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ESC 102

Addenda

Location of Change	What is Changed	Justification
Logo	New logo has been implemented to use in the RFP	It is the actual Bolton Farmers' Market. It provides better insight on their design philosophy. It is also cuter. (Cuter than Rabbits)
Abstract: Third Paragraph	We identified what the term "Refrigeration" meant	We wanted to make the term clearer since there is a difference between refrigeration and freezing
Abstract: Last Paragraph	Added the evidence for a specified point	The evidence was missing
Abstract: Last Paragraph	Took out the part where it deals with the quality of life	Our RFP does not focus on improving the quality of life of the community
1.1 Community	Added a picture of the Community	We wanted to give an insight on the members of the Bolton Farmers' Market.
1.1 Community: First Paragraph	We took the description of the community from 1.3 to the beginning of 1.1	It was out of place in 1.3
1.2 The need of the Community	Justified why this was a problem for the Bolton Farmers' Market	The justification was missing
1.3 Design Philosophy	Talked about the logo of the Bolton Farmers' Community	Provided more evidence to support their design philosophy
Engineering Problem	Moved the engineering problem section to the requirements heading	It made more sense to move it to the requirements section but at the same time, we have left enough information for the design team to understand the problem fully.
2. Stakeholders	Talked about the selected criteria used to differentiate between primary and secondary stakeholders	The justification for this was missing from the original RFP
2.1.4 Market Executives	Moved this stakeholder from secondary to primary	Based on our new stakeholders' criteria, this stakeholder needed to be placed in the primary stakeholders.
2.1.1 Meat Vendors	Changed the word "Market" to "Meat"	We only wanted to discuss meat vendors as a stakeholder. This is justified in the appendix.
2.1.1 Meat Vendors	Add a few lines that link the stakeholder section to the requirements	Needed an introductory requirement that will be further discussed in the requirements section
2.1.2 Consumers: Last Paragraph	Added the last paragraph	The connection between this specific stakeholder and the requirements section needed to



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		be established
2.1.3 The Health Inspectors at the Farmers' Market	Changed the title from "Health Inspection Agency" to "The Health Inspectors at the Farmers' Market". We also added the first and last lines to make things clearer.	We agreed upon the fact that the actual Health agencies are not affected by this problem, but only those that actually visit the market
2.1.4 Market Executives	Added the Second Paragraph	The market executives make this event happen, and are the reason this community exists. Consequently, the success of the market will reflect on the managers' reputation
2.2.1 The Residents of the Bolton Community	Changed the whole from discussing the environment as a stakeholder to one that discusses the residents of the Bolton community as a stakeholder	What we had before suggested that we were discussing the residents of the community rather than the environment of which they live in. This encompasses the environment as well.
3. Currently implemented Designs	We separated Reference Designs to two distinct subheads which are: Currently Implemented Designs and Inadequate Concept Designs.	We wanted to introduce some designs that are implemented to pre-introduce some requirements beforehand. More designs were explored after the requirements section to provide a better insight on how these requirements could be applied. At the same time, we wanted to enlighten the design teams.
3.1 Coolers and Mediums	Section 4.1.5 Coolers section(from old RFP) was removed and incorporated into this new section	This was as a result of the distinction that we made for the reference design section.
Pictures	Added captions to all the pictures that were introduced in this RFP	Captions were missing
Currently implemented Designs	Instead of giving descriptions to what everything is, we discussed why they failed to meet the expectations of the farmers' market, this also introduced some of our requirements	Needed to create a link between this section and the requirements. Also needed to further introduce some of our requirements
Requirements of Design	1.Added several lines stating that the experience of the farmers should be improved	1. It is important for the solution to supersede the current implementations, so that the lived experience can be improved.



