ANALYSIS OF AUTOMATION OF BULK PACKAGING LINE AT WIXON INC.

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ABSTRACT

The purpose of this thesis is to analyze the impact the installation of an automated packaging system would have on the predominately manual bulk packaging work centers at Wixon Inc., a privately held, integrated food and beverage developer, manufacturer, and processor. The objective of this thesis is to determine if converting to an automated system would minimize costs and increase line speeds. The owners desire a 3-year payback on the investment. In addition to the financial and economical aspects of automating the equipment, there are potential food safety and personnel safety improvements that would be brought to the firm by changing equipment. The firm's owners want to be proactive and minimize any impact a reduction in the labor pool might see cause from the exit of workers from the Baby Boomer generation.

Methods used to determine the objectives of this thesis include a comparative time study of bag filling rates, an analysis of incremental cost savings, net present value (NPV) analysis and return on investment (ROI). Data were collected from studies conducted by the engineering consulting firm of Middough Incorporated, from Wixon Inc. accounting records and, interviews of key Wixon employees.

The report provided by Middough determined that the new system would be able to replace three work centers in the Bulk Packaging department based on bag fill rates and flexibility in bag sizes. This reduces the employee cost per bag.

The incremental costs were analyzed using accounting records for past history. Floor space, labor costs and other integral costs were compared to determine what cost

savings there may be. Cost savings were treated as cash flow. The NPV and ROI for the project used this cash flow to determine if an investment in automation is a wise one.

The conclusion based on the analysis made was that, based on NPV the investment would be profitable. However, the 3-year payback of $1.5 million would not be possible under current assumptions. The automation would reduce the number of needed employees enough to absorb any reduction in the labor pool while providing increased food and employee safety.

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CHAPTER I: INTRODUCTION

Wixon Inc. is a privately held, integrated food and beverage developer, manufacturer, processor and contract packager in St. Francis, Wisconsin. Being more than a century old, the company has a long and eventful history. During its history, it has seen its share of successes and challenges. One current challenge is to adapt its Bulk Packaging department to meet the modern needs of the customer in a way that allows Wixon to maintain a competitive advantage over its competitors.

1.1 Company History

Charles Franklin Wixon founded the company in 1907. Wixon sold his handcrafted spices and seasoning blends from his horse drawn cart to the people and businesses of Chicago. In 1964, the business expanded with the merger of Wixon Spices and Milwaukee Spice Mills to become Milwaukee Spice Corporation. At this time, the company moved to its current location, St. Francis, Wisconsin. In the 1980s, the company changed its name to Wixon Fontarome when the company was acquired by French owned Fontarome, SA. In 1999, the company achieved ISO 9001 certification. In 2004, the firm was sold to CEO, A. Peter Gottsacker; CFO, Peter Caputa; and VP of sales, Chuck Ehemann. The firm's name changed to Wixon Inc. In 2011, the company achieved Food Safety System Certification (FSSC 2200), a Global Food Safety Initiative (GFSI) recognized food safety scheme. In 2015, Wixon reached a new company record of $100 million in annual sales.

1.2 Background and Justification

The bulk packaging department has been in existence since Wixon moved to its St. Francis location in 1964. In that time, it has not adapted to the needs of the industry in both

food safety and efficiency. This has caused the work centers of this department to be at a competitive disadvantage. Wixon is able to be competitive when it bids on business in which the product is packaged in 20 to 50 pound bags. However, often the customer requires special or smaller sizes to meet their need (e.g. 17.4 lbs. for every batch of 1000 lbs. of pork). The outdated equipment and processes of the Bulk Packaging department make it difficult for Wixon to effectively outbid its closest competitors. Consistently, Wixon gets out bid because it cannot reduce costs given the current equipment and processes.

For Wixon to become competitive when customers request this type of service, the firm needs to innovate the Bulk Packaging equipment. This potentially means the use of mechanization techniques. Mechanization may reduce the number of employees needed to perform the process as it is currently almost entirely manual. The removal of this "human factor" may also enhance the food safety system. This is accomplished by eliminating the potential for human error in the work centers. In addition to the reduction of labor costs, new, more automated equipment may increase efficiency and throughput. This may be accomplished by the use of newer and more sophisticated technologies as well as the removal of "human factor" limitations. Additional indirect savings to the process may be in the form of reduction of safety claims, especially repetitive motion issues.

Another strategic use for automated Bulk Packaging systems is to compensate for the potential upcoming labor shortages. Shortages are projected due, in part, to the looming exit of the Baby Boomers from the work force (Atwater and Jones 2004).

1.3 Project Plan.

Wixon Inc. desires an analysis of the Bulk Packaging department's efficiency and the impact mechanization would have on efficiency and profitability of the department's work centers. The objective is to reduce the up-charge per bag by $0.25 with a three-year payback on any capital required to purchase and implement the project. This number was determined based on the margin by which Wixon consistently loses bids for work to be performed on the Bulk Packaging line. Wixon's competitors' bids were approximately $0.25 per bag lower than the firm's bid.

The questions to be answered by this analysis are: Will a change to a mechanized system of bulk packaging equipment reduce labor per unit produced, reduce incremental costs and increase throughput? In addition, the analysis will answer the question of what the current capacity constraints are and if mechanization will increase the capacity.

The analysis will start with a profit and loss analysis of the production runs on the Bulk Pack lines for the last 3 years. This will determine the current profitability of the work centers as well as where the costs occur and the magnitude. Metrics used to analyze the situation and potential solutions are: labor costs per bag of product, the reduction of incremental cost and bags per minute.

Once the current state is determined, the company engineer will be consulted on the potential equipment to be considered for the mechanization project. Historical data will be compared with the capabilities of the potential equipment to determine any competitive advantages the new equipment may bring. There will then be an analysis to determine if the efficiency brought by the new equipment is at a level that can create a 3-year payback for the capital. In addition, the net present value of the investment will be analyzed. According

to Peter Caputa, historically,Wixon does not use net present value as a tool for deciding whether a capital investment should be made. The analysis was conducted to examine the potential long term financial benefits a mechanized bulk packaging system may have.

CHAPTER II: LITERATURE REVIEW

2.1 Company History

In Wixon's 108-year history, it has developed from a single man selling hand crafted spice blends to the local neighbors and packing houses of Chicago to a multimillion dollar corporation producing and selling highly technical and specialized blends and services. Wixon's customer base has also changed over the years. Today they fulfill the needs of small "Ma and Pa" shops and the needs of multibillion dollar food conglomerates (e.g., Nestlé, Clorox). As one could imagine, the number of blends Wixon offers has changed dramatically since Charles Wixon's 1907 offerings. Wixon currently maintains a catalog of more than 7000 spice, seasoning, and flavor blends. The catalog grows by approximately 25 blends per month (Wixon Inc. 2016).

Wixon has enhanced what it offers to its customers. Now, not only do they sell spice and seasoning blends, but they also offer product development, custom blending, and contract packaging. To better focus on business to business customers, Wixon discontinued its Flavor Shaker line in 2004, thus removing the firm from the retail market. The focus turned to offering customers a full service experience. The firm designs the blend, mixes it, and packages it to the customer's specifications. This helped to generate the motto found on Wixon's trucks, "From concept to consumption…or any point in between."

