

**THE ADOPTION OF GOOD  
MANUFACTURING PRACTICES IN GRAIN  
ELEVATORS**

by

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## **ABSTRACT**

With increased focus on food safety and protection, the Food & Drug Administration (FDA) has examined the possibility of removing the exemption for elevators pertaining to Good Manufacturing Practices (GMPs). The objective of this thesis was to determine the extent to which Kansas Elevators have adopted GMPs.

To accomplish the objective of this thesis, information from an online survey completed by 42 elevators was summarized and analyzed. The information that was collected focused on the general classification of the elevators, grain safety programs, pest control programs and procedures, operational methods and personal practices, and maintenance of the facilities and equipment. Correlation coefficients were computed to determine if there were any significant correlations between elevator characteristics and GMPs.

The study found that many of the elevators surveyed do not comply with the GMP requirements, and would require more resources in order to do so. Little connection was made between classification information such as size, location, or number of employees and GMP implementation. The significant correlations found were between HACCP and Pest Management, and HACCP and Traceability. The main limitation of this thesis was the small number of survey participants.

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## **CHAPTER 1: INTRODUCTION**

### **1.1: Introduction**

Since September 11<sup>th</sup>, 2001, security has been on the minds of many. The possibility of a terrorist attack has caused the government to analyze everything from air travel to mail service. Concerns have arisen about the security of food in the United States, and if it can be assured that a bioterroristic attack through food would not be possible. Over the years, food-processing facilities have been bombarded with programs and regulations ensuring their products are carefully handled and treated with the utmost respect and care. As these programs become more established, the government has moved on to other parts of the supply chain. In 2005 the FDA created a working group to discuss the modernization of Current Good Manufacturing Practices (GMPs) to encompass the changes that have been made in the food industry and economy since originally written. One of the issues examined was the necessity to expand enforcement into grain processing facilities, such as grain elevators.

### **1.2: Research Problem**

Independent elevators, or small coops, tend to have aged and archaic equipment and storage facilities. These facilities are not necessarily conducive to programs that would ensure the safety and integrity of the products. Therefore, most small elevators do not comply with GMPs. If compliance with GMPs is going to be enforced in the near future, it is important to understand what the current program status is, and what needs to be done to meet the guidelines outlined by the FDA.



### **1.3: Objectives of Study**

This thesis examines what it would take for Kansas's elevators to comply with GMPs. A survey will be employed to determine if elevators currently comply, what programs and practices would need to be implemented to comply, and how much personnel, equipment, and documentation would be needed if compliance were enforced.

### **1.4: Hypotheses**

The previous objectives generate several hypotheses that will be tested with this project. The first hypothesis is that most elevators do not currently meet the standards of GMPs. Most elevators are short on resources, and have very few workers.

The second hypothesis is that most elevators will require more manpower to comply with GMPs. With new sanitation programs, more documentation, and new procedures will come the necessity of more man-hours. Increased sanitation and documentation take time. Assuming the current employees are already fully employed, and knowing that most elevators run lean, more people will be required to complete the new tasks.

The third hypothesis is that most elevators will require more equipment to comply with the increased standards. As mentioned above, there will be more duties, documentation, and provisions required for the facilities to adopt GMPs. This will in turn require more equipment to keep the facility in compliance, but may also require more equipment for documentation and training, such as computers.

The fourth hypothesis acknowledges that most elevators have some cleaning and monitoring programs in place; however, they are presently not complete or thoroughly

documented. Many customers of elevators may currently require or suggest that the elevators implement preventative measures for pests, segregation, and sanitation.

The fifth hypothesis is that there will be a connection between categorization data such as location, number of employees, and the size of the elevator, and whether GMPs are currently present. These characteristics could determine the amount of manpower, technology, information, and resources available for elevators to implement GMPs.

## CHAPTER 2: LITERATURE REVIEW

### 2.1: Food Security

The United States is a very conscious country when it comes to food. The status of food security is constantly on the minds of government officials and citizens; because consumers want clear information about the products they purchase (Ratcliff, 2004). This includes the origin of ingredients, the growing conditions of food, and how the final product is produced, so they can make informed decisions about what to buy. Therefore, when something horrifying happens in a food sector that causes illness or death, such as the spinach E. coli outbreak in September 2006, consumers immediately react with caution. The initial public announcement by the FDA on September 14<sup>th</sup> warned people against eating bagged fresh spinach because of the possible contamination with E.coli in eight states (FDA News, 14 Sept 2006). By the next day, the number of affected states had risen to twenty, and also to Canada and Mexico (FDA News, 15 Sept 2006). There was an epidemic on the hands of the government, and people were beginning to panic. Would spinach ever be safe again? What was the government doing to ensure the spread would not continue? The FDA ensured everyone that with the help of the CDC, they were investigating the cause of the problem, and everything was under control (FDA News, 15 Sept 2006). In March 2007, the FDA reported they had pinpointed the contamination to a few areas, but could not determine what the actual source of the infectivity was (FDA News, 23 March 2007). However, even after the government and producers determined spinach crops were finally safe, people had already determined they were not, which potentially had a significant economic impact on spinach growers (MSNBC, 2006). The

lesson to be learned from this situation is that people will react quickly and strongly to food issues.

Long before the incident with E. coli, consumers have been questioning the safety of the foods consumed by humans. September 11<sup>th</sup>, 2001 sparked great fear in the souls of Americans, causing the government to reevaluate their policies and procedures regarding everything from border security to food safety. Americans are accustomed to the safety, abundance, and affordability of food (Davis, 2004). After 9-11 many people started questioning other ways terrorists could affect our economy and possibly harm more citizens. At that time, the topic of bioterrorism was brought to the table.

In his article “Towards Management of Food Safety,” Raghavan (2004) defines bioterrorism as “the use or threatened use of microorganisms or toxins from microbes to produce death or disease in humans, plants or animals” (p. 24). There are many goals associated with bioterrorism, including the desire to induce fear into people, to harm an industry due to personal or political reasons, or to cause economic problems for a country (Davis, 2004). In a 2002 report issued by The National Academies' National Research Council, the United States was considered vulnerable to bioterrorism due to the inability to detect and respond in a rapid manner to a large terrorist attack (National Academies' National Research Council, 2002). In his article “Agroterrorism: Need for Awareness” Davis (2004) states “based upon history, ease of access, availability, and impact, there are many who feel that direct contamination of food itself would be the easiest approach to waging bioterrorism...”(p. 394).

Bioterrorism encompasses a large area of terrorism, including agroterrorism. Agroterrorism is a type of bioterrorism that is specifically aimed at the agricultural

industry, specifically against livestock, plants, foods, and feed (Raghavan, 2004). The main objective of a terrorist in this situation is to create economic damage to cripple a society. Agroterrorism can affect all types of agriculture, which can include crops, grain holding facilities, and food processors (Davis, 2004). Considering there are hundreds of grain elevators in Kansas, this should be a significant concern to the Kansas agriculture industry. Some experts feel that America's agriculture is an unsuspecting target for agroterrorism, and we have not recognized how vulnerable and unprotected we really are to a potential attack. Before 9-11 changes in agricultural safety were being made, but slowly. The FDA had created suggestions and procedures for some areas of agriculture to minimize contamination and the spread of disease, but not nearly enough has been done to ensure crops and livestock are safe from terrorist attacks. American agriculture is vulnerable to terrorist attacks in many ways. The environments in which livestock and crops are grown are fairly vulnerable and open to almost anyone. This is especially true for family owned farms, where there is practically no food security. Another issue related to production agriculture is that commingling of grains during transportation, storage, and processing is constant (Monke, 2005). This lack of security, mixing of products, and inability to assure there is no contamination makes agriculture an easy target for terrorists.

Beyond the fear of a terrorist attack is the question of what will happen to our agriculture if there is an agroterrorism situation. Monke (2005) states in his article "Agroterrorism: Threats and Preparedness," that the economic loss from an agroterroristic incident could be huge. He goes on to suggest that the losses would include the value of lost production, destruction of infected products, and containment of possibly infected products or livestock. This would affect our local markets, the availability of food, and

numerous jobs. Although the amount of people that actually grow crops is very small, several people work within the food chain either as producers, processors, distributors, and even grocery and restaurant employees. The local economy would be significantly impacted by an agroterrorism attack, but would likely recover. Areas of the economy that might not recover so quickly would be the export markets.