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	<p>2.The engineering problem (1.4 in the old RFP), was moved to the requirements section</p> <p>3.Abibing the farmers' market philosophy was added to the constraints</p> <p>4. The general constraints were moved before the table</p> <p>5. Safety requirements were moved out of the table into general constraints</p>	<p>2. To clearly identify the problem before introducing the requirement. Also, to move the engineering problem after the stakeholders were introduced</p> <p>3. To emphasize the importance of the market's philosophy. Also, there is no point in a solution which the famers' market will reject</p> <p>4. It makes more sense to be aware of the general constraints before getting into detailed requirements and objectives</p> <p>5.This constraint is really specific and does not have metrics and criteria, therefore it is better suited in this section</p>
Requirements Table	<p>1.Some requirements were removed or altered</p> <p>2. Passive and active distinction was removed</p> <p>3. The cost requirement was split into two sections</p> <p>4.A new section of safety was added to the table</p>	<p>1. This was to revise the requirements and ensure the scoping agrees with the rest of the revisions</p> <p>2. Since there was only one requirement that depended on this distinction, it was removed and re-scoped to apply to both cases. This way, unnecessary confusion is avoided.</p> <p>3. There are two separate costs associated with this solution. Therefore, the corresponding requirements sections were created. Also, there is no on-site operational cost because any type of on-site operational cost would be as a result of using a municipally provided service or utility like electricity, or running water which can't be used in the open field location of the farmers' market.</p> <p>4. This objective refers to a specific part of operational safety, which directly impacts the primary stakeholder.</p>



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5. Inadequate Concept Designs	This is already talked about above	This is already justified above, we are just mentioning it here to point out that fact.
6. Conclusion	We rewrote the conclusion to restate the purpose of the RFP rather than restating what we had talked about	We felt that restating what we had previously written was a waste of space and it would be much more useful to remind the design teams what their purpose is at the very end in case they had gotten confused and lost track while reading the RFP.
Appendix A	Added the definitions of freezing and refrigerating	To clearly differentiate between the two terms. They are very different concepts especially with our kind of issue at hand.
Appendix B.2	Most of B.2 was changed to match the new revised and changed section of requirements. Section B.3 was moved into section B.2.2	Once a new revised section of requirements was completed, appendix B.2 needed to be revised as well to meet our changes that were performed on the requirements section.



Abstract

The following document is a request for proposal, which intends to inspire the development of a solution to meat refrigeration during the Bolton Farmers' Market.

The Bolton Farmers' Market hosts local producers from Caledon. It promotes organic and environmentally beneficial products, and the traditional farming heritage. The market does not have access to the city's power grid [1].

In this proposal, chicken, beef, lamb, pork are all classified as meat products. Upon slaughtering of the meat, bacteria cultures start to colonize the exposed tissues. Bacteria grow at the fastest rate in an optimal range of 4 to 15°C [2]. Therefore, it is recommended to **refrigerate** the meat between **0 and 4°C** [3]. In these conditions, bacterial growth is minimized [3]. Due to the lack of electricity at the market, maintaining that temperature becomes increasingly difficult without electricity, and sacrifices the sanitation and safety of the products [4]. As a result, the participation of meat vendors has diminished over the past years [1].

The objective of this proposal is to develop a sustainable and reliable solution for meat refrigeration. This solution must meet the constraints of the proposal, and the design should revolve around the philosophy and the values of the Bolton Farmers' Market.

Bolton's farmers have identified the refrigeration problem as an impediment in their participation in the market [1]. Therefore, an improved solution to this problem would increase the reliability and practicality of meat vending, and local vendors would be encouraged to participate in the market.

References

- [1] B. R. S. D. Jith Dravin, Interviewee, Bolton Farmers' Market. [Interview]. 7 February 2014.
- [2] "Meat Safety," [Online]. Available: <http://www.meatsandsausages.com/sausage-making/meat-safety>. [Accessed 15 February 2014].
- [3] "Storing Meat in Your Refrigerator," [Online]. Available: <http://web.extension.illinois.edu/meatsafety/refrigerator.c>. [Accessed 16 February 2014].
- [4] H. Verhoeven, Interviewee, Meat Vending. [Interview]. 13 February 2014.



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Request for Proposal 2.0

Improving Meat Refrigeration in the Absence of Electricity at the Bolton Farmers' Market



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1. Introduction

This Request for Proposal (RFP) introduces a problem faced by Bolton Farmers' Market. The RFP addresses the difficulties faced when refrigerating meat without electricity. The final objective of the RFP is to solve the issue regarding refrigeration to promote the contribution of meat vendors in this specific market. The solution should be compatible with the constraints that this RFP will outline and define. Refer to Appendix A.1 for the definition of meat, refrigeration and freezing.