Wixon, and the spice industry in general, has a long history. This history is supported by methods and processes practiced for decades. In addition, many of the employees in the industry have been performing the same job functions and processes for many years. Wixon embraces the traditions and proven methods of the past but also

strives to improve upon them. The owners know that success is found through progress. They strive to meet this progress by providing value added services such as global sourcing, blending capabilities, reverse engineering, regulatory guidance, sensory panels and custom packaging to meet customer needs (Wixon Inc. 2016). Wixon sees that the Bulk Packaging lines may be lacking in added value. A new packaging line could potentially provide new pack sizes in poly bags not formerly available. When this was discussed with Wixon CFO, Pete Caputa, he stated that the added capability is nice to have but cautioned that it is of no value if customers are not interested in buying goods packaged in the new format (Caputa 2016).

2.2 Potential Future Labor Shortages

The United States has historically experienced systemic labor shortages. Wixon is not immune from this phenomenon. A systemic labor shortage happens when there is a deficit in the number qualified workers to fill the number of new jobs available over a large number of industries, professions, and skill levels (Atwater and Jones 2004). Shortages have historically occurred in times of economic transition from war to peace, when health emergencies such as pandemics occur, and when major innovations change the business and economic climate (e.g., the industrial revolution). A scenario that is predicted to impact the work place in the next 25 to 30 years is the retirement of workers from the Baby Boomer generation. The sudden departure of these workers will greatly outnumber the qualified entrants. The Employment Policy Foundation (EPF) projects that within this time period, at a growth rate of 3% annually, there will be U.S. employment shortage of 35 million workers (Atwater and Jones 2004). The national impact of a

systemic labor shortage may include a decrease in growth rate of the standard of living compared to previous years and a rise in wage-push inflation.

Systemic labor shortages typically follow a three phase pattern; the formative, middle and final phases (Atwater and Jones 2004). The phases have been determined and defined from analysis of a number of past and current labor shortages. Researchers have seen that different industries enter and proceed through the phases at different speeds. Research has shown that some industries take up to 35 years for the phases to occur before the industry has returned to stability. Researchers use past shortages to learn and prepare for current and future shortages (Atwater and Jones 2004).

The formative phase occurs early in the shortage. It is usually the time when an industry recognizes there is, or will soon be a shortage of skilled workers for the number of positions to be filled. This can pose a significant problem for employers because they often feel they need to pay available workers having the appropriate skills a higher wage to attract or retain them. This can cause the price of production to increase. The formative phase typically lasts three to five years (Atwater and Jones 2004).

The middle phase of systemic labor shortages brings with it indications that the shortage is larger than forecast. The middle phase may take from five to ten years. This is the phase when companies attempt to minimize the impact of the shortages with the use of automation and Information Technology to minimize the number of open positions. This method of labor substitution often involves large amounts of capital and are frequently at risk of abandonment. A 1995 Standish Group study found that 30 percent of the IT projects planned were not completed (Atwater and Jones 2004). The executives surveyed, representing 385 companies, stated that over half of the incomplete IT projects

were due to the costs exceeding the budgeted amounts. This middle phase is the one in which Wixon currently finds itself. The owners are cognizant of the potential risk involved with the substitution of labor with technology.

In the final phase, companies start to re-engineer processes in lieu of the technological changes typical of the middle phase. Changes in process engineering may reduce the number of skilled positons but they may also carry a higher risk than technological changes made in the previous phase (Atwater and Jones 2004). There are also new available workers for the skills needed. This new pool of employees is attracted because of the increased compensation demanded by the shortage. The final phase also brings with it relief to some firms and an end to others. The companies that are not able to keep up with the costs of increased compensation, re-engineering processes and technological improvements soon find themselves out of the industry. The exit of companies from the market creates a reduction of labor demand, reduces the shortage and alleviates the stress on the labor market for the industry. This provides the surviving firms with new skilled talent to support their efforts. The key to surviving a systemic labor shortage is a firm incorporating the proper proportion of changes that allow for rapid adaptation to the shortage (Atwater and Jones 2004).

A common reaction to a labor shortage brought on by the exodus of the Baby Boomers in the next few decades is for businesses to try and change the processes to require less employees (Atwater and Jones 2004).

This absorption of open positions is what Wixon owners, Peter Gottsacker (CEO) and Pete Caputa (CFO) would like the automation of the Bulk Packaging line to accomplish. Gottsacker and Caputa recognize potential future staffing problems and

would like to be proactive to avoid unnecessary gaps in productivity that may lead to lost revenue and customer confidence. Automation would create a need for fewer employees retained to the Bulk Packaging work center. These employees; however would need to be highly skilled to meet the higher technological demands of the automated system (Gottsacker 2015).

2.3 Automation of Packaging Equipment

In an effort to reduce labor costs, increase efficiency and minimize human error, food processing companies change processes to include automated packaging lines. Packaging lines are often made up of a number of different pieces of equipment, all integrated to achieve the above mentioned qualities. Packaging lines are frequently comprised of conveying, filling bags, bottling, casing, labeling, sealing, weighing, food safety (e.g., metal detection, sifting and/or x-ray), wrapping, cartonning and palletizing.

One of the most important components of many firms' packaging lines is the conveyer system. Conveyer systems are constantly being developed to increase efficiency and perform other functions that may have been accomplished via manual methods (i.e., flipping, turning, lifting, diverting and indexing) (Mahalik 2014). The speed at which product can get to the different functional units of the packaging line can reduce runtimes and increase throughput. If there is a bottleneck in any section of the system, a loss in efficiency and throughput could occur. In the commodity-based spice and seasoning industry, margins are already small and a loss of a few seconds can increase cost leading to an increase of price to the customer and, ultimately, the loss of competitive edge compared to other firms in the market. Some companies (e.g., tomato processing lines) can have up to a kilometer of conveyers (Mahalik 2014).

The materials from which conveyers and other packaging components are constructed is very important. These pieces need to be durable enough to run for many hours in, sometimes, harsh conditions (i.e., extreme heat or cold) as well as maintain food safety standards. Conveyers constructed from plastics have the luxury of being less expensive and lighter than the same machines constructed with stainless steel. Stainless steel is often the choice for anti-microbial applications. However, stainless steel can develop an accumulation of bacteria called biofilm that can exacerbate food safety concerns (Mahalik 2014). These food safety concerns may include but are not limited to pathogenic bacteria such as *Salmonella spp*., *Listeria monocytogenes*, and *Staphylococcus aureus*. Pathogens can cause serious adverse health consequences or death to humans or animals. To avoid this, the engineer designing the packaging line for a firm may want to use materials less likely to be susceptibal to biofilms such as ones with a coating of polyolefin like polyethylene (Mahalik 2014). Materials other than stainless steel may also be used in situations where conveyers need to run through metal detectors, interact with electronic interfaces or are used in harsh environments such as high acid product processing. Regardless of the material used, it must be easily cleaned and sanitized when it is used at a point where it comes in full or close contact with the food product.

The cleaning process can be very harsh. It may include high pressure or temperature water with different types of detergents and sanitizers as well as physical abrasion (e.g., scrub brushes, salt washes). Any material used in the construction of the line will need to be able to stand up to the the harsh and frequent cleaning regiments

needed to ensure the removal of bacteria as well as other food components (e.g., fats, sugars and allergenic proteins).

Packaging line components need to be seamlessly integrated. Integration between packaging components maintains the synchronicity and efficiency of the system. As stated in section 1.2, automation and IT solutions are regularly used to minimize costs. The ARC Advisory Group, a leading technology research and advisory firm for industry and infrastructure, concurs with the belief that the food industry is undergoing changes driven by the need to reduce costs. Wixon Inc. sees this in its difficulties in producing winning bids against its competitors when the main work center is the Bulk Packaging line. Not only is the industry depending on the reduction of labor to reduce costs, but it is also looking at incremental costs such as improved safety (e.g., reduction of repetitive motion injuries) and liability issues such as loss of traceability. Automating the packaging line and integrating the components can reduce the chances of human error and human limitations.

