to know about your successes with the project.

Appendix D. Frequently asked questions

1. **Can a school conform with state and federal nutrition requirements while using a milk dispenser? Will using a dispenser impact its reimbursements?**

   Yes, schools are able to fulfill state and federal nutrition requirements while using milk dispensers. State and federal laws state that at least two varieties of milk must be offered, and each variety of milk must have a fat content of 1% or less if it is unflavored or 0% (skim) if it is flavored. As long as the bulk milk from the dairy fits these requirements, state and federal nutrition requirements will be met.

   State and federal reimbursements will not be impacted as long as the normal requirements for milk are met: students must have 8 oz. of milk on their tray prior to reaching the cashier. Although students may choose to not take milk under the offer vs. serve provision, the dispensers must still be located prior to the cashier for the students that decide to take milk in order for it to count as a reimbursable meal.

2. **Are there any health and safety concerns (i.e. more germs) when a milk dispenser is used?**

   The use of a milk dispenser does not introduce any more germs into a student's day than what an average student experiences. Students dispense milk by lifting a metal bar, which they may lift with their hand or their forearm. No contact is made with the valve that the milk comes out of. The level of germs found on the metal bar would not be any higher than what is found on classroom doorknobs, serving utensils, bathroom sinks, or any other object touched by students on a daily basis.

   There are four Minnesota statutes that apply to the use of bulk milk dispensers. Statutes **4626.1335 6-201.11** and **4626.1350 6-201.14** discuss the type of flooring required in food preparation areas and cafeterias. Statute 4626.0905 4-703.11 discusses requirements for cleaning and sanitizing equipment food-contact surfaces and utensils. Finally, statute **4626.0833** indicates that the dispensing tube of a milk dispenser must be cut at an angle that leaves no more than an inch protruding from the dispensing head. As long as these guidelines are met, there are no further health and safety concerns.

3. **Does spillage increase when dispensers are used in lieu of milk cartons?**

   In conversations held with several schools that switched to milk dispensers (Olympia, WA, Boulder Valley School District in Colorado, and New London-Spicer School District in Minnesota), milk spillage was a non-issue. Several custodians indicated that spillage decreased rather than increased.

4. **Are there any health risks associated with custodians loading and/or unloading milk into dispensers?**

   No, there are no additional health risks associated with loading and unloading milk into and out of dispensers than there are with loading and unloading crates of cartons into and out of milk coolers. However, because loading and unloading milk into and out of dispensers requires lifting, custodians should lift with their legs rather than their backs. Lifting any type of material with back muscles as opposed to leg muscles will create strain on the body.

5. **Which suppliers are willing to provide bulk milk?**

   The availability of bulk milk will vary from dairy to dairy. Kemps is one dairy that is a confirmed source of bulk milk. It is advised that school officials check with their dairy to determine the availability of bulk milk. The dairy must be able to provide multiple varieties of bulk milk that have the fat content requirements provided by state and federal guidelines (see question 1).