1.1 The Community



Figure 1 Members of the Bolton Farmers' Market [5]

The Bolton Farmers' Market has emerged as a unique and well established community. Bolton is the center of rural region Caledon, located in the Peel region of the Greater Toronto Area. It is the suburbanized center of Caledon. Bolton is an area of heritage and farming culture, where many generations of farmers proudly represent their products and farming methods [6]. The market has been in operation since 2009 and allows the local residents of Bolton to try out and experience the produce that is locally grown as shown in Figure 1. The members of the community consist of the following: meat vendors, consumers, the health inspectors at the farmers' market and the market executives whom are the primary stakeholders. They are all present at the farmers' market which runs regardless of the weather from June to October. The regular operational hours are 9:00 AM to 1:00 PM every Saturday, located in an open field. The market features a diverse assortment of foods, artwork, and crafts [6].

1.2 Need of the Community

The Bolton Farmers' Market is relatively small, especially since Bolton is the most urbanized region of Caledon [7]. One of the self-identified problems from the market is that there is a lack of participation from the local producers, specifically meat vendors. The executives for the Bolton Farmers' Markets are also on the team that is charge of economic development for the region of Caledon [8]. They believe that the famers' market is one of the main contributors to the economy of Bolton. They believe that having meat vendors participating in the market will increase the popularity of the event and help boost the local economy of Caledon. Last year there were zero meat vendors at the Bolton Farmers' Market [9]. Meat vendors are deterred from the market due to the absence of cooling systems that are operable without access to the Ontario Power Grid.



1.3 Design Philosophy

The market emphasizes the importance of promoting local produce, and its benefits over mass production. It is set up in a natural environment, which has been a local grass field over the last couple of years. The community encourages organic and chemical-free methods of farming. All the vendors follow this code. Their philosophy prioritizes environmentally friendliness, producing minimum waste, toxins and reducing the use of synthetic chemicals [9].

When designing a solution for the Bolton Farmers' Market, the philosophies and heritage of the market must be considered. Solutions that encompass environmental friendliness are preferred at the market. Waste produced, pollution created, energy consumed and disturbance to nature are all aspects that should be implemented in any solution. **They provide fresh, local produce, in a fun manner. These attributes are terms reflected in their own logo which can be seen in the top left corner of every page.**

2. Stakeholders

This section is divided into primary and secondary stakeholders. The distinction made between these two is based upon participation at the market. If the stakeholder attends the market, then they are a primary stakeholder, if they relate to the market, however do not attend it, then they are a secondary stakeholder.

2.1 Primary Stakeholders

In this section, meat vendors, consumers, the health inspectors at the farmers' market and the market executives will be discussed as primary stakeholders.

2.1.1 Meat Vendors

Meat vendors are the only vendors of concern in this RFP [Appendix B.1]. They require adequate refrigeration for their products. The meat should be kept in a 0 to 4°C [10] [11] temperature range to slow down bacterial growth. Being able to ensure the meat remains in this range is a priority to the vendors [2]. The refrigeration process must keep the meat in a sanitary state. The vendors participate in the markets to make a profit. Therefore, it is important for the method of refrigeration to be cheap. Since the vendors must transport and setup their own stations, portability is another significant factor to the design. Reliable refrigeration would increase the participation of meat vendors and improve the lived experience of the farmers' market. [9]

2.1.2 Consumers

Consumers are also substantial stakeholders. Jith Dravin, the executive manager of the Bolton Farmers' Market, informed the design team "Our main objective and pursuit is to provide a great atmosphere for the families that do visit us... providing healthy products and awareness to others is one of our main aims... at the end, our main purpose is to provide health awareness for any visitor." [9]. The manager's statement provides great insight and evidence on how crucial the consumer is to the farmers' market. The lack of variety of products found at the market is the one of the main obstacles preventing the farmers' market from growing. Incapable of providing all the products is directly related to lack of participation from meat vendors. Consumers on average spend \$ 1,017 per year on meat products [12]. This number shows the significance of meat products to the consumers.

The consumer is affected by the safety of the design and how it affects the products they are purchasing. Also, noise disturbance, visual appeal, and how the design impacts the environment will directly affect this stakeholder.

A well-established market would attract more consumers on a weekly basis, and significantly improve the lived experience of this community.



2.1.3 The Health Inspectors at the Farmers' Market

Health inspectors occasionally visit the market without notice to test the quality of produce at the market. They require meat products to comply with the Meat Inspection Act [13]. The inspectors must conduct mandatory and random checks on markets to ensure the quality of the products do not violate the food safety and quality act. Since the inspectors are in contact with the meat and its place of storage, they require a safe working environment and sanitary meat to inspect. Also the inspector's evaluation of the product is greatly influenced by the reliability of the cooling method. Only the health inspectors that are onsite are directly affected by this problem.