CHAPTER III: ECONOMIC AND FINANCIAL THEORY

3.1 Introduction

Wixon Inc. is a small, privately owned spice, seasoning and flavoring, S corporation. Sales levels have recently reached near $100MM, annually. The firm's owners have a goal to reach $200MM/year in sales within five years. In addition to the R&D, blending and flavor compounding departments, Wixon has a well established internal and contract packaging division. One of these packaging departments, Bulk Packaging, is not as efficient or profitable as desired by the owners and senior management.

The current process has nine employees in three lines. Many of the reasons for the number of employees are due to the need to monitor quality and food safety aspects of the process as well as the lack of automation. Executive management feels the Bulk Packaging department is one area that has the potential to evolve into a high-end profit center. This will, in management's opinion, require some mechanization and automation of the current, predominantly manual process.

Concerns the firm has with this transition include changes to efficiency, installation and maintenance costs, food safety and personnel safety risks, use of displaced line employees, space and height restrictions and the financial impact.

In addition to these concerns, the CEO has requested that less conventional methods of mechanization are considered. This is in an effort to remain cutting edge and innovative in the firm's five-year reconstruction plan. One aspect of the plan to mechanize the department focuses on the potential design of the actual Bulk Packaging equipment.

Wixon's owners are trying to decide if the installation and transition to an automated packaging line would reduce costs enough to justify the capital investment. The goal is to get the cost per bag down to a level that would make it possible to reduce the upcharge applied to products packaged to a level that is at least as low as the firm's competitors in the market for this type of packaging. According to Pete Caputa, CFO, the reduction would need to be approximately $0.25 per bag packed.

The analysis used to determine if the project is viable in the eyes of the owners is net present value (NPV), a determination of the changes in incremental costs, and an analysis of the input substitution of capital for labor. The results of analyses made using these economic concepts should provide the owners with a better understanding of the potential for the transition to an automated line. Wixon is a privately held company, thus the shareholders are the owners themselves. Caputa stated that this does not necessarily make it any easier. He feels that the immeasurable risk is having the future of 230 employees depending on the owner's decisions.

3.2 Net Present Value (NPV)

Net present value is the theory that indicates a dollar today is worth more than a dollar tomorrow. The time value of money is imperative in the financial decision making process (Baye 2010). Wixon's decision whether to automate the Bulk Packaging line must consider the time value of the cash flows both in and out of the work center.

3.2.1 Opportunity Cost

To analyze using NPV, the owners must consider the opportunity costs of investing in the new equipment. The opportunity cost of capital (also known at the discount rate of capital) is the rate at which the next best investment with similar risk

would earn. It is what the investors are giving up for the investment taken. The concept of opportunity cost is, the investment in which a shareholder could invest his money. Both investments must carry the same level of risk (Brealey, Meyers and Allen 2014). In the context of this thesis, Wixon is considering investing in equipment to automate the Bulk Packaging lines. This investment brings risk with it. The owners could also take the money they were planning on using for the equipment and place it in a different investment of a similar level of risk (e.g., stocks, bonds). According to Mr. Caputa, the understood opportunity cost is approximately 10%. This would be the rate of return from any alternate investment at a similar risk.

Figure 3.1: Net Present Value Equation

$$\mathrm{NPV} = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_T}{(1+r)^T}$$

Where $-C_0$ is the initial investment, C is the cash flow for period i, r is the discount rate and T is the life of the investment (Brealey, Meyers and Allen 2014).

3.3 Incremental Cost

Incremental cost is defined as the extra cost associated with making a managerial decision. It is similar to marginal cost that is the cost associated with the production of one unit of output whereas incremental costs can be applied across numerous units. It is a cost that comes from the choice to change the way the unit is made.

Wixon's owners want an analysis of the changes that may occur in the transition from the current Bulk Packaging processes to the automated line. If the sum of the discounted costs of the changes is not enough to meet or exceed the desired per-bag cost

reduction versus the incremental revenues, the project would not be profitable and the owners should not make the investment.

Figure 3.2: Incremental Cost (Marginal Cost) Equation

$MC = \frac{\Delta C}{\Delta Q}$, where MC is the marginal Cost (Incremental Cost), ΔC is the change in cost and ΔQ is the change in quantity (Baye 2010).

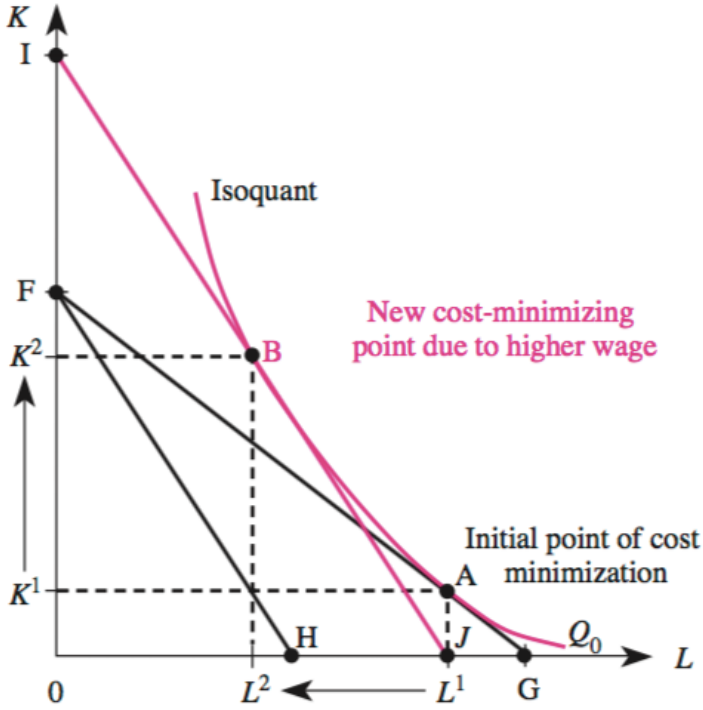
3.4 Input Substitution

A key principle in economics is input substitution. Businesses can produce goods using a combination of different inputs. To reduce costs while maintaining a desired level of production quantity, firms can substitute one input for another. Essentially the firm reduces one input and increases another. Common combinations of inputs may include labor/capital, capital/energy and materials substitution. Since Wixon Inc. is considering an investment in an automated packaging line that would require a reduction in the number of employees needed to manufacture the same quantity of product, this thesis uses the labor/capital substitution. Figure 3.3 below illustrates the theory that when the price of an input changes, it causes a shift in the cost minimizing bundle. Points A and B along the isoquant are examples of differing ratios of capital and labor that generate the same amount of production (Q). The clockwise pivot of the isocost line from FG to FH represents the effect increased labor wages would have if Wixon spent the same amount on the inputs. Line FH shows that there would be no way to obtain the quantities desired at increased labor wage rates. To achieve this Wixon needs to keep the ratio between labor and capital investment so the isocost line is tangent to the isoquant. The way to achieve this is to shift the line by increasing the capital input. This is demonstrated by line IJ in figure 3.3. The

scenario depicted in figure 3.3 is of concern for Wixon as the available labor pool diminishes due to baby boomers leaving the workforce. As there are fewer employees available to fill the positions, the ones available will be able to demand higher wages (Atwater and Jones 2004).