Much of our economy is dependant on exports. In 2004, 21.8% of U.S. crops were exported to other countries (U.S. Census Bureau, 2006). The United States was responsible for 24.8% of wheat exports, 68.2% of corn, and 36.9% of soybean exports in 2005. It has also been reported that over the last 30 years exports have accounted for approximately 20 to 30% of farm revenues (Davis, 2004). If a major agroterrorism attack were to happen, countries that import our products might place restrictions, or even ban U.S. exports completely, which will affect a large part of our economy.

Although in recent years more measures have been taken to increase food security from production to distribution to consumption, little has been done to secure raw food products. Tighter procedures have been put into effect to trace food from the consumer back through the system; however, this process is very limited once it reaches the raw product. The only way to prevent agroterrorism is to enhance the existing programs, and extend them beyond the processes for which they exist.

## **2.2: Traceability**

Although the United States has some programs to trace products back through the food production chain, traceability is still limited. The European commission regulation number 178/2002 defines traceability as “the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or

feed, through all stages of production, processing and distribution” (Regulation 178/2002). To clarify, traceability is not a process that is intended to prevent the contamination of food during production, but to reduce the risk of further contamination or issues when a problem has been identified (Hirai, 2006). Traceability systems are established to improve food safety, and reduce product recalls by identifying the direct line of contamination. They are also put in to place to help companies market their ability to ensure contaminated, modified, or allergen-containing products have been contained and segregated.

The introduction of genetically modified grains and animals has also increased the desire for programs that can segregate and trace. Although consumers concerns for food safety, purity, and identification has forced many companies to implement measures to ensure the identity of grain, most elevators in the United States do not implement such programs. Most grain is delivered to country elevators by the farmer, binned and blended in the elevator, and then shipped to transfer stations and on to food processing facilities. This system makes it difficult to preserve grain identity. Most grain handlers can only trace products one step forward and backward in the supply chain. Interest in more precise and efficient systems is prevalent (Hirai, 2006).

### **2.3: Good Manufacturing Practices (GMPs)**

According to Sauer (2005) in his article “Sanitation: How Your GMP Program Affects the Bottom Line,” good manufacturing practices (GMPs) are the foundation for other food safety programs. GMPs, which are enforced by the Food and Drug Administration (FDA), are the procedures and programs used in food facilities to ensure the safety of food production. GMPs encompass procedures for sanitation, safety, food safety, HACCP (Hazard Analysis Critical Control Points), and maintenance to ensure a

facility is producing a quality product that is safe to consume, while still maintaining the safety of the employees. In the five year period between 1999 and 2003, GMP related recalls cost food companies in the United States around \$400 million annually (Sauer, 2005). The term “GMP Related” refers to recalls that could have easily been prevented had the proper GMPs been in place. This dollar value is proof that GMPs are important, and can affect the bottom line of a company. Suggestions have also been made that using GMPs properly can help a company to succeed, by reducing waste, increasing employee commitment, and allowing a company to market itself as a more desirable supplier.

By inserting proper controls and programs, a company can reduce the amount of product that is wasted (Sauer, 2005). Product usually is wasted by poor sanitation conditions, poor equipment maintenance, and irresponsible mistakes in production. By inserting programs that monitor these conditions, waste can be reduced which can save money. Adopting programs and controls in a food production facility can also increase employee commitment. By training employees in the programs implemented, they feel important to the process, and pay more attention to detail. This in turn helps with the other areas of the program, such as reduction in waste, because tasks are completed correctly the first time. By decreasing waste, and increasing employee commitment, companies can expect better final products. This in turn allows them to promote the facility as a desirable and reliable supplier.

Although GMPs are ideal for a food manufacturing company to adopt, they are also the law. However, GMPs are not enforced further down the supply chain in facilities such as grain elevators. In 2002, the Center for Food Safety and Design and Applied Nutrition assembled a group of individuals to inspect the current GMPs, and determine if a



“modernization” was needed to further meet the needs of the changing food industry (U.S. Food & Drug Administration, 2005). The committee concluded “there have been changes in both the food industry and in the science of food safety that indicate a need for modernization” (p. 10). Therefore, in November of 2005, “Food CGMP Modernization: A Focus on Food Safety” was released explaining seven areas the inspection committee proposed be changed. One of the seven areas, was the provision in 21CFR 110.19 that excludes “establishments engaged solely in the harvesting, storage, or distribution of raw agricultural commodities.” The committee recommended the exclusion be removed, and GMPs be applied to these raw commodity facilities. The main topic of concern behind this suggestion was the significant increase of foodborne illness. After reviewing material from the Center for Disease Control and Prevention (CDC) which showed a significant increase in reported outbreaks of foodborne illness associated with fruits and vegetables, it was determined the outbreaks occurred during harvest, initial packaging, and distribution (U.S. Food and Drug Administration, 2005). The FDA then completed their own after-the-fact study of 36 farms and packing houses, and found most of the issues relating to infectivity were sanitation, hygiene, and cross contamination. These three areas of concern are all addressed by GMPs, and possibly could have been reduced or prevented had GMPs been applied to the raw materials.

In 2005 AIB International, a company that audits food production facilities, recognized the necessity of an audit for GMPs directed towards grain elevators. The document, “AIB Consolidated Standards for Grain Handling Facilities,” was modeled after the GMPs required for food processing facilities. These standards were made public in 2007 to allow grain processing facilities to assess their policies in relation to the following

categories of interest: adequacy of grain safety, pest control, operational methods and personal practices, preventative maintenance, and cleaning practices. This document stresses the need for security, safety, maintenance, and Standard Operating Policies (SOPs) in grain handling operations.

#### **2.4: Hazard Analysis Critical Control Points (HACCP) Implementation**

Elevators are not currently required to comply with GMPs, and since GMPs are the basis for other programs, there is no information available to assess the cost of implementing programs in grain elevators. The hunt for information on the cost associated with implementation of GMPs is also not available; as the facilities required to comply have been doing so for many years. Therefore, to better understand the implementation and cost of food safety programs, three cases of applying Hazard Analysis Critical Control Points (HACCP) will be assessed, as HACCP is part of the overall GMP program. The three cases apply to analysis of an airline catering company, a seafood processing facility, and a milk plant.

The first case, “Cost of GHP improvement and HACCP adoption of an Airline Catering Company” by Bata et al (2006), was examined to ascertain the cost items that need to be explored when implementing HACCP. The main costs expected before the implementation were administrative, training, consulting, documentation, and equipment costs. Administrative and training costs were expected to be high due to the increased man-hours required for training of new and existing employees, extra hours in-house employees would have to work to get the system installed and running, and the time to document all the new information. Consulting costs were budgeted due to the rapid turnover of employees and lack of expertise of current staff. After the implementation of

the HACCP program, it was found that the costs for extra employee hours and training were the highest, amounting to about 58% of the total cost of the program. Purchasing of new equipment and operational changes were about 42% of the total implementation costs. The high training costs were due to a decrease in production of employees amounting to €16191.38. The training and employee costs were calculated by taking the amount of extra hours applied to the HACCP program, and multiplying them by the salary of the individuals. Training costs also included registration for seminars, travel, and other incidental costs.

Three estimates of the cost of HACCP were studied by Caswell (2005) in the next case, “The Cost of HACCP Implementation in the Seafood Industry: A Case Study of Breaded Fish.” The three included the cost of implementing the minimum FDA requirements, the cost of HACCP in relation to FDA requirements and voluntary measures above the regulations, and the incremental costs of HACCP adoption attributed to the FDA regulations. The analysis that most closely fits the purpose of this thesis is the adoption of HACCP to meet minimum FDA regulations. The costs expected to implement HACCP were similar to the case above, including training, documentation, additional personnel, and equipment. Another aspect that had not been taken into consideration in the previous case was the cost of planning. Planning and designing the procedures, equipment installation, and researching the regulations was not taken into consideration in the previous case, probably because they were hiring a contractor to carry out those tasks. In this study, a lot of the requirements of HACCP were already being met in the facility before implementation, meaning the company had less to do and had to spend less money to implement HACCP, because they already had some of the measures in place. After

implementation, equipment was again found to be one of the most expensive aspects of the process, followed closely by training of employees.