2.1.4 Market Executives

The Bolton Farmers' Market managers are attempting to increase their recognition in the local area. They have had the privilege of organizing, managing and supervising the farmers' market. They aim to support local farmers to make their business more viable, and raise the awareness of eating healthy [9]. The market executives make this event happen, and are the reason this community exists.

Jith Dravin and his associates have committed themselves to a design philosophy that drives their way of operation. They desire a community where every product, producer and distributor is locally sourced [9]. The integrity of the design determines whether or not the market executives will accept such a design as a solution. Therefore, this solution can impact the ultimate goal of the executives. The executives are concerned with the safety of the design, and how well it integrates with their philosophies. Also, a design that causes minimal disturbance to the market would be preferred.

Presenting an outstanding engineering design solution of the refrigerating problem will allow the Bolton Farmers' Market to stand out amongst the competition. Consequently, the success of the market will reflect on the managers' reputations.

2.2 Secondary stakeholders

In this section the residents of the community of Bolton will be discussed as secondary stakeholders.

2.2.1 The Residents of the Bolton Community

The farmers' market praise themselves for their contributions concerning the environment's state. The farmers' market has demonstrated tremendous effort in attempting to raise awareness regarding local and environmentally beneficial farming. They believe in small steps, small steps that lead to remarkable strides. As residents of Bolton, whether they attend the farmers' market or not, they are directly affected by the surrounding environment. A solution to the problem discussed in this RFP will impact the local farmers' market which influences the local environment, ensuring more satisfied residents. Therefore, the residents of the Bolton community are indirectly affected by the success and participation at the farmer's market.

3. Currently Implemented Designs

This section will outline the currently implemented solutions with associated justifications. To be clear, these solutions do not work in their currently implemented way, however, a different implementation or a combined solution that meets the requirements listed below is a completely legitimate and acceptable solution.



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3.1 Coolers and Mediums

Coolers have been used at the farmers' market previously. This section will cover different mediums that can be used with coolers. Refer to Figure 2 for an image of coolers.



Figure 2. A Coleman Cooler [47]

3.1.1 Gel packs

Model Type: MAXCOLD® GEL PACK [14] (Refer to Figure 3, Gel pack)

Gel packs can leak into the meat products if punctured or mishandled. Gel packs are made with diethylene glycol ethylene glycol, hydroxyethyl cellulose or vinyl-coated silica gels, which may lead to serious injury if ingested [15] [16]. Gel packs pose a safety concern for meat vendors and consumers, and are therefore not a suitable solution. Also, the use of these synthetic chemicals is against the philosophies of the farmers' market.



Figure 3. A Gel Pack [14]

3.1.2 Ice packs and Ice Cubes

Model Type: ULINE COLD PACK Model No.S-736 [17]
(Refer to Figure 4, Ice pack)

Ice packs are a common solution among farmers' markets. They remain frozen for 3-4 hours at room temperature, and 24-36 hours in coolers [18]. On exceptionally hot days, especially with the frequent opening of the coolers, the ice packs melt much faster, and the temperature may fall above the safe range [19]. Also, ice packs add extra weight to the meat vendors' mobile setup, and require frequent rearrangement and replacement. These factors increase the setup and operating time, reducing the feasibility of this solution.



Figure 4. An Ice Pack [17]

Ice cubes are incapable of maintaining cold temperatures for the specified nine hours [9]. Also having meat that soaked with water increases moisture, which is proportional to bacterial growth [20]. Therefore, ice cubes sacrifice the sanitation of the meat and are not a viable solution. Refer to Figure 5 for an image of ice cubes.



Figure 5. Ice Cubes [51]

4. Requirements of the Design

In this section we will outline the requirements that the design team must follow in order to create a solution that the meat vendors at the farmers' market will be able to use. The goal is to improve the meat vendor's experience at the farmers' market so any previous experiences should be considered the bare minimum. The solution may be a process or a product as long as it fulfills the requirements listed below.

4.1 The Engineering Problem

Any solution must safely refrigerate meat without electricity and abiding by the market's design philosophies. Meat needs to be refrigerated at temperatures of 0 to 4°C [10] [11] in order to pass safety regulations. The solution should not degrade the meat to the point it becomes unsellable according to the tests recommended by the FAO [21]. The solution must be able to work for the five hour duration of the farmers' market as well as the estimated total of four hours for transportation and set up time [19]. The design must also consider possible limitations, such as, single person operation, transportation, sanitation and the philosophies of the market.