The installation of the new vertical form fill and seal machine will require fewer employees to operate. This alone will require a shift in the input ratios to meet desired quantity levels. Those employees required to run the machine will need to have more specialized abilities and may demand a higher wage.

Figure 3.3: Input Substitution



Adapted from Baye 2010.

3.5 Payback Period

Financial managers of firms often make investment decision based on the amount of time it will take for a project's original investment to be recouped. This time is

measured in periods. There are some dangers with using this type of analysis including no consideration of earnings after the desired payback period. Payback period is determined by dividing the initial investment by the incoming annual cash flows.

Figure 3.4: Payback Period Calculation

Payback Period = Initial Investment / Annual Cash Inflows

Example: $200,000 investment / $50,000 annual cash flow = 4-year payback (payback at end of the fourth period)

(Investopedia 2016).

CHAPTER IV: METHODS AND RESULTS

4.1 Identification of the issue

Wixon's engineering staff enlisted the help of Middough Incorporated (MI). MI provided analysis and mechanization plans for two aspects of the Bulk Packaging process; (1) improved handling of the most highly used (by volume) bulk raw materials and (2) a new packaging line for the finished blends.

This thesis addresses the mechanization of new packaging equipment. It focuses on whether the purchase and use of the equipment recommended by MI is a strategically prudent decision, which if installed, will aid the firm in its goals.

4.1.1 Conceptual Solution Development

Wixon is a small sized food manufacturer. The market place is well saturated with firms providing spice blends and seasonings. Wixon competes with both the large firms, (e.g., Kraft, Newlyweds, McCormick) as well as small firms (e.g., Georgia Spice Company, and Asenzya Spice – *formerly Foran spice*). Most of the raw materials used in the blends by these firms are commodities. Because of this, the price differentiation a customer sees during the bid process has little influence on raw material costs. There is more of an impact on the price charged from costs associated with the manufacturing of the goods. The lower a producer can keep its labor costs and overhead, the better chance a bid can be competitive. In addition, if a firm can offer innovation, it can potentially justify the higher pricing bid.

In an interview with the CEO and co-owner of Wixon, A. Peter Gottsacker, he stated that one of the weakest areas of strategic advantage for Wixon is when the customer desires his product custom packaged in a 3 to 20-pound poly bag. This disparity was supported by the results of the customer satisfaction survey Wixon's marketing department conducted in 2013. In the survey, 95 customers were asked to rate twenty-one aspects of their business to determine how Wixon was meeting or exceeding their needs. Of the categories rated, the one that received the lowest score with a 7.51 (out of 10) was price. In fact, the firm's closest competitor received an 8.11 and the same customers rated the overall portion of the industry at 8.13. The firm's customers also scored Wixon lower than desired on how competitive they were when it came to the bidding process for new business. The fact there is a perceived gap is apparent to Wixon. Mr. Gottsacker stated, during one of the bidding exercises for a customer's pizza seasoning business, Wixon was greatly under-bid by the competition. In fact, the margin was approximately $0.25 per bag (on an 11.5-pound bag). At a total ingredient cost of $0.50 per pound, the total ingredient cost for one bag would be $5.75. A bid of $0.25 represents 4.35% of the bid per bag.

This size bag is packed using one of the Bulk Packaging lines and requires much much time, labor and overhead that Wixon consistently loses to its competitors in bidding. Gottsacker's experience with bidding told him that, since there was considerable difference in bids, one way to alleviate the disparity may be to re-innovate the Bulk Packaging department. His feeling was that a potential way to bridge the gap and achieve the corporate goals was to improve the processes in the Bulk Packaging department on the order of approximately $0.25 per bag. In addition to mechanization and new equipment potentially helping to lower the cost of manufacturing, it may also provide previously

unavailable packaging offerings to customers. The added value could possibly help to justify a higher price bid.

4.1.2 Current Configuration of Bulk Packaging Lines

Bulk packaging currently consists of three lines (line numbers 4, 5, and 6). Each line currently requires two to four employees to operate.

Line 4 is situated in an enclosed suite to isolate it from other lines and to prevent potential cross contamination. The line is comprised of a gravity fed hopper with a vibratory aid, a Prater vibrating sifter, a bank of rare Earth magnets, a Hayson vertical form and fill packaging unit, take away conveyer belts, a Fortress metal detector and a Hitachi inkjet date coder. This line requires two employees. One employee is needed to work the filler room and make sure the hopper is always charged with product. This same employee must also be available to seal completed cases at the end of the line. The other is needed to operate the vertical filler, metal detector and check-weigh balance.

Lines 5 and 6 are each comprised of the following components: vibratory sifting, vibration-aided hoppers and transition feeders, banks of rare earth magnets, metered bag fillers, balances, impulse bag sealers, inkjet date coders, takeaway conveyers, and Fortress metal detectors. These lines require three to four employees per each line.

4.2 Time Study of Current Process

In an effort to aid MI's assessment and proposal for a new Bulk Packaging line, Wixon's engineering department with the assistance of Bulk Packaging department management and employees, conducted a time study to help achieve a metric for the number of bags per minute each current line is capable of producing. This metric would be used as a current baseline to compare against the capabilities of any potential mechanized

(or other) solution. Overall, twenty-one blends and twenty-five time tests were run. Each of the blends was packed in different sized bags; however, all bags were within the range of 3.25 to 19.12 pounds. The study timed eight different Bulk Packaging employees. This was done to allow for variations of the different employee skills and speeds, helping to make the metrics more accurate.

4.2.1 Time Study Results

Line 4 tested at 2.7 bags per minute, 159 bags per hour and 1033.5 bags per 6.5-hour shift (allowing for lunch, breaks, start up and shutdown times).

Line 5 tested out at 2.8 bags per minute, 168 bags per hour and 1092 bags per 6.5-hour shift.

Line 6 tested out at 2.1 bags per minute, 124.5 bags per hour and 809.3 bags per 6.5-hour shift.

4.3 Proposed Solution from Middough Incorporated

Middough Incorporated's (MI) proposal to improve the efficiency of the Bulk Packaging department involves replacing the existing equipment for all three lines. This change is possible mainly because MI selected a vertical form, fill and seal (VFFS), machine from HaysssenSandiacre. The VFFS specified is the Ultima SV 16-22 HP. The particular specifications that allow it to replace the other machines are its product speed (bags/minute) and its adaptability to numerous bag sizes with minimal down time adjustment. In addition, the machine can be regularly operated with only one to two employees.

Based on the time and capability studies performed by MI and Wixon, the main mixer that produces the products for the Bulk Packaging lines is capable of producing 60 lbs. of product per minute. The new VFFS is designed to meet that rate of processing and

not create a bottleneck in the total process. Table 4.1 below shows the different sized bags that the VFFS can handle, the rates of fill for each size and the range in weight each bag size can hold. It also shows the comparison between the numbers of bags of which the current, more manual process, and the proposed VFFS line are capable.

Table 4.1: Capability Study: Product Bag Sizes, Weight Ranges and Comparison of Bag Rates of Current Process vs. VFFS

Product Bag Sizes	Weight Ranges	Bags/Min Current process	Bags/Min w/VFFS
10″ X 14″	1.5-5.0 lbs.	3.4 bags/min	12-40 bags/min
10″ X 18″	5.0-8.0 lbs.	2.6-3.8 bags/min	7.5-12 bags/min
12″ X 20″	8.5 -10.5 lbs.	3.8 bags/min	5.7-7.1 bags/min
12″ X 24″	11.0 – 16.0 lbs.	1.8-3.6 bags/min	3.8-5.5 bags/min
16″ X 24″	16.0 – 21.5 lbs.	1.6-2.4 bags/min	2.8-3.8 bags/min
16″ X 30″	22.0 – 27.0 lbs.	Not capable	2.2-2.7 bags/min

4.3.1 Estimated Price of New Equipment

The engineer's estimate for installation of the VFFS line project from MI is broken down into labor, materials and subcontractor costs. The project is estimated to take 704 total man-hours of labor for a total cost of $80,017. The material cost estimate totals $406,780. The subcontract estimate total is $2,216. The total for MI's estimate is $489,013 (Middough Inc. 2012).