According to Roberto et al. (2006), in “Costs and Investments of Implementing and Maintaining HACCP in a Pasteurized Milk Plant,” the HACCP system has high initial cost and staff requirements due to training, equipment, supplies, and technical support. However, in the long term, the return on investment is worth it due to the improvement in food safety, reduction of contamination, and fewer customer complaints. The implementation in this facility was based on a strong pre-requisite program already in place. In order to properly implement the HACCP program, an assessment of the preexisting programs had to be done to insure they were not recreating the wheel, and probably to minimize costs and training. Some of the areas evaluated for preexisting programs were sanitation, employee training, equipment, and pest control. It was reported that there was a higher initial cost for four months of implementation, but costs dramatically decreased after the initial adoption because training and equipment costs in the beginning were high. After employees were trained, and the new equipment was purchased and installed, the costs to maintain the program were significantly less. The first year of the HACCP program cost about 28% more than the second year due to initial costs.

Although these cases provide valuable information on implementing a program, it must be taken into consideration that these are three very different food industry segments than grain elevators fit into. However, looking at all these cases a general trend can be seen in the costs of implementing a program. The most expensive areas of adoption are employee training and new equipment.

## **CHAPTER 3: METHODS**

### **3.1: Sampling Theory**

Sampling theory is the idea that a sample of a group will represent the distribution of data for that group as a whole. A sample is a part of a population that is observed and used to draw conclusions about the population as a whole, because it is impractical to examine the whole population itself (Studenmund, 2001). The sample in this thesis consists of a group of elevators in Kansas. A sample is used in this instance because surveying every elevator in Kansas would be time consuming, expensive, and difficult to achieve. The results collected from this survey sample will be used to garner conclusions about how elevators' practices and policies in Kansas coincide with GMP regulations.

The results of the survey depend on the responses of the elevators. The two reasons that elevators may not respond to a survey, nonresponse and nonresponse bias, must be taken into consideration when drawing conclusions about the data collected. Nonresponse is when a potential respondent is either unable to be contacted, or the coordinator of the survey fails at contacting that subject (Groves et al., 2006). Nonresponse bias is when a subject receives the survey, but chooses not to respond. Nonresponse bias could be a result of many reasons, including disinterest in the topic, fear of facility exposure, or lack of time to complete the survey. These nonresponse types must be taken into consideration when analyzing the survey data, as not to misinterpret the information.

### **3.2: Sampling Procedures**

The survey participants consisted of grain elevators in Kansas. All elevators in Kansas were welcome to participate in the survey, and were not excluded for any reason other than the inability to contact them. The sampling procedure that was chosen for this

thesis was to include a link to the survey in the Kansas Grain and Feed Association (KGFA) electronic newsletter. This letter was only sent to 942 members of the organization; however, the amount of those people directly associated with an elevator is unknown because other members, such as vendors and suppliers, are also members of the KGFA.

Elevators were also reached through phone calls and e-mail addresses found on the FarmNet Services Inc. website titled “Kansas Grain Elevators.” This attempt was made to narrow the gap between elevators that were members of the KFGA organization and nonmembers.

### **3.3: Survey Questions**

The survey is divided into five different categories. These categories are in line with the layout of the AIB Consolidated Standards for Grain Handling (2007). A copy of the survey can be found in Appendix A.

The first section of the survey is for general classification of the elevators. These questions categorize participants by elevator capacity, size of work force, location, and the types of grains that are stored at the particular facilities. These questions are important to use as a basis for determining the relationship between elevator characteristics and GMP adoption.

The second section of the survey focuses on the adequacy of the grain safety programs of the participating elevators. Questions about standard operating procedures, self-audits, and food safety are of main concern. Questions pertaining to the completion of self-audits of food and personal safety are explored to determine if recognition of problems, and awareness of the facilities’ overall safety, is thoroughly noted. Cleanliness of the

facilities is also investigated to determine the consistency and frequency of sanitation efforts. A question related to the HACCP program is also included to understand how many facilities have implemented this food quality and safety program, which would be mandatory if the current exemption for grain elevators were removed.

The third section asks questions about participants' pest control programs and procedures. These questions focus on pest management and fumigation procedures, including questions about rodent control, insect control, and fumigation chemical storage.

The fourth section focuses on operational methods and personal practices. These practices include employee hygiene, incoming grain inspections, traceability programs, magnet usage, dust suppressant, and carrier inspections. This section's goal is to determine if proper procedures are in place to ensure the integrity of the product.

The last section of the survey addresses maintenance of the facility and equipment. These questions center on programs that help maintain and prioritize equipment repair and upkeep, such as a repair schedule, work order system, and lubrication schedule. Equipment upkeep is important to maximize processing time, reduce extraneous material from entering the product, and ensure the safety of the employees.

### **3.4: Statistical Analysis**

Regression analysis will be used to determine the correlations between GMPs and the elevators surveyed. A common problem encountered when running a regression is multicollinearity. Multicollinearity is when two or more independent variables are highly correlated in the data being studied (Studenmund, 2001). This means that when one of the independent variables changes, the other will also, which makes it hard to determine the

effects of one from the other. To avoid this problem, simple regressions will be run on the data.

The variables used in the statistical analysis will include food safety, master cleaning schedule, HACCP, pest management, traceability programs, size, location, and number of employees. The results of these regression analyses will be used to determine if there are any correlations between the variables, explaining if any of the variables significantly affect the implementation of GMPs.

The regression model for this thesis is fairly simple. The function is as follows:

$$\text{(equation 3.1) } Y = \alpha + \beta_1 X + e$$

where

X = Dependent variable

$\alpha$  = Intercept of the estimated regression

X = Independent variable

e = the error

From these simple regressions, the correlation coefficients of the variables will be determined, which is the square root of the  $r^2$ .

A correlation coefficient, r, is a measurement of the strength of the linear relationship between two variables (Studenmund, 2001). If two variables are perfectly positively correlated, r will equal +1, and -1 if they are perfectly negatively correlated. If the variables are completely uncorrelated, then r equals 0. Positive correlation is when the variables move in the same direction at the same time (Knight, 2006). For example, if the amount of elevators with a HACCP program increases when the number of employees



increases, they are positively correlated. However, if the number of HACCP programs decrease when employees increase, these variables are negatively correlated.

Expectations of this analysis include high correlations between the GMP programs that are closely related in process, such as HACCP and Traceability. I also expect that the classification variables, location, size, and number of employees, will be positively correlated with the other variables. It seems reasonable that increasing the number of employees will increase the amount of programs implemented due to increased resources.

## **CHAPTER 4: RESULTS**

### **4.1: Elevator Characteristics**

The data for this thesis was collected from 42 of the elevators reached by the survey distribution. Section one of the survey focused on general questions that would classify each elevator by size, number of employees, crop type, and location. Table 4.1 shows that more than half of the elevators had a capacity between a million and five million bushels. Of the 42 respondents represented in Table 4.2, a large proportion of the elevators employed between four to six employees per facility. However, many employees could be passed between elevators and other facilities if a coop or larger company employed them. As seen in Table 4.3 the most common grains stored in the elevators were wheat, soybeans, sorghum, and corn; although, a few elevators indicated the storage of oats and sunflower kernels. Table 4.4 indicates that most of the respondents were located in the middle or eastern part of Kansas, with about 19 percent located in the western part of the state. Three of the survey participants were located Illinois, Oklahoma, and Nebraska.

### **4.2: Grain Safety Programs**

Section two of the survey included questions about the adequacy of the grain safety programs each elevator possessed. Table 4.5 shows the amount of elevators with the main standard operation procedures, grain receiving, employee practices, storage procedures, and transportation procedures. Each elevator was allowed to indicate the usage of more than one, which explains the high number of total respondents. As shown in Table 4.6, of the 42 elevators that responded, 25 indicated they had a written self-audit program. Of those 25 respondents, only six reported that they completed audits monthly, while nine audited the

**Table 4.1 Capacity of Elevator Storage of Survey Participants**

<i>Capacity in Bushels</i>	<i>Respondents</i>
0 to 100000	1
100001 to 300000	3
300001 to 500000	6
500001 to 800000	5
800001 to 1000000	2
1000000 to 5000000	22
5000001 to 10000000	2
more than 10000000	1
Total Number of Respondants	42

**Table 4.2 Number of Elevator Employees**

<i>Employee Ranges</i>	<i>Number of Elevator Employees</i>
0 to 3	5
4 to 6	18
7 to 10	7
11 to 15	5
16 to 20	2
21 to 30	3
31 to 40	1
41 or More	1
Total Number of Respondants	42