There are some general constraints that all solutions must obey in order to satisfy the stakeholders' needs.

1. The solution should abide by the farmers' market's design philosophy. Any solution must prioritize environmentally friendliness by minimizing the amount of waste, toxins and use of synthetic chemicals. There is no point in producing a solution that the market will refuse to use.
2. The solution must not rely on any external electricity from an outlet connected to the Ontario Power Grid. This constraint is due to the location of the farmers' market, an open field.
3. The solution must pass all of the tests for the quality control of meat when they apply. Follow the FAO guidelines to determine which are applicable [22]. If these tests are not passed then the vendor will not be able to sell his or her meat and the solution will be useless and counter-productive.

Organoleptic Evaluation

- Appearance
- Colour
- Texture and Consistency
- Smell and Taste

Physical Test

- Temperature
- Humidity
- Water Activity
- Weight Differences
- Chemical Analysis
- pH level

Micro-bacterial Test

4. The solution must not pose any imminent or obvious danger to anyone at the farmers' market. The design must ensure the safety of the vendor. Safety features that avoid injury are beneficial to the design. Also, the design must comply with safety standards [39], therefore the design will ensure an adequate level of safety. Our meat vendor reported that he did not experience any injuries the 2013 season of the Bolton Farmers' Market [10] and we would like to see this record upheld.



In the following table the requirements for a solution will be listed in descending order of importance.

Requirements					
Topic	Objective	Metric	Constraint	Criteria	Justification
Meat Sanitation	Keep meat refrigerated during transportation	Temperature in Celsius	Must be below 4 and above 0°C [10] [11]	Lower is better as long as the temperature is not below 0°C	Refer to Appendix B.2.1
Cost	To provide a solution that is financially feasible	Start-up cost per pound of meat (\$/lbs.)	Must be below \$200/150 lbs. of meat [19]	Lower cost per pound of meat is better	Refer to Appendix B.2.2
		Off-site running cost (\$/season)	Must be below \$1.65/season	Lower cost per season is better	
Portability	To create a solution that can be easily assembled/disassembled for the farmers' market	Setup time in hours (h)	Must take less than 2 hours to set up [9]	Lower setup time is better	Refer to Appendix B.2.3
	To create a solution that can be easily transported to and from the farmers' market in one trip.	Area in Meters Squared (m ²)	Total has to fit in the bed of a long bed pick-up truck (1.2 x 2.4 m) [19]	Less space taken up is better	
Sound	Should be quiet and not disrupt the eco-friendly atmosphere created by the environment of the farmers' market	Decibels (dB)	Must not exceed 65 dBs [23]	Lower decibels is better	Refer to Appendix B.2.4
Safety	Should minimize the risk of injury when lifting any part of the solution	Pounds (lbs.)	Once loaded with meat any individual part must not weigh more than 121.3 lbs. [24]	Lower is better	Refer to Appendix B.2.5



Requirements					
Topic	Objective	Metric	Constraint	Criteria	Justification
Efficiency	Minimize the amount of time to retrieve merchandise	Seconds (s)	Must take less than 190 seconds to find the desired merchandise and retrieve it [25]	Lower amount of seconds is better	Refer to Appendix B.2.6
	Maximize the length of time the solution can keep ice if left undisturbed	Hours (h)	Must keep ice for at least 12 hours [26]	Larger number of hours is better	Refer to Appendix B.2.6

Additional Temperature Constraints

Any solution must have a control gauge to measure the internal temperature [27].

Additional Portability Constraints

Any solution must be maneuverable by one person [19].

Additional Carry Capacity Constraints

Any solution should carry the same amount meat carried by previous meat vendors as a minimum. They must be able to carry 150 lbs. in total [19]. See Appendix B.2.6.

Additional Constraints for Processes if Applicable

No irreversible alterations to the environment

Must be able to be set up by one person [19].

5. Inadequate Concept Designs

In this section several concepts will be explored which may help to refrigerate meat but fail the requirements outlined above.

5.1 Dry Ice

Model Type: Dry ice sold by The ICEMAN [28]. Refer to Figure 6 for an image of dry ice.