In an interview with the firm's engineer, Paul Wasielewski, he emphasized that MI's cost estimate did not include other necessary actions that would affect the total cost of the project. Wasielewski stated the project would require structural changes to the production area (e.g., masonry work, new concrete and epoxy floor finishing), utility upgrades, changes in fire protection, additional storage hardware as well as other

unforeseen expenses (Wasielewski 2015). The total estimate for the project is approximately $1.5 million.

4.3.2 Determination of Employee cost per Bag

Wixon uses a constant rate of $25 per employee, per hour, worked when determining production costs. This rate includes the salary and benefits the employee receives. The Bulk Packaging department considers the production day to be 6.5 hours. However, the employees are paid for eight hours. The difference between the two measurements of a shift accounts for downtime in which production is not producing product but still getting paid. According to the August 17, 2013 Business Insider, Weisenthal states the average American working in the USA works approximately 1,700 hours per year (Weisenthal 2013). This is based on an 8-hour workday. With an adjustment to meet Wixon's 6.5-hour shift there are 1381.25 shift hours per year (S). The average bags per hour (A) was determined by taking the average number of bags per minute as determined by the time study and converting that number to an annual basis. Employee cost per bag (E) was determined by multiplying an 8-hour day by the standard $25 per hour rate and then dividing by the average number of bags per 6.5-hour work shift. The number of employees was determined by the employees needed to run the line. Currently, the Bulk Packaging department runs 2 shifts. There are eight employees working first shift and three employees working second shift. The VFFS line would only need a maximum of two to three (if a material handler is used to move incoming and packaged product) employees. Figures 4.1 and 4.2 show the formula used to determine the annual employee cost for each line. Table 4.2 shows the annual impact of employee wages on the price per bag using the 6.5-hour work day adjustment.

Figure 4.1: Employee Cost per Bag Formula

$$\text{Employee Cost per Bag} = \frac{\$25/\text{hour pay rate constant} * 8 - \text{hr work shift}}{\text{bags produced in 6.5 hr production shift}}$$

Figure 4.2: Annual Employee Cost Formula

Average bags per hour x

Employee cost per bag x

Number of employees per line x

Shift hours per year =

Annual employee cost

Table 4.2: Annual Employee Costs per Line

Production Line	Cost
Line 4	$85,000
Line 5	$170,000
Line 6	$110,058
Sub total	$365,058
VFFS	$85,000
Savings	$280,058

4.4 Input Substitution: Labor vs. Capital

The input substitution was measured by the difference of the employee cost per bag of the current, labor intensive, bulk packaging lines (4, 5, and 6) and the employee cost per bag of the potential purchase of the new VFFS equipment. This is demonstrated in Table 4.3. The sum of the employee cost per bag for bulk packaging lines 4, 5, and 6 is $0.53. The employee cost per bag for the VFFS is $0.06. Table 4.4 shows a comparison of the time and employee cost resources required to complete 1000 bags of product. The comparison was used to demonstrate the efficiency of the lines on a level that is more realistic.

Table 4.3: Comparison of Employee Average Cost per Bag: Existing Bulk Packaging Lines vs. VFFS

Production Line	Employee Cost Per Bag
Line 4	$0.19
Line 5	$0.18
Line 6	$0.16
Total for Current Lines	$0.53
VFFS	$0.06
Difference in Cost	$0.47

Table 4.4: Employee Cost and Comparison of Packing 1000 Bags: Existing Bulk Packaging Lines vs. VFFS

Production Line	Hours to make 1000 bags	Employee Cost for 1000 bags
Line 4	6.29	-$157.25
Line 5	5.95	-$148.75
Line 6	8.03	-$200.75
Average Current Lines	6.76	-$168.92
VFFS	0.29	-$7.25
Difference in Cost	6.47	-$161.67

4.5 Incremental Costs: Existing Bulk Packaging Lines vs. VFFS

Incremental cost was determined by comparing the changes in costs associated with the operation of the new equipment in the Bulk Packaging department. The cost changes analyzed were floor space, labor, and burden both general and from support departments (e.g., Maintenance, Quality Control, Shipping and Regulatory). Wixon's owners felt that these cost changes would have the highest impact on the decision.

4.5.1 Floor Space Assumptions and Calculations

Floor space at Wixon is limited. Because of this, the owners are interested in the footprint and amount of space each work center occupies. In an interview with Peter Caputa, he stated that the best way to determine the value of a square foot of manufacturing space was to look online to determine the cost of a manufacturing space build out. The value assigned to the floor space calculation in table 4.5 was derived from the web site, DCD.com (DC&D Technologies 2015). The cost used came from data listed for two manufacturing sites, Lee Steel Corporate Plant ($60.68 per square foot) and SWF Industrial Plant ($48.80 per square foot). The average of $54.74 was used in the cost calculation. The value of each work center was determined by multiplying the DCD.com data by the square footage of each work center (Figure 4.3). Work center footage took into account the foot print of the machine, space need for staging pre and post processed product as well as, other associated equipment (e.g., lift trucks, sinks, tool carts, etc.).

The VFFS would take the place of lines 5 and 6 and would potentially make line 4 obsolete, thus freeing up the space in the work center for other uses. The difference of the sum of the total floor space value of the current lines (4, 5, and 6) and the value of the estimated floor space need for the VFFS is $7,718.34 (Table 4.6).

Table 4.5: Price of Manufacturing Space Build Out

Facility	Price per SqFt
Lee Steel Corporate Plant	$60.68
SWF Industrial Plant	$48.80
Average cost per SqFt	$54.74

(DC&D Technologies 2015)

Figure 4.3: Floor Space Cost Calculation
Floor Space Cost = Average Cost per SqFt (Table 4.5) x Size of Work Center (in SqFt)

Table 4.6: Work Center Floor Space Cost Comparison

Work Center	Size (in Sq./Ft)	Cost at $54.74/SqFt
Line 4	241	$13,192.34
Line 5	400	$21,896.00
Line 6	400	$21,896.00
Total of lines 4,5,6	1041	$56,984.34
VFFS	900	$49,266.00
Difference in Cost	141	$7,718.34

4.5.2 Burden Assumptions and Calculations

Burden was broken up into general and also by the different support departments that aid Bulk Packaging department with their work.

The general burden amount is derived by accounting for the items the bulk department needs to produce product. General burden for the existing lines is determined using past costs for categories such as those listed in the profit and loss reports for the department such as repair and maintenance equipment, parts, laundry, training, and equipment rental, (see Appendix A). General burden for the VFFS equipment was estimated based on discussions with Wixon cost analysts, department managers and the firm's engineer.

To determine support department burden, Wixon accounting calculates and records the financial impact each support department has on Bulk Packaging. The calculation includes reports by each support department manager defining how much of their department's time is spent supporting Bulk Packaging. That amount is applied to other accounting calculations such as the support department's utilization rate and budget to generate the amount of burden applied to Bulk Packaging. The amount is applied to the

machine hours each piece of equipment in the department operates. Table 4.7 shows the calculated burden rate per machine.