**Table 4.3 Types of Grain Stored**

<i>Types of Grain</i>	<i>Respondents</i>
Wheat	39
Corn	41
Sorghum	39
Soybeans	39
Other (Sunflowers, Oats)	12

**Table 4.4 Location of Elevators**

<i>Area</i>	<i>Number of Repondants</i>
Western	8
Central	15
Eastern	16
Out of State	3
Total Number of Respondants	42

**Table 4.5 Standard Operating Procedures**

<i>Program</i>	<i>Number of Repondants</i>
Grain Receiving Pit Procedure	31
Employee Practices	37
Storage Procedure	22
Transportation Procedure	18

**Table 4.6 Self Audit Program**

<i>Self Audit Program</i>	<i>Respondents</i>
Yes	25
No	15
Nonresponse	2
Total Number of Respondents	42
<i>Rate of Audit Completion</i>	
Daily	1
Weekly	2
Monthly	6
Yearly	9
Other	5
Nonresponse	2
Total Number of Respondents	25
<i>Documentation of Violations</i>	
Yes	23
No	1
Nonresponse	1
Total Number of Respondents	25

**Table 4.7 Estimated Employee Requirements for a Self Audit Program**

<i>People Required for Program</i>	<i>Employees</i>
None	7
None but will increase work hours	3
1 employee	4
2 employees	0
3 to 5 employees	0
5 to 8 employees	0
more than 8 employees	0
Nonresponse	1
Total Number of Respondents	15

facility only once a year. Unexpectedly, 23 elevators reported documenting their violations of the program for future reference and corrective action. Of the 15 facilities that did not possess self-audit programs, only four indicated that they would need additional employees to implement the program (Table 4.7).

Table 4.8 shows that of the 25 facilities that completed self-audits, almost half reported the inclusion of food safety in their audit programs. All of the survey participants were asked if they had a food safety program, with 13 responding no as indicated in Table 4.9. Of the respondents that specified they did not have a food safety program, 10 specified they would need to hire at least one more employee to implement the program. Four respondents indicated they would not need more employees, but would have to increase the work hours of one of their current employees to satisfy the program tasks. The elevators that answered yes to having a food safety program were also asked how often their employees were trained. Only 71%, of those surveyed said they trained their employees, with 11 training only yearly. Only eight said they trained their contractors on food safety practices. However, Table 4.9 shows that out of the 17 participants that did train employees most did document the training. Table 4.10 shows how many extra people would be needed by the elevators without a food safety program.

When asked if they had a master-cleaning schedule, 27 of the participants indicated they did, and 20 of those said they do complete daily cleaning to keep a safe and sanitary environment. When asked if they possessed a schedule for periodic cleaning, Table 4.11 indicates that 21 did, and that they kept documentation of this cleaning. Of the nine that said they did not have a master-cleaning schedule, only three said

**Table 4.8 Food Safety Audits**

<i>Food Safety In Audits</i>	<i>Respondents</i>
Yes	12
No	12
Nonresponse	1
Total Number of Respondents	25

**Table 4.9 Food Safety Program**

<i>Food Safety Program</i>	<i>Respondents</i>
Yes	13
No	13
Nonresponse	16
Total Number of Respondents	42
<i>Frequency of Employee Training</i>	
Monthly	3
Quarterly	3
Yearly	11
Other (Never)	7
Nonresponse	5
Total Number of Respondents	29
<i>Contractor Training</i>	
Yes	8
No	16
Nonresponse	5
Total Number of Respondents	29
<i>Training Documentation</i>	
Yes	15
No	9
Nonresponse	5
Total Number of Respondents	29

**Table 4.10 Estimated Employee Requirements for a Food Safety Program**

<i>People Required for Program</i>	<i>Employees</i>
None	9
None but will increase work hours	4
1 employee	7
2 employees	3
3 to 5 employees	0
5 to 8 employees	0
more than 8 employees	0
Nonresponse	6
Total Number of Respondents	29

**Table 4.11 Master Cleaning Schedule**

<i>Master Cleaning Schedule</i>	<i>Respondents</i>
Yes	27
No	9
Nonresponse	6
Total Number of Respondents	42
<i>Frequency of Cleaning</i>	
Daily	20
Weekly	5
Monthly	2
Yearly	0
Total Number of Respondents	27
<i>Possess Schedule for Periodic Cleaning</i>	
Yes	21
No	6
Total Number of Respondents	27
<i>Documentation</i>	
Yes	21
No	6
Total Number of Respondents	27

**Table 4.12 Estimated Employee Requirements for a Master Cleaning Schedule**

<i>People Required for Program</i>	<i>Employees</i>
None	3
None but will increase work hours	2
1 employee	2
2 employees	1
3 to 5 employees	0
5 to 8 employees	0
More than 8 employees	0
Nonresponse	1
Total Number of Respondents	9



they would need additional personnel to implement the program (Table 4.12). Two said they would need additional equipment, such as a dust collection system, and a vacuum system.

The last area of the grain safety program section discussed the Hazard Analysis Critical Control Point (HACCP) program. Only 12 of the elevators had a HACCP program implemented as shown in Table 4.13. This was not a surprise, because as seen in the studies on HACCP previously reported, GMPs are usually implemented before a HACCP program can be put into practice. Seeing that several elevators fell short in at least one GMP area, it would be hard for these facilities to run a HACCP program effectively. Of the 24 facilities that indicated they did not have a HACCP program, 10 suggested they would need another employee to properly implement the program (Table 4.14). When asked if they would require any additional equipment, eight noted the need for magnets and supporting equipment, such as a computer, for monitoring and documentation.

#### **4.3: Pest Control Programs**

Participants were asked if they had a pest management program to ensure pests did not contaminate product in the facility. Almost 62% of the total survey respondents indicated some type of pest management program as seen in Table 4.15. Table 4.16 indicates the amount of employees that would be needed for elevators that do not have a pest management program. When asked if the facilities had bird management, such as nets in loading areas, only three elevators responded yes (Table 4.17). However, when they were asked if they had bait stations for mice and rats, 33 indicated they did (Table 4.18).

When asked if participants had a fumigation management program to control insects, Table 4.19 indicates that a little over half the elevators answered yes. The same

**Table 4.13 HACCP Program**

<i>HACCP Program</i>	<i>Respondents</i>
Yes	12
No	24
Nonresponse	6
Total Number of Respondents	42

**Table 4.14 Estimated Employee Requirements for a HACCP Program**

<i>People Required for Program</i>	<i>Employees</i>
None	8
None but will increase work hours	3
1 employee	10
2 employees	0
3 to 5 employees	0
5 to 8 employees	0
More than 8 employees	0
Nonresponse	3
Total Number of Respondents	24

**Table 4.15 Pest Management Program**

<i>Pest Management Program</i>	<i>Respondents</i>
Yes	26
No	10
Nonresponse	6
Total Number of Respondents	42

**Table 4.16 Estimated Employee Requirements for a Pest Management Program**

<i>People Required for Program</i>	<i>Employees</i>
None	3
None but will increase work hours	3
1 employee	1
2 employees	1
3 to 5 employees	0
5 to 8 employees	0
More than 8 employees	0
Nonresponse	2
Total Number of Respondents	10

**Table 4.17 Bird Management**

<i>Bird Management</i>	<i>Respondents</i>
Yes	3
No	32
Nonresponse	7
Total Number of Respondents	42

**Table 4.18 Bait Stations**

<i>Bait Stations</i>	<i>Respondents</i>
Yes	33
No	2
Nonresponse	7
Total Number of Respondents	42

**Table 4.19 Fumigation Management**

<i>Fumigation Management</i>	<i>Respondents</i>
Yes	23
No	2
Nonresponse	17
Total Number of Respondents	42
<hr/> <i>Documentation</i> <hr/>	
Documentation Only	1
Documentation & Written Procedure	23
Written Procedure Only	0
None	1
Nonresponse	0
Total Number of Respondents	25
<hr/> <i>Equipment Calibration Records</i> <hr/>	
Yes	15
No	3
Not Applicable	7
Total Number of Respondents	25
<hr/> <i>MSDS Sheets for Chemicals</i> <hr/>	
Have But Do Not Display	4
Have And Are Displayed	21
Do Not Have Them	0
Total Number of Respondents	25
<hr/> <i>Pesticide Cabinets or Room</i> <hr/>	
Yes	24
No	1
Total Number of Respondents	25

amount of elevators indicated that documentation and written procedures were in effect for the program. When asked if they kept record of fumigation equipment calibration, only 15 said they did. However, seven of the respondents indicated this documentation did not apply to them for reasons such as contracting out fumigations.