Solid carbon-dioxide (dry ice), can be used to refrigerate the meat. Firstly, dry ice would flash-freeze the meat [29]. If meat is cooled rapidly below 10°C without adjusting the pH, the muscle fibers contract and change the tenderness of the meat [30]. Also, dry ice is a physical hazard if handled without proper protection [31]. Lastly, the cost of shipping and operating with dry ice is beyond the financial abilities average worker in Canada [32].

The requirements prioritize meat quality, operational safety, and cost, all of which dry ice ranks poorly in.



Figure 6. Dry Ice [28]



5.2 Generators

In this section different generators will be discussed as reference designs.

5.2.1 Solar Generator

Model Type: Sunforce Products 58050 55-Watt Solar Panel Charging Kit. [33]

Solar panels fit in with the design philosophies of the community, and they can provide enough electricity to power portable refrigerators [33].

However they are overly expensive for vendors in this market. Also, the market runs weekly regardless of the weather. Some days the solar panels may not receive enough sunlight to generate power, so the temperature may fall above the safe range. Refer to Figure 7 for an image of a solar generator.

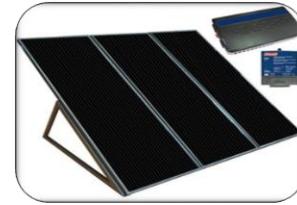


Figure 7. Solar Panels [33]

5.2.2 Diesel Generator

Model Type: Honeywell® 17kW Automatic Standby Generator [34]

Diesel generators can also power portable refrigerators. However, burning diesel and other fossil fuels does not fit in with the farmers' market's philosophy. **Also, generators are too loud and disturb the atmosphere of the market [35] which is one of our requirements.** Refer to Figure 8 for an image of a diesel generator.



Figure 8. Diesel Generators [34]

5.3 Processes

5.3.1 Root Cellar

This solution is a process of storage rather than a product. Root cellars coincide with the philosophy of the market; however, they damage and can cause irreversible change to the immediate environment. Since the market may change locations, disrupting the environment is not acceptable. Also, the setup time takes much longer than the current setup time allowed. Lastly, retrieving the meat from the ground may be unappealing to consumers.

Appealing methods and products are favored over less appealing ones [36], consequently, the root cellar may result in less profit.



Figure 9. A Root Cellar [48]

6. Conclusion

The main purpose of the RFP is to design a solution that the farmers' market will be able to recommend to meat vendors so that they may be able to preserve their meat more effectively. The solution will reliably refrigerate the meat products, increasing participation from local meat vendors. The increased participation may help to draw more consumers and expand the market, satisfying the market executives' goal.



Appendix A:

A.1 Meat Related Definitions

Meat: Throughout this document, the term “meat” is repeatedly referred to. Meat includes all the different types of meat and poultry sold at the Bolton Farmers’ Market. These include, beef, lamb, chicken, and pork. [19]

Refrigerating Meat: Meat refrigeration means to lower and maintain the internal temperature of a meat product to a temperature of 0°C to 4°C [10] [11].

Freezing Meat: Meat freezing means to lower and maintain the inner temperature of a meat product to -15°C [10] [11].

A.2 Efficiency

We are defining efficiency to be a combination of cost, power consumption and effectiveness at staying cool. To be efficient the solution must maximize the length of time it can keep ice while only using the amount of energy that can be purchased for a day’s worth of energy.

A.3 Need

A need is any physical product or process that will improve quality of life within the community.

Appendix B:

B.1 Scoping in on meat

There are two main reasons behind the reasoning for selecting meat and poultry products instead of other dairy products or vegetables, this is discussed below:

1. Meat is one of the fastest products that will spoil under unfavourable conditions. Having said that, the solution will work for any other products effectively, as those other products have a slower rate of spoiling under unfavourable conditions.
2. The executives for the Bolton Farmers’ Market have specifically instructed on the importance of meat vendors as they believe, having them in the market will increase the popularity of their event.

B.2 Requirements and priorities

This section justifies why these requirements were chosen and how their priorities were decided.

B.2.1 Meat Sanitation

Maintaining a stable temperature range is the most important requirement for the design as it is the test that the health inspectors most commonly run at the farmers’ market [19].

We have selected the ranges suggested by the Canadian Food Inspection Agency and the Food and Agriculture Organization for refrigerating meat.