Cost savings was calculated by summing both types of burden for lines 4, 5, and 6 then subtracting out the estimated combined burden for the VFFS.

Table 4.7: Burden Rate per Machine Hour Applied to Bulk Packaging Equipment

Source	Burden rate ($/machine hr.)
General	$17.13
Maintenance	$5.49
QC	$14.17
Shipping	$17.01
Regulatory	$21.50

(Wixon Accounting Department 2016)

4.5.3 Final Incremental Cost Calculation

To determine the incremental cost for each work center the total cost of floor space and burden were calculated for the three existing Bulk pack lines as well as the VFFS line (Figure 4.4). The costs for the existing Bulk Packaging lines were summed. Then the total of the incremental costs for the VFFS line were subtracted from the totals for the existing lines. The difference of the two cost totals produces the incremental cost savings (Table 4.8).

Figure 4.4: Cost Total Equation

Cost Total = Floor Space Cost + Total Burden Cost

Table 4.8: Incremental Cost Comparison: Current System vs. VFFS

Cost	Current system (Lines 4,5,6)	VFFS	Difference
Floor Space	$56,984.34	$49,266.00	$7,718.34
Burden			
General	$23,660.81	$17,106.24	$6,554.57
Maintenance	$7,583.06	$2,502.41	$5,080.65
QC	$19,572.31	$6,458.86	$13,113.45
Shipping	$23,495.06	$11,747.53	$11,747.53
Regulatory	$29,696.88	$9,799.97	$19,896.91
Burden Total	$104,008.13	$47,615.02	$56,393.11
Cost Total	$160,992.47	$96,881.02	$64,111.45

4.6 Net Present Value

Net present value was calculated using the formula shown in Figure 3.1 and, to a more detailed level, the formula in Figure 4.6. The initial estimated investment of $1.5 million was used as the cash flow for C_0.

4.6.1 Cash Flow Calculation and Assumptions

The cash flows for the remaining periods of the investment were determined by adding the cost savings from changes in labor to the changes in incremental costs.

4.6.2 Depreciation Calculation and Assumptions

Wixon's policy for depreciation of manufacturing equipment is to depreciate for 10 years using the modified accelerated cost recovery system (MACRS) depreciation schedule. Table 4.9 shows the deprecation schedule as applied to the initial investment of $1.5 million.

The amount of depreciation calculated for each period was then deducted from the total cost savings of the same period to generate the pre-tax profit.

Table 4.9: 10-Year Depreciation on $1.5MM Initial Investment

Period	Depreciation Rate (MACRS)	Depreciation Amount (in thousands of dollars)
0		$0.00
1	0.10	$150.00
2	0.18	$270.00
3	0.144	$216.00
4	0.1152	$172.80
5	0.0922	$138.30
6	0.0737	$110.55
7	0.0655	$98.25
8	0.0655	$98.25
9	0.0656	$98.40
10	0.0655	$98.25
11	0.0328	$49.20

4.6.3 After Tax Profit Calculation and Assumptions

Since Wixon is an S corporation, it is not directly taxed. Taxes pass through the organization and are paid by the owners. In an interview with Peter Gottsacker, he stated his tax rate was 46% (Gottsacker 2015). The tax rate was multiplied by the pre-tax profit for each period to obtain the after tax profit amount.

4.6.4 Operating and Net Cash Flow Calculations

The amount of depreciation, in table 4.9 was added to the after tax profit to obtain the operating cash flow for each period. Because there were no additional revenue inputs other than the initial investment in period 0, the operating cash flow and net cash flow for periods one through eleven were equal. The net cash flow for period 0 was the original investment (-$1.5 million) plus the operating cash flow of the period ($0) for a total of -$1.5 million.

4.6.5 Discount Rate and Inflation

The discount rate Wixon uses, as discussed above, is 10%. This nominal discount rate was adjusted for inflation using an inflationary rate of 1.5%. The rate was selected

because of historical data from 2013 and 2014 (Coinnews Media Group LLC 2016). The inflation rates in 2015were uncharacteristically low (ranging from 0.0 to 0.7) and January 2016's level (1.4) was back up to levels similar to 2013 and 2014 (Coinnews Media Group LLC 2016).

The nominal discount rate is adjusted for inflation to give the real discount rate. (See figure 4.5)

Figure 4.5: Real Discount Rate Equation

$$\text{Real Discount Rate} = \frac{1 + \text{Nominal Discount rate}}{1 + \text{Inflation Rate}} - 1$$

Figure 4.6: Net Present Equation

Sum of Change Costs = Change in Incremental Costs + Change in Labor Costs

Pretax Profit = Sum of Change Costs - Depreciation

Tax = Pretax Profit * Tax rate

After Tax Profit = Pretax Profit - Tax

Net Cash Flow = After Tax Profit + Depreciation

Net Present Value =

$$\text{Initial Invest} + \frac{\text{Net Cash Flow}_{\text{year 1}}}{(1 + \text{discount rate})} + \frac{\text{Net Cash Flow}_{\text{Year 2}}}{(1 + \text{discount rate})^2} + \cdots + \frac{\text{Net Cash Flow}_{\text{Year 11}}}{(1 + \text{ discount rate})^{11}}$$

4.6.7 Net Present Value Results

The real rate was used in the net present value equation in Figure 3.1. The net present value of the investment is $541,290 over the span of eleven years. By net present value standards, the purchase and installation of the VFFS system would be a good investment in the long run.

Table 4.10: Net Present Value in Thousands of Dollars

Period	Capital Investment	Change in Incre-mental Cost	Change in Labor Costs	Sum of change on Costs	Tax Depreciation Rate (MACRS)	Tax Depre-ciation	Pre-Tax Profit	Tax at Rate of 46%	After Tax Profit	Depre-ciation	Operating Cash Flow	Net Cash Flow	Present Value at 11.5% (real rate)
0	-1,500	0	0	0		0	0	0	0	0	0	-1,500	-1,500
1	0	64.11	297.5	361.61	0.10	150	211.61	97.34	114.27	150.00	264.27	264.27	237.01
2	0	64.11	297.5	361.61	0.18	270	361.43	166.26	195.17	270.00	465.17	465.17	374.17
3	0	64.11	297.5	361.61	0.144	216	361.47	166.28	195.19	216.00	411.19	411.19	296.63
4	0	64.11	297.5	361.61	0.1152	172.8	361.50	166.29	195.21	172.80	368.01	368.01	238.10
5	0	64.11	297.5	361.61	0.0922	138.3	361.52	166.30	195.22	138.30	333.52	333.52	193.53
6	0	64.11	297.5	361.61	0.0737	110.55	361.54	166.31	195.23	110.55	305.78	305.78	159.13
7	0	64.11	297.5	361.61	0.0655	98.25	361.55	166.31	195.23	98.25	293.48	293.48	136.98
8	0	64.11	297.5	361.61	0.0655	98.25	361.55	166.31	195.23	98.25	293.48	293.48	122.85
9	0	64.11	297.5	361.61	0.0656	98.4	361.55	166.31	195.23	98.40	293.63	293.63	110.24
10	0	64.11	297.5	361.61	0.0655	98.25	361.55	166.31	195.23	98.25	293.48	293.48	98.82
11		64.11	297.5	361.61	0.0328	49.2	361.58	166.33	195.25	49.20	244.45	244.45	73.82
												Net Present Value	541.29

4.7 Payback Period

Although the net present value result shows the VFFS investment would be profitable, Wixon's owners do not look as closely at the long run of the investment. Historically, they are more comfortable to choose to make an equipment investment if there is a payback within two to three years. The expectations of the bulk packaging project are that the investment will return their investment within three years.