#### **4.4: Operational Methods and Personal Practices**

A series of questions were also asked about daily operational methods and personal practices. These questions were divided into six sections focusing on employee practices, grain handling, and extraneous materials. The first section focuses on personal sanitary practices. Of the elevators surveyed, Table 4.20 shows that only eight said they emptied their trash daily, while 20 said the trash was emptied weekly. Those same participants indicated 23 cleaned restrooms weekly, while eight cleaned them daily. According to Table 4.20, 32 elevators had designated areas for eating and drinking. When asked if employees wore clean uniforms or clothing, and if the company supplied uniforms, 10 indicated they did (Table 4.21). Of those surveyed, 24 said their employees wore clean garments, but they were not supplied by the elevator. When asked if steel toe boots were worn, 16 respondents said yes, and eight said they supplied the boots for their employees. However, 19 elevators said their employees were not required to wear steel-toed boots in the facility. Also pertaining to clothing and accessories, at least 69% of the total elevators surveyed do not require that jewelry be removed when handling product. When asked if employees were taken out of the production area when they had obvious boils or sores, 18 elevators indicated they were not. However, 11 said the employee was sent home until well, and six said the employees were removed from production areas. When asked if

**Table 4.20 Sanitation**

<i>Trash Disposal</i>	<i>Respondents</i>
Daily	8
Weekly	20
Monthly	2
Other (As Needed)	5
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Restroom Cleaning</i>	
Daily	8
Weekly	23
Monthly	0
Other (As Needed)	4
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Eating Drinking &amp; Smoking Areas</i>	
Yes	32
No	3
Nonresponse	7
Total Number of Respondents	42

**Table 4.21 Employee Hygiene & Safety**

<i>Clean Uniforms</i>	<i>Respondents</i>
Yes	24
Yes, and They are Supplied	10
No	1
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Safety Footwear</i>	
Yes	8
Yes, and They are Supplied	8
No	19
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Jewelry, Etc. Removed</i>	
Yes	6
No	29
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Employees with Boils &amp; Sores</i>	
Sent Home Until Well	11
Continue Normal Work	18
Removed from Grain Handling, Work Elsewhere	6
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Contractors Required to Comply</i>	
Yes	32
No	3
Nonresponse	7
Total Number of Respondents	42

contractors were required to comply with all employee personal hygiene practices, most of the elevators said yes.

The next section of the operational practices focused on product control. When asked if they had a written incoming grain inspection, 24 of the respondents said yes (Table 4.22). Those same elevators stated they had programs in place to prevent grain cross-contamination and kept written records of the grade designations. The status of site security was asked to determine how many elevators had measures in place to secure the product from terrorist attack. As shown in Table 4.23, most of the elevators only locked the facility at night or when the elevator was closed. Only one elevator reported they had the doors locked at all times.

The next section asked questions about traceability. When asked if their elevator had a traceability program, only eight facilities answered yes, which was not surprising (Table 4.24). Of those eight, all of them reported testing their program at least yearly, and seven of them claimed they kept documentation of program testing. When the elevators that did not have a traceability program were asked if they would require more employees if the program was implemented, eight said they would need one more employee, while nine indicated they could implement the program without hiring more employees (Table 4.25).

The next section focused on extraneous material (Table 4.26). Surprisingly, 23 elevators said they did not have a program in place to prevent wood, glass, metal, and other extraneous material from entering the product. Twenty-one of those same elevators said they did not have a procedure for removing or handling brittle plastic or glass in the



**Table 4.22 Product Control**

<i>Incoming Grain Inspection Program</i>	<i>Respondents</i>
Yes	24
No	11
Nonresponse	7
Total Number of Respondents	42
<i>Grain Cross Contamination Prevention Procedure</i>	
Yes	24
No	11
Nonresponse	7
Total Number of Respondents	42
<i>Grain Designation Records</i>	
Yes	28
No	7
Nonresponse	7
Total Number of Respondents	42

**Table 4.23 Site Security**

<i>Site Security</i>	<i>Respondents</i>
None	1
Doors Locked at All Time	1
Doors Locked in the Evening Only	31
Property Fence with Monitored Gate	2
Security Guard	1
Security Cameras	3
Metal Detectors	0

**Table 4.24 Written Traceability Program**

<i>Written Traceability Program</i>	<i>Respondents</i>
Yes	8
No	27
Nonresponse	7
Total Number of Respondents	42
<i>Traceability Program Audit Frequency</i>	
Weekly	1
Monthly	2
Yearly	5
Never	0
Total Number of Respondents	8
<i>Documentation</i>	
Yes	7
No	1
Total Number of Respondents	8

**Table 4.25 Estimated Employee Requirements for a Traceability Program**

<i>People Required for Program</i>	<i>Employees</i>
None	7
None but will increase work hours	2
1 employee	8
2 employees	5
3 to 5 employees	1
5 to 8 employees	0
More than 8 employees	1
Nonresponse	3
Total Number of Respondents	27

facility. Thirty of them said they didn't have any written procedure for inspecting or removing chipping paint to ensure it did not contaminate the product. When asked how often the ceiling and roof were inspected for leaks, 19 inspected them at least monthly. Twenty-eight respondents said they covered receiving pits to keep out dust, water, pests, and debris.

When asked if they had magnets in their system, less than half indicated that they did (Table 4.27). Of those that did, all but one said they had a program in place to inspect and clean the magnets. Most of them also indicated they inspected their magnets at least monthly, with one inspecting daily. Although most respondents with magnets said they had used them upon the receipt of grain, most of them did not have magnets on their loadout systems.

The next section asked questions about using dust suppressants on grain. Some elevators use dust suppressants to assist with cleaning and reduction of ignition. As indicated in Table 4.28, only 12 of the elevators used a dust suppressant. Of those 12, only four kept documentation of the usage. However, eight of the users calibrated their system at least once a year.

The last section focused on bulk shipping of grain. When asked if there was a procedure for inspecting inbound and outbound carriers, 19 respondents indicated they had one. Of those 19, 12 said they used seals on their outbound cars to ensure product was not tampered with before reaching its destination. Surprisingly all 19 elevators said they kept records of product distribution. Of the elevators that did not have an inspection program, nine indicated they could carry out this program if implemented without hiring additional personnel.

**Table 4.26 Extraneous Material**

<i>Extraneous Material Program</i>	<i>Respondents</i>
Yes	12
No	23
Nonresponse	7
Total Number of Respondents	42
<hr/> <i>Glass and Brittle Plastic Removal Procedure</i> <hr/>	
Yes	14
No	21
Nonresponse	7
Total Number of Respondents	42
<hr/> <i>Paint Removal Procedure</i> <hr/>	
Yes	5
No	30
Nonresponse	7
Total Number of Respondents	42
<hr/> <i>Ceiling and Roof Inspection Frequency</i> <hr/>	
Daily	6
Weekly	4
Monthly	9
Yearly	13
Other	3
Nonresponse	7
Total Number of Respondents	42
<hr/> <i>Receiving Pit Covers to Keep Out Contamination</i> <hr/>	
Yes	28
No	7
Nonresponse	7
Total Number of Respondents	42

**Table 4.27 Magnets**

<i>Magnets</i>	<i>Respondents</i>
Yes	16
No	19
Nonresponse	7
Total Number of Respondents	42
<hr/> <i>Magnet Inspection and Cleaning Program</i> <hr/>	
Yes	15
No	1
Total Number of Respondents	16
<hr/> <i>Magnet Testing Frequency</i> <hr/>	
Daily	1
Weekly	3
Monthly	8
Other	4
Total Number of Respondents	16
<hr/> <i>Magnets Installed on Loadout System</i> <hr/>	
Yes	2
No	14
Total Number of Respondents	16
<hr/> <i>Magnets Installed on Grain Dump or Receipt</i> <hr/>	
Yes	13
No	3
Total Number of Respondents	16

**Table 4.28 Dust Suppressant**

<i>Dust Suppressant Used</i>	<i>Respondents</i>
Yes	12
No	23
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Documentation</i>	
Yes	4
No	8
Total Number of Respondents	12
<hr/>	
<i>Mineral Oil Calibration Frequency</i>	
Weekly	1
Monthly	1
Yearly	6
Other	4
Total Number of Respondents	12

#### **4.5: Preventative Maintenance**

A preventative maintenance program is a program used to keep equipment running smoothly, while minimizing the amount of unexpected down time. When asked, all the elevators that responded indicated they had a preventative maintenance program in Table 4.31, while only 19 had a work order program. A work order program is used to prioritize repairs that need to be completed. Sixteen of the elevators said they had a maintenance schedule for replacement of screens and parts to keep equipment running smoothly, and 30 said they had a written lubrication program for the same reason.