Keeping the meat in an optimal temperature range ensures its sanitation and inhibits bacterial growth. The challenge of maintaining this temperature resulted in this proposal, and it is the main problem the design should address [27].

The meat still needs to be kept cool while it is in transportation to and from the market. If the meat spoils on the way to the market there is no way that the meat can be sold and the vendors time and product is wasted. When the vendors don't end up selling all of their product they take it back home and put it back in their freezers [19]. They don't want to let their product go to waste so the meat should stay refrigerated during transportation.

B.2.2 Operational Cost

The priority of the vendors at the Bolton Farmers' Market is to sell their products for profit. Therefore, the operational cost of the design is a significant factor when evaluating the solution. The primary stakeholder emphasized the importance of cost in his evaluation of a new design [19].

The start-up cost includes the price of the actual solution and the materials needed to operate the solution for the entire season, for example batteries.

Off-site running cost includes any costs necessary to prepare the solution for use for one day at the market, for example the cost of running a refrigerator to freeze ice packs for use during a day at the market.

The explanations for the cost estimations are below:

Start-up cost: 170CAD: $2 * 49.99 + 35 * 1.99 = 170$ (tax is not included)

According to Henricus Verhoeven, he operates 2 coolers and approximately 30 to 40 ice packs for refrigerating 150 pounds of meat. To assume his start-up cost, one 50 liter cooler costs 49.99CAD and one ice pack costs 1.99CAD according to Canadian Tire [10] [21] [16].

Active cost: 0.65CAD: $277 / 365 * 10.9 / 24 * 9 * 21 / 100 = 0.65$ dollars (tax is not included)

The power rating is 277 kwh/year for the GE 4.5 Cu. Ft. Bar Fridge. The Bolton Farmers' Market opens every Saturdays through June to October from 9.00a.m. to 1:00 p.m. The electricity cost is 10.9 cents/kwh. There are approximately 21 days he presents at the market, and 9 hours per day [40].

In order to provide the design teams with some more design space to operate in we rounded up and added money to our estimates. 170 became 200, 200 became 250 and 0.65 became 1.65.

B.2.3 Portability

The farmers' market is a mobile event where the vendors set up their own stations. The vendors transport their products to the market, where they setup their vending station. Therefore, the ease of transporting the design is an essential criteria to the design. Some vendors are alone, therefore the vendor must be able to setup and transport the solution alone. The maximum amount of time the vendors have in the morning to set up is 2 hours. [9].

The metric of area in meters squared is not in terms of pounds of meat because no matter what the vendor should only need one trip to bring all of the equipment and meat to the market. Otherwise the solution is counter-productive and several problems arise. For example if the vendor is a one man team who does care of what arrived in the first trip while the vendor goes to make the second trip, another issue is that the



vendors only have limited set up time and multiple trips waste time. In terms or transportation pick-up truck beds are the smallest unit used by farmers [37].

B.2.4 Sound/Altering the environment

The market attempts to create a peaceful and undisturbed environment. The sound the device creates affects all the stakeholders at the market, and it can alter the lived experience of this community. As a result, this requirement is an important aspect of the design. [9]. Also, the design must not cause irreversible alterations to the environment and the market. This ensures that the design agrees with the philosophy and beliefs of the Bolton Farmers' Market. 60-65 dBs is the level at which normal conversation takes place [23].

B.2.5 Safety

In some cases the vendor is a single individual so any part of the solution once loaded with meat, if it needs to be, must not weigh more than what the average man individual can lift without injuring themselves [24].

B.2.6 Efficiency/Carrying Capacity

Refer to Appendix A.4 for our definition of efficiency.

Time Aspect:

Given the nature of business at a farmers' market (intimate and one to one relationship between the consumer and producer) we feel that the maximum amount of time that a consumer would be willing to wait would be the same amount of time to get serviced at a fast-food drive thru. We chose to use McDonalds, the biggest fast-food vendor in the world as our benchmark. [25]

Keeping Ice Aspect:

Cooling Aspect:

The term keep ice means to keep ice in its solid state and prevent it from melting.

Most coolers are maximized and can keep ice for 6 days [26] but we lowered that number to be realistic. 12 hours is more than the 9 hours estimated for the time the solution will be in use because in a comparison when keeping meat and ice at the same temperature, it takes more energy to keep meat at this cool temperature [38]. The temperature to keep ice matches with the temperatures to refrigerate meat properly so it makes for a good comparison [22].