Using the net present value calculation performed above, it is obvious that the cash flows generated will not return the investment within the desired three years. In fact, the investment would not be fully recovered until nearly all the way through the fourth, non-discounted payback period. If discounted periods are used, the investment would be paid back by some time in the seventh period.

Table 4.11: Payback Time for $1.5 Million Investment

	Number of Periods
Payback Period	3.9765 Periods
Discount Payback Period	6.0104 Periods

4.7 Food Safety and Personnel Safety Aspects

Often overlooked contributors to the cost of running a food processing line are food safety and employee safety. The current production lines in the Bulk Packaging department are labor-intensive. The more times a human needs to interact directly with the food products, the more potential there is for contamination of the product. Line 5 and 6 each have three to four employees assigned and line 4 has at least two. The new VFFS system is designed to have the one to two employees feed the product into the initial hopper and then receive finished, sealed product containers at the end. The more

automated system would eliminate the employee-product interaction points at the bag fill, and sealer steps. It would also minimize the amount of contact during the hopper filling by using larger super sacks that hold more than three times the amount of product than the fiber drums the current system uses.

The reason the avoidance of human contact is so important is to minimize the potential risk of pathogenic contamination as well as cross contamination from employee contact with other higher risk products such as allergens. Allergens and foodborne pathogens are among the highest occurring reasons for food recalls. According to The Grocery Manufacturer's Association's October, 2011 report, "*Capturing Recall Costs: Measuring and Recovering the Losses"*, the cost impact of a recall is huge. Of the companies survived, 77% of respondents who had conducted a Class I (health or safety risk) recall stated that the financial impact on their firms was $30 million (GMA 2011). With the risk of such a large potential cost, the investment in equipment to minimize the risk should be easier to accept.

Employee welfare and safety is also a factor in the cost of operating a food production plant. Any worker injury has two sets of costs; direct and indirect. Direct costs are those such as medical costs, fines, worker compensation payments, and potential charges for legal council. Indirect costs such as additional training, replacement employees, low employee morale and lost productivity can be many times greater than the direct costs (Occupational Safety & Health Administration n.d.). The new VFFS line uses fewer employees and would have newer, safer, technology so there would be less of a chance of employees to obtain an injury.

CHAPTER V: SUMMARY AND CONCLUSION

5.1 Summary of Results

5.1.1 Employee Cost Per Bag

If Wixon were to implement the VFFS system recommended by Middough Inc. the increased efficiency and fill rate would create an annual employee cost per line savings of $280,058. That equates to an average savings per bag of $0.47 compared to the current Bulk Packaging lines. The owners are looking for a savings of approximately $0.25 per bag to become a more competitive bidder in the bulk packaging market.

5.1.2 Incremental Costs

The new VFFS work center would take up slightly more than the foot print of lines 5 and 6 together. There would be some space liberated if the firm decided to remove line 4. This would be possible because the VFFS would be designed and is intended to accommodate the workload of all three existing lines. Freeing up 141 square feet would save the firm $7,718.34.

Many of the general and support department sources of burden would decrease if the firm would invest in the VFFS. There would be a total cost savings from decreased burden in the amount of $56,393.11.

In total, moving to the new VFFS would create a burden cost savings of $64,111.45 annually.

5.1.3 Net Present Value

The NPVof the investment was $541,290. Although the firm's owners are not accustom to using net present value as an investment decision tool, the results of the

calculation indicate the VFFS system would prove to be profitable in the life of the investment.

5.1.4 Payback Period

The investment would not meet the desired payback period of three years. In fact, it would take nearly four years to pay back the investment and a little more than six discounted periods to pay it back.

5.1.5 Break-Even Amount

If the firm could generate additional savings or cash flows, they would be able to meet the desired 3-year payback period. Using the 3.97-years payback period (Table 4.11) and the net cash flows determined in Table 4.10, the firm would need to generate an additional $119,723 annually to meet this goal (see Figure 5.1)

Figure 5.1: Break-Even Calculation for 3-Year Payback of Investment

3.9765 yr. payback – 3 yr. (desired payback period) = 0.9765 remainder periods.

0.9765 x $368,000 (net cash flow from year 4) = $359,168

$359,168 ÷ 3 yr. = $119,723 per year additional cash flow needed to meet 3-year payback.

5.1.6 Soft savings – Food Safety and Personnel Safety

These are costs that are often forgotten and not considered in profit and loss or other financial calculations when considering a new equipment investment. In fact, many times, it is after an incident has happened that the financial burden is felt.

5.2 Recommendations

Based on the net present value analysis and the reduction in price per bag that exceeds the owner's desired level, the investment should be made. Although the payback extends past the three years required by the owners, the benefit of a food safe design and

enhanced safety features makes the VFFS worth the extra payback time. The more advanced technology and flexibility of the VFFS offers a potential to generate additional business to earn the nearly $120,000 of additional cash flow needed to meet the desired payback period. In addition, the new system would decrease the number of employees needed to staff the bulk packaging department. This would help to make the transition to a smaller labor pool due to the exit of the Baby Boomers easier to manage.

5.3 Future Considerations

One aspect of the analyses in this thesis that was not able to be considered was the potential for the VFFS system to be able to package goods in new sizes and styles of bags that may create new sales revenue. Due to the fact that Wixon does not assign revenue specific to work centers, it is difficult to predict the increase in sales the new system might provide at this time. The more advanced technology and flexibility of the VFFS offers a potential to generate additional business to earn the nearly $120,000 of additional annual cash flow needed to meet the desired payback period. This increase in sales could help to reduce the payback period to a level the owners could accept.

APPENDIX A

Table A.1: Comparative Profit and Loss of Wixon's Bulk Packaging Lines 2015 - Labor

	2015 Actual	2015 Re-estimate	2015 Actual vs. Re-estimate (+/- $)	Actual vs. Re-Estimate (%)
Sales Adjustments				
Labor:				
Salary	$31,872.31	$43,892.85	$(12,020.54)	-27.39%
Hourly	$252,979.75	$280,352.62	$(27,372.87)	-9.76%
Overtime	$23,158.12	$24,552.84	$(1,394.72)	-5.68%
Bonus	$19,595.18	$19,100.95	$494.23	2.59%
Benefits:				
Health	$60,343.45	$56,234.75	$4,108.70	7.31%
Life & Disability	$4,238.84	$4,909.96	$(671.12)	-13.67%
FICA	$23,764.34	$26,735.54	$(2,971.20)	-11.11%
FUTA/SUTA	$5,112.79	$5,786.92	$(674.13)	-11.65%
401K	$3,609.03	$4,484.01	$(874.98)	-19.51%
Profit Sharing	$18,009.97	$18,135.59	$(125.62)	-0.69%
Total Benefits	$115,078.42	$116,286.77	$(1,208.35)	-1.04%
Temporary	$47,133.79	$48,542.50	$(1,408.71)	-2.90%
Recruitment	$-	$-	$-	0.00%
Total Labor	$489,817.57	$532,728.53	$(42,910.96)	-8.05%

Table A.2: Comparative Profit and Loss of Wixon's Bulk Packaging Lines 2015 – Other Expenses and Total Expenses