#### **4.6: Correlation Analysis**

The results of the correlation calculations can be seen in Table 4.32. Correlations were run between all the variables listed, to see if any of them were significantly related. The highest correlation, significant at the 1% level, was between HACCP and traceability. This is not surprising, as these two programs are similar. They both require general GMPs to be in place, and require extra training, equipment, and records. The factors that would motivate an elevator to implement one program would also provide motivation for the other program.

The second highest correlation, significant at the 5% level, was between HACCP and pest management. This is also not surprising, as the HACCP program focuses on areas of the process that could be weak and cause contamination or issues with the final product. Pests are a real risk to product contamination, and any area they could reside that would be in contact with the product would be considered a point of contamination that HACCP tries to control. Therefore, if you have HACCP, you will definitely have measures in place to

**Table 4.29 Carrier Inspections**

<i>Written Carrier Inspection</i>	<i>Respondents</i>
Yes	19
No	16
Nonresponse	7
Total Number of Respondents	42
<hr/>	
<i>Seals Used</i>	
Yes	12
No	7
Total Number of Respondents	19
<hr/>	
<i>Distribution Records</i>	
Yes	19
No	0
Total Number of Respondents	19

**Table 4.30 Estimated Employee Requirements for a Carrier Inspection Program**

<i>People Required for Program</i>	<i>Employees</i>
None	6
None but will increase work hours	3
1 employee	4
2 employees	0
3 to 5 employees	0
5 to 8 employees	0
More than 8 employees	0
Nonresponse	3
Total Number of Respondents	16



**Table 4.31 Preventative Maintenance Program**

<i>Preventative Maintenance Program</i>	<i>Respondents</i>
Yes	35
No	0
Nonresponse	7
Total Number of Respondents	42
<hr/> <i>Work Order System</i> <hr/>	
Yes	19
No	16
Total Number of Respondents	35
<hr/> <i>Maintenance Schedule for Inspection and Replacement</i> <hr/>	
Yes	16
No	19
Total Number of Respondents	35
<hr/> <i>Written Lubrication Program</i> <hr/>	
Yes	30
No	5
Total Number of Respondents	35

**Table 4.32 Correlation Matrix**

	FS	MC	H	PM	T	Size	E	L
FS	1.000	0.293	0.183	0.114	0.308	-0.143	-0.149	0.147
MC		1.000	0.153	0.265	0.134	-0.068	0.038	0.081
H			1.000	0.337*	0.567**	-0.175	-0.101	0.015
PM				1.000	0.194	-0.060	0.210	0.180
T					1.000	-0.199	-0.215	-0.068
Size						1.000	0.156	-0.164
E							1.000	0.136
L								1.000

Definitions:

FS	Food Safety (Table 4.9)
MC	Master Cleaning (Table 4.11)
H	HACCP (Table 4.13)
PM	Pest Management (Table 4.15)
T	Traceability (Table 4.24)
Size	Size (Table 4.1)
E	Employees (Table 4.2)
L	Location (Table 4.4)

Significance:

*	Significant at the 5% level (use "Significance F")
**	Significant at the 1% level (use "Significance F")

**Table 4.33 Correlation Number of Observations**

	FS	MC	H	PM	T	Size	E	L
FS	26	26	26	24	24	26	26	26
MC		37	37	36	35	37	37	37
H			37	36	35	36	37	37
PM				36	35	36	36	36
T					35	35	35	35
Size						42	42	42
E							42	42
L								42

reduce product contamination.

Several of the correlation results were surprising. A higher correlation between food safety and HACCP was expected. Since the goal of HACCP is to determine the points in the system that could cause potential problems and minimize the risk, much like a food safety program does, stronger connection was anticipated. However, these elevators may not have the proper tools to create a HACCP program as of yet, and are only as far as Food Safety.

Another area that was also surprising was the lack of correlations between size, location, number of employees and other GMPs. It was expected that these three independent variables would have strong impacts on the implementation of GMPs. In the case of size it was predicted that as an elevator increased in size, they would probably be owned by a larger company, which would have adopted more GMPs. Another prediction was as the elevators grew in size, they would supply product to larger companies that would require more GMPs to be implemented. However, by looking at the correlations, the correlations are negative, and not significant.

This same trend was seen in the correlations between GMPs and location. I predicted that location would make a difference on the level of GMP implementation in the elevators. My theory was that the closer an elevator got to a metro area, the more GMPs they would have in place. However, the same result of no significant correlation was found. Although the majority of correlations between number of employees and GMPs was positive, unlike the other two variables, there again was no significance in the correlations.

## CHAPTER 5: CONCLUSION

### 5.1: Summary

The purpose of this thesis was to determine to the extent at which Kansas's grain elevators have adopted GMPs. The reason for this analysis is because the FDA has been discussing the removal of the GMP exemption for elevators currently in place. An anonymous survey was given to participants in Kansas to measure their level of GMP implementation. Of the surveys sent out, 42 elevators participated in the study.

The survey given to participants included five categories of questions, in line with the layout of the AIB Consolidated Standards for Grain Handling (2007). The categories included were general classification, adequacy of grain safety programs, pest control programs and procedures, operational methods and personal practices, and maintenance of the facility and equipment.

Five hypotheses were created for this thesis. Hypothesis one predicted that elevators would not comply with GMPs. This was true for this sample, as many of the facilities surveyed did not have all the proposed GMPs in place. Therefore they would not comply if the exemption was removed. Hypothesis two expected that more manpower would be required to implement the GMPs. As shown in the results section, some elevators indeed indicated they would need more employees to implement some of the GMPs. Hypothesis three suggested that more equipment would be required to implement these GMPs. Some of the elevators indicated that they would need more equipment in order to implement some of the programs. Hypothesis four acknowledged that some of the programs would be in place in various elevators; however these programs would not be complete. This was true for the elevators surveyed. All the elevators had some sort of

GMP foundation in place, but the programs needed assistance in meeting the expectations of the FDA. Several of the elevators had the right idea when it came to self-audit and pest management programs. However, the depth of these programs were not nearly as intricate as required by the FDA regulations. Hypothesis five was shown to be incorrect, as it theorized that location, size, and number of employees would have an impact on GMP implementation. The data showed that no significant connection was found between these variables and GMP adoption.

## **5.2: Limitations**

Limitations of this thesis included sample size and elevator participation. Kansas was chosen for this analysis because surveying all the elevators in the United States was an unrealistic proposition. However, such a small sample from the area surveyed was not expected. Many factors inhibited the study and reduced the sample size, such as elevator availability, interest in the project, lack of funds, and time constraints. Another constraint was the way in which the survey was administered, which was through the KGFA. Not all Kansas elevators are members of this organization.

Further studies should be completed with larger sample sizes to gain a better grasp of GMP adoption by grain elevators. This information shows that the elevators surveyed do lack in GMP implementation, and this is an issue in at least Kansas. If the exemption is removed, and elevators are required to comply with GMPs, there is a concern with elevator compliance. Therefore, further studies should be completed to determine if the level of compliance is similar for the whole United States, and what resources and actions would be needed to comply.

Other factors that might have enhanced the study would be asking questions about product distribution, type of company, and number of facilities. Knowing to whom the product was sold to, or what it was intended to be used for, might have provided an idea of what types of constraints would be put on the product down the line. If some of the product was only for feed and others were for food, the influences on, and goals of elevator procedures might have been different.

The type of company could have an effect on the overall attitude of GMPs. If a large company owned the elevator, they might have more procedures that the elevator was supposed to follow. Whereas if the elevator were privately owned, and there was only one facility, the procedures might be lacking in their rigidity. Knowing how many facilities a company owned might also have an effect on GMP compliance. Again, if there are many facilities, such as with a coop, there might be more rules to keep things consistent between elevators.