The efficiency of the design was not the biggest concern of the stakeholder. As long as the operational cost did not exceed the given constraint, then the stakeholder prioritized the functionality of the design over its safety. However, efficiency is still part of the requirements because it is a major part of the markets philosophy.



Carrying Capacity Aspect:

The stakeholders have had a minimum carrying capacity in implementation in past years [19]. Exceeding this capacity is not a primary concern, however, it can be beneficial for the vendor if the storage allows higher carrying capacity. This requirement is not essential, however it can greatly improve the design.

The metric for carrying capacity is hard to quantify because it is related to efficiency. The product may be able to store a lot of meat however if it is inefficient in doing so then it is of no value. That is why we do not have a metric for carrying capacity, as long as it holds the minimum required amount of meat and is efficient.



Appendix C:

Interviews:

Interview 1: Meat vendor Henricus Verhoeven

Phone call (Feb 13th at 10pm).

Henricus Verhoeven : owner of Bio-Visions Farm

- used ice packs replace every one or two ~~two~~ hours 30-40 ice packs
12 coolers
- in summer, he experienced problems
 - need extra ~~other~~ coolers to keep ice packs cool
 - shade problems didn't have a power outlet at Bolton
 - operational cost
 - sometimes used a ~~refrigerator~~ refrigerator
 - leftover go to refrigerator
- inspection - thermometer . if meat is labelled. . or meat has a
. meat is already processed.
. goes to a meat packing place
- They do not check for contamination b/c
- 150 pounds of meat brought on each day
he went to Bolton Farmers' Market, his wife went to another farmers market.
- Meat . beef . pork . chicken. Camp.
- everything was safe
- -3°C or less . always less auto charge.
- 10% of profit ~~not~~ for operational cost (at most).
- truck and trailer to transport meat.



FRESH. FUN. LOCAL.

14

Interview 2: Research Assistant Jith Dravin, and economic development officers Ben Roberts and Sandra Dolson

Conference Call Notes (Feb 7 at 3pm)

Jith Dravin: Research Assistant and Farmers' Market Manager

Ben Roberts: Economic Development Officer

Sandra Dolson: Economic Development Officer

- contribution: bring locally grown and produced food to the residents
- average 10 vendors; 400 people a day last year
- open Saturdays (rain or shine), June ~ October 9am - 1pm
- encourage people to buy locally grown produce and lead healthy lifestyle (care about what they eat)
- one of the problems: get the local producers to come to the market.
 - lack of labor to come to two different market on the same day is one of the reason.
 - emphasize on on-line advertising (Facebook works)
 - an issue: developing social media for farmers' market
 - Why the farmers not come?
 - too big for the farmers' market.
 - family-run farms can get huge profits not worthwhile come to the market
 - stakeholders: farmers' market & farmers & consumers & children
There are events for children. They like coming out to the market even though they don't buy things. They bring their parents along.
 - People have a good time on Saturday mornings (hang out). *Hillary*



Interview 2 (cont.): Research Assistant Jith Dravin, and economic development officers Ben Roberts and Sandra Dolson

- location: pedestrian friendly & high density & high visibility
- 95% vendors have tents to protect themselves from the sun so leaving the products on the table for four hours is not a big issue
- problem: not enough vendors within the area come to the market
- other markets get much more support from the community
- Bolton is more urbanized.
- issue to work on: trying to find efficient ways to transport product from the surrounding areas to a central farmers' market
 - currently, vendors use personal vehicles to bring their products to the farmers' market. quite often if there is meat involved, it has to be refrigerated (on hot days) fresh products as well. There are a lot of different things the farmers have to prepare for in the early mornings.
 - cooler won't work because of no power source
 - issue: find a way to generate power? to keep the refrigerator operating. Solar energy?
 - right now, cooler box with ice in it & bring generator. Ice not able to maintain the meat cold for 9 hours.
 - who are presenting? farmers, bakers, vegetable vendors, fruit, handcraft
 - Market is small, have certain proportion, so not go through health inspection. "Health inspectors from the regional health unit come by to the market. They will check to make sure that meat vendors have their goods at the appropriate temperature, particularly around the meat. Is what they really concerned. They will check to make sure that no body are selling eggs. You are not permitting to sell eggs at the market unless they are graded. You never know when they are going to drop by or if they are going to drop by. Vendors are told to expect them." (Sandra)
 - Vendors are responsible for getting all the license and insurance



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