	2015 Actual	2015 Re-estimate	2015 Actual vs. Re-estimate (+/- $)	Actual vs. Re-Estimate (%)
Other Expenses:				
Laundry	$2,788.61	$2,259.97	$528.64	23.39%
Shoes	$450.00	$550.00	$(100.00)	-18.18%
Training/Education	$255.07	$855.07	$(600.00)	-70.17%
R&M Equipment	$4,637.81	$3,499.95	$1,137.86	32.51%
Supplies:				
Manufacturing	$10,110.13	$10,401.68	$(291.55)	-2.80%
Office	$688.94	$850.85	$(161.91)	-19.03%
Total Supplies	$10,799.07	$11,252.53	$(453.46)	-4.03%
Travel & Entertainment:				
Travel	$110.40	$110.90	$(0.50)	-0.45%
Meals	$245.53	$334.38	$(88.85)	-26.57%
Entertainment	$73.92	$-	$73.92	
Total Travel & Entertainment	$429.85	$445.28	$(15.43)	-3.47%
Equipment Rental	$5,024.36	$5,033.78	$(9.42)	-0.19%
Safety:				
Lean:				
Outside Fees	$472.25	$300.00	$172.25	57.42%
Promotion:				
Telephone	$729.93	$605.38	$124.55	20.57%
Commissions:				
Safety Incentives	$611.85	$297.88	$313.97	105.40 %
General Freight	$470.99	$505.26	$(34.27)	-6.78%
Depreciation:				
Equipment	$20,576.38	$20,576.38	$-	0.00%
Total Depreciation	$20,576.38	$20,576.38	$-	0.00%
Total Other Expenses	$47,246.17	$46,181.48	$1,064.69	2.31%
Exceptional:				
Total Exp. Before Int.	$537,063.74	$578,910.01	$(41,846.27)	-7.23%
Total Exp. Before Taxes	$537,063.74	$578,910.01	$(41,846.27)	-7.23%
Total Expenses	$537,063.74	$578,910.01	$(41,846.27)	-7.23%

Table A.3: Comparative Profit and Loss of Wixon's Bulk Packaging Lines 2014 – Labor

	2014 Actual	2015 vs 2014 (+/- $)	2015 vs 2014 (%)
Sales Adjustments			
Labor:			
Salary	$52,716.34	$(20,844.03)	-39.54%
Hourly	$237,697.99	$15,281.76	6.43%
Overtime	$31,988.65	$(8,830.53)	-27.61%
Bonus	$18,063.98	$1,531.20	8.48%
Benefits:			
Health	$54,398.41	$5,945.04	10.93%
Life & Disability	$3,509.11	$729.73	20.80%
FICA	$25,395.77	$(1,631.43)	-6.42%
FUTA/SUTA	$5,503.65	$(390.86)	-7.10%
401K	$2,921.23	$687.80	23.54%
Profit Sharing	$17,643.34	$366.63	2.08%
Total Benefits	$109,371.51	$5,706.91	5.22%
Temporary	$34,351.75	$12,782.04	37.21%
Recruitment	$-	$-	0.00%
Total Labor	$484,190.22	$5,627.35	1.16%

Table A.4: Comparative Profit and Loss of Wixon's Bulk Packaging Lines 2014 – Other Expenses and Total Expenses

	2014 Actual	2015 vs 2014 (+/- $)	2015 vs 2014 (%)
Other Expenses:			
Laundry	$1,918.80	$869.81	45.33%
Shoes	$142.66	$307.34	215.44%
Training/Education	$865.71	$(610.64)	-70.54%
R&M Equipment	$6,336.20	$(1,698.39)	-26.80%
Supplies:			
Manufacturing	$16,027.93	$(5,917.80)	-36.92%
Office	$1,080.01	$(391.07)	-36.21%
Total Supplies	$17,107.94	$(6,308.87)	-36.88%
Travel & Entertainment:			
Travel	$-	$110.40	
Meals	$135.97	$109.56	80.58%
Entertainment	$-	$73.92	
Total Travel & Entertainment	$135.97	$293.88	216.14%
Equipment Rental	$5,024.36	$-	0.00%
Safety:			
Lean:			
Outside Fees	$591.48	$(119.23)	-20.16%
Promotion:			
Telephone	$493.03	$236.90	48.05%
Commissions:			
Safety Incentives	$63.95	$547.90	856.76%
General Freight	$513.37	$(42.38)	-8.26%
Depreciation:			
Equipment	$16,793.62	$3,782.76	22.52%
Total Depreciation	$16,793.62	$3,782.76	22.52%
Total Other Expenses	$49,987.09	$(2,740.92)	-5.48%
Exceptional:			
Total Exp. Before Interest	$534,177.31	$2,886.43	0.54%
Total Exp. Before Taxes	$534,177.31	$2,886.43	0.54%
Total Expenses	$534,177.31	$2,886.43	0.54%

Table A.5: Comparative Profit and Loss of Wixon's Bulk Packaging Lines 2013 – Labor

	2013 Actual	2014 vs 2013 (+/-$)	2014 vs 2013 (%)
Sales Adjustments			
Labor:			
Salary	$51,945.50	$770.84	1.48%
Hourly	$296,448.12	$(58,750.13)	-19.82%
Overtime	$27,970.62	$4,018.03	14.37%
Bonus	$18,832.38	$(768.40)	-4.08%
Benefits:			
Health	$35,734.79	$18,663.62	52.23%
Life & Disability	$3,102.04	$407.07	13.12%
FICA	$28,381.39	$(2,985.62)	-10.52%
FUTA/SUTA	$7,962.43	$(2,458.78)	-30.88%
401K	$2,583.56	$337.67	13.07%
Profit Sharing	$14,835.93	$2,807.41	18.92%
Total Benefits	$92,600.14	$16,771.37	18.11%
Temporary	$66,748.93	$(32,397.18)	-48.54%
Recruitment	$8,250.00	$(8,250.00)	-100.00%
Total Labor	$562,795.69	$(78,605.47)	-13.97%

Table A.6: Comparative Profit and Loss of Wixon's Bulk Packaging Lines 2013 – Other Expenses and Total Expenses

	2013 Actual	2014 vs 2013 (+/-$)	2014 vs 2013 (%)
Other Expenses:			
Laundry	$2,283.96	$(365.16)	-15.99%
Shoes	$118.63	$24.03	20.26%
Training/Education	$644.74	$220.97	34.27%
R&M Equipment	$12,024.43	$(5,688.23)	-47.31%
Supplies:			
Manufacturing	$7,827.60	$8,200.33	104.76%
Office	$1,466.98	$(386.97)	-26.38%
Total Supplies	$9,294.58	$7,813.36	84.06%
Travel & Entertainment:			
Travel	$-	$-	0.00%
Meals	$59.13	$76.84	129.95%
Entertainment	$-	$-	0.00%
Total Travel & Entertainment	$59.13	$76.84	129.95%
Equipment Rental	$9,106.09	$(4,081.73)	-44.82%
Safety:			
Lean:			
Outside Fees	$562.01	$29.47	5.24%
Promotion:			
Telephone	$610.29	$(117.26)	-19.21%
Commissions:			
Safety Incentives	$468.17	$(404.22)	-86.34%
General Freight	$446.40	$66.97	15.00%
Depreciation:			
Equipment	$3,572.12	$13,221.50	370.13%
Total Depreciation	$3,572.12	$13,221.50	370.13%
Total Other Expenses	$39,190.55	$10,796.54	27.55%
Exceptional:			
Total Exp. Before Interest	$601,986.24	$(67,808.93)	-11.26%
Total Exp. Before Taxes	$601,986.24	$(67,808.93)	-11.26%
Total Expenses	$601,986.24	$(67,808.93)	-11.26%

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