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# APPENDIX A: GMPS AND ELEVATOR COMPLIANCE SURVEY

## AXIO SURVEY

### GMPs and Elevator Participation

#### Survey Description

My name is Sarah Velasquez, and I am pursuing my Master of Agribusiness degree from Kansas State University. I have created a survey that addresses the major points of GMPs used in food and feed facilities. The survey takes about 10 to 15 minutes to complete, and includes some short questions to determine what programs and procedures elevators are currently applying. The survey is confidential, and the name or location of your facility will not be disclosed. By agreeing to participate in this survey, you will be assisting me in my research, while providing valuable information that could help your elevator facility remain competitive in the industry. If you would rather complete the survey over the phone or in person, have any questions or comments, or would like the results of the survey, please contact me at sev1872@ksu.edu. I sincerely thank you in advance for participating in my research. Sarah

#### Opening Instructions

If your business has more than one elevator facility, please fill out the survey for each elevator. Your participation is strictly voluntary, and your responses to this survey will be kept anonymous. Please answer all questions to the best of your ability. Thank you for participating in this survey!

#### Page 1

Please complete the following questions about your elevator. These questions are only for the benefit of classifying elevator information, and in no way will identify your particular elevator.

#### Question 1 **\*\* required \*\***

Please mark the box by the capacity of your elevator storage.

- 0 to 100,000 bu
- 100,001 to 300,000 bu
- 300,001 to 500,000 bu
- 500,001 to 800,000 bu
- 800,001 to 1,000,000 bu
- 1,000,000 to 5,000,000 bu
- 5,000,001 to 10,000,000 bu
- more than 10,000,000 bu

Further comments about your response:

#### Question 2 **\*\* required \*\***

How many workers does your elevator employ? This includes office personnel and other supporting

staff.

- 0 to 3
- 4 to 6
- 7 to 10
- 11 to 15
- 16 to 20
- 21 to 30
- 31 to 40
- 41 or more

Further comments about your response:

**Question 3** *\*\* required \*\**

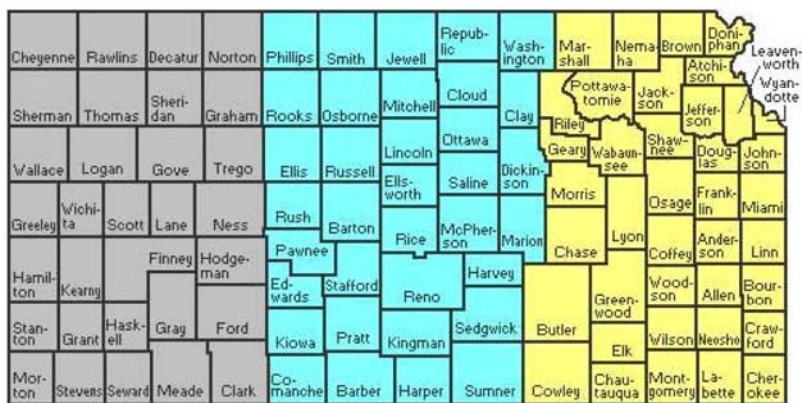
What grains do you store in your facility?

- Wheat
- Corn
- Sorghum
- Soybeans
- Other:

Further comments about your response:

**Question 4** *\*\* required \*\**

Please choose the area in which your facility resides.



- Grey
- Blue
- Yellow
- Out of State (Please Indicate Which State below)

Further comments about your response:

---

**Page 2**

Please answer the following questions to the best of your knowledge.

**Question 5**

A Standard Operating Procedure (SOP) is a written procedure that explains how a job should be done, or what should happen in a certain situation.

Do you have a written Standard Operating Procedure (SOP) for any of the following? Please mark all that apply.

- Grain Receiving Procedure
- Employee Practices
- Storage Procedure
- Transportation Procedure

Further comments about your response:

---

**Page 3**

A self audit program is auditing of equipment, grounds, food safety, and personal safety, completed by the facility itself.

**Question 6 *\*\* required \*\****

Do you have a written self audit program?

- Yes
- No

Further comments about your response:

**Page 4**

---

Fill out this page only if you answered:

- **No** on question 6. *Do you have a written self audit p..* on page 3 .

**Question 7**

---

If you do not have a self audit program how many people do you think you would need to hire in order to implement this program? Implementing the program would require training, auditing time, and creation and documentation of a written program.

- No employees, you can implement with the current amount of employee work hours
- No employees, but will have to increase current employee work hours
- 1 employee
- 2 employees
- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

**Page 5**

---

Fill out this page only if you answered:

- **Yes** on question 6. *Do you have a written self audit p..* on page 3 .

Please complete the following questions about your self audit program.

**Question 8** *\*\* required \*\**

---

How often do you complete self audits?

- Daily
- Weekly
- Monthly
- Yearly
- Other:

Further comments about your response:

**Question 9** *\*\* required \*\**

---

Do you have documentation of the violations of procedures, and the corrective actions?

- Yes  
 No

Further comments about your response:

**Question 10** *\*\* required \*\**

---

A food safety audit program is a program that assesses food safety in your facility.

Does this audit include Food Safety?

- Yes  
 No

Further comments about your response:

**Page 6**

---

Fill out this page only if you answered:

- [Yes](#) on question [10. Does this audit include Food Safet..](#) on [page 5](#) .

A Food Safety program is a program to assess the safety of the food product in all situations.

**Question 11** *\*\* required \*\**

---

Do you have a written Food Safety program?

- Yes  
 No

Further comments about your response:

**Page 7**

---

Fill out this page only if you answered:

- [No](#) on question [11. Do you have a written Food Safety ..](#) on [page 6](#) .

**Question 12**

If you do not have a Food Safety program how many people do you think you would need to hire in order to implement this program? Implementation would consist of conducting food safety audits, training in procedures, and creation and documentation of a written program.

- No employees, you can implement with the current amount of employee hours
- No employees, but will have to increase current employee work hours
- 1 employee
- 2 employees
- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

**Page 8**

Fill out this page only if you answered:

- [Yes](#) on question [11. Do you have a written Food Safety .. on page 6 .](#)

**Question 13 *\*\* required \*\****

How often are employees refreshed of food safety procedures?

- Monthly
- Quarterly
- Yearly
- Other:

Further comments about your response:

**Question 14 *\*\* required \*\****

Do you train contractors on food safety procedures?

- Yes
- No

Further comments about your response:

**Question 15 *\*\* required \*\****

---

Do you have written documentation of all food safety procedure training?

- Yes  
 No

Further comments about your response:

---

**Page 9**

Please answer the following questions based on your sanitation operations.

**Question 16** *\*\* required \*\**

A Master Cleaning Schedule is a schedule of all cleaning activities in the facility, including equipment, bins, floors, dumps, and other needed areas.

Do you have a Master Cleaning Schedule?

- Yes  
 No

Further comments about your response:

---

**Page 10**

Fill out this page only if you answered:

- **No** on question **16. Do you have a Master Cleaning Sche..** on **page 9** .

**Question 17**

If you do not have a Master Cleaning Schedule how many people do you think you would need to hire in order to implement this program? Implementation would include cleaning, training, supervision, and paperwork completion for the program.

- No employees, you can implement with the current amount of employee work hours  
 No employees, but will have to increase current employee work hours  
 1 employee  
 2 employees  
 3 to 5 employees  
 5 to 8 employees  
 more than 8 employees

Further comments about your response:

**Question 18**

Would you need any more equipment or supplies if you implemented this program? Supplies and equipment might include computer for documentation, brushes, brooms, vacuum system, etc. If yes, please list equipment and supplies below.

Characters Remaining: 500

**Page 11**

Fill out this page only if you answered:

- [Yes](#) on question [16. Do you have a Master Cleaning Sche..](#) on [page 9](#) .

**Question 19 *\*\* required \*\****

General house keeping is defined as cleaning normal traffic areas such as floors, and minimizing dust and debris in the facility.

How often is general housekeeping completed to ensure a sanitary and safe environment?

- Daily
- Weekly
- Monthly
- Yearly

Further comments about your response:

**Question 20 *\*\* required \*\****

Do you have a cleaning schedule of areas that are to be cleaned daily, once a month, and once a year?

- Yes
- No

Further comments about your response:



**Question 21** *\*\* required \*\**

---

Do you have a written record of date, areas, and equipment to document cleaning has been completed?

- Yes
- No

Further comments about your response:

**Page 12**

---

**Question 22** *\*\* required \*\**

---

HACCP stands for Hazard Analysis Critical Control Point

Do you have a written HACCP program? It is a preventative program to address physical, chemical, and biological hazards in the process.

- Yes
- No

Further comments about your response:

**Page 13**

---

Fill out this page only if you answered:

- *No* on question [22. Do you have a written HACCP progra..](#) on [page 12](#) .

**Question 23**

---

If you do not have a HACCP program how many people do you think you would need to hire in order to implement this program? Implementation would consist of monitoring control points, training in procedures, and creation and documentation of a written program.

- No employees, you can implement with the current amount of employee hours
- No employees, but will have to increase current employee work hours
- 1 employee
- 2 employees
- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

---

**Question 24**

If this program were implemented, would you require any new equipment and supplies? Equipment and supplies would include a computer for documentation, extra equipment parts, and possibly new control point equipment such as magnets.

Characters Remaining: 500

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**Page 14**

---

**Question 25 *\*\* required \*\****

A Pest Management Program is a program that is designed to keep the facility rodent, bird, and insect free.

Do you have a written Pest Management Program?

- Yes  
 No

Further comments about your response:

---

**Page 15**

Fill out this page only if you answered:

- **No** on question **25. Do you have a written Pest Managem..** on **page 14** .

---

**Question 26**

If you do not have a Pest Management Program how many people do you think you would need to hire in order to implement this program? Implementation would require training, monitoring of equipment, and documentation for the program.

- No employees, you can implement with the current amount of employee work hours  
 No employees, but will have to increase current employee work hours  
 1 employee  
 2 employees

- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

---

**Question 27**

If this program were implemented, would you require any new equipment and supplies? Equipment and supplies would include a computer for documentation, insect and rodent traps, and contracted pest management services.

Characters Remaining: 500

---

**Page 16**

Fill out this page only if you answered:

- [Yes](#) on question [25. Do you have a written Pest Managem...](#) on [page 14](#) .

---

**Question 28** *\*\* required \*\**

Do you have a written fumigation management plan?

- Yes
- No

Further comments about your response:

---

**Question 29** *\*\* required \*\**

Do you have documentation and a written procedure for all pesticide applications?

- Documentation only
- Documentation and written procedure
- Written procedure only
- None

Further comments about your response:

**Question 30** *\*\* required \*\**

Do you have pesticide equipment calibration records?

- Yes
- No
- Not Applicable

Further comments about your response:

**Question 31** *\*\* required \*\**

MSDS are Material Safety Data Sheets that explain the hazards and proper uses of chemicals.

Do you have all MSDS for all pesticides and chemicals used in the facility available to employees?

- We have them, but do not display them for employees
- We have them, and they are displayed for employees
- We do not have them

Further comments about your response:

**Question 32** *\*\* required \*\**

Do you have pesticide cabinets or rooms?

- Yes
- No

Further comments about your response:

**Page 17**

**Question 33** *\*\* required \*\**

Do you have equipment for bird management such as nets around loading and unloading areas?

- Yes
- No

Further comments about your response:

**Question 34** *\*\* required \*\**

Do you have bait stations for mice and rats?

- Yes
- No

Further comments about your response:

**Page 18**

**Question 35** *\*\* required \*\**

How often is all trash emptied?

- Daily
- Weekly
- Monthly
- Other:

Further comments about your response:

**Question 36** *\*\* required \*\**

Are clean uniforms or garments worn in the facility?

- Yes
- Yes, and they are supplied by the elevator
- No

Further comments about your response:

**Question 37** *\*\* required \*\**

Is safety footwear worn within the facility, such as steel toed boots?

- Yes
- Yes, and they are supplied by the elevator
- No

Further comments about your response:

**Question 38** *\*\* required \*\**

Are all watches, earrings, rings (besides plain wedding bands), false fingernails, and nail polish required to be removed to prevent product contamination?

- Yes
- No

Further comments about your response:

**Question 39** *\*\* required \*\**

What is done with all persons that have obvious boils, sores, or infected wounds?

- They are sent home until well.
- They continue normal work.
- They are removed from grain handling, but allowed to work in the office or other areas.

Further comments about your response:

**Question 40** *\*\* required \*\**

How often are restrooms cleaned and maintained to ensure a sanitary condition?

- Daily
- Weekly
- Monthly
- Other:

Further comments about your response:

**Question 41** *\*\* required \*\**

Are all contractors and guests required to conform to company safety and hygiene policies?

- Yes
- No

Further comments about your response:

**Question 42** *\*\* required \*\**

Are proper areas designated for eating, drinking, and smoking?

Yes

No

Other:

Further comments about your response:

**Page 19**

**Question 43** *\*\* required \*\**

Do you have a written incoming grain inspection program?

Yes

No

Further comments about your response:

**Question 44** *\*\* required \*\**

Do you have a procedure in use to prevent cross contamination of grains?

Yes

No

Further comments about your response:

**Question 45** *\*\* required \*\**

Do you have grain grade designation records?

Yes

No

Further comments about your response:

**Question 46** *\*\* required \*\**

---

Site Security are measures used to keep unauthorized people out of the facility.

What type of site security do you have?

- None
- Facility doors locked at all time.
- Facility doors locked in the evening or down times only.
- Property fence with monitored gate.
- Security guard.
- Security cameras.
- Metal detectors.

Further comments about your response:

---

**Page 20**

**Question 47** *\*\* required \*\**

---

A traceability program is a procedure to trace grain from loadout, back through all the bins, to the truck it came in on, and possibly back to the farmer.

Do you have a written traceability program?

- Yes
- No

Further comments about your response:

---

**Page 21**

Fill out this page only if you answered:

- *No* on question [47. Do you have a written traceability.. on page 20](#) .

**Question 48**

---

If you do not have a Traceability Program how many people do you think you would need to hire in order to implement this program? Implementing this program would require training, auditing, and keeping written records up to date.

- No employees, you can implement with the current amount of employee work hours
- No employees, but will have to increase current employee work hours



- 1 employee
- 2 employees
- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

---

**Question 49**

If this program were implemented, would you require any new equipment and supplies? Equipment and supplies would include a computer for documentation, insect and rodent traps, and contracted pest management services.

Characters Remaining: 500

---

**Page 22**

Fill out this page only if you answered:

- [Yes](#) on question [47. Do you have a written traceability..](#) on [page 20](#) .

---

**Question 50 *\*\* required \*\****

Testing of your traceability program would be determining if you can trace a grain from loadout back to its field or farmer through documents.

How often is your Traceability program audited?

- Weekly
- Monthly
- Yearly
- Never

Further comments about your response:

---

**Question 51 *\*\* required \*\****

Do you keep written documentation of your traceability program testing?

- Yes
- No

Further comments about your response:

---

**Page 23**

Extraneous material is all material other than the grain itself. This includes dirt, dust, glass, metal, pests, plastic, or other foreign material.

---

**Question 52** *\*\* required \*\**

Do you have a written program in effect to prevent wood, glass, metal and other extraneous material from contaminating grain?

- Yes
- No

Further comments about your response:

---

**Question 53** *\*\* required \*\**

Do you have a procedure for removal, replacement, and handling of glass and brittle plastic?

- Yes
- No

Further comments about your response:

---

**Question 54** *\*\* required \*\**

Is there a written paint inspection and removal procedure?

- Yes
- No

Further comments about your response:

---

**Question 55** *\*\* required \*\**

How often are ceilings and roofs inspected to ensure they are in good repair so there is no leakage

into stored product?

- Daily
- Weekly
- Monthly
- Yearly
- Other:

Further comments about your response:

---

**Question 56 *\*\* required \*\****

Do you have covers on all receiving pits to keep out dust, water, pests, and debris?

- Yes
- No

Further comments about your response:

---

**Question 57 *\*\* required \*\****

Do you have magnets?

- Yes
- No

Further comments about your response:

---

**Page 24**

Fill out this page only if you answered:

- **Yes** on question **57. Do you have magnets?** on **page 23** .

---

**Question 58 *\*\* required \*\****

Do you have a routine inspection and cleaning program for magnets?

- Yes
- No

Further comments about your response:

**Question 59** *\*\* required \*\**

---

How often are all magnets tested?

- Daily
- Weekly
- Monthly
- Other:

Further comments about your response:

**Question 60** *\*\* required \*\**

---

Are magnets installed in the loadout system?

- Yes
- No

Further comments about your response:

**Question 61** *\*\* required \*\**

---

Are magnets installed at the grain dump or receipt?

- Yes
- No

Further comments about your response:

**Page 25**

---

**Question 62** *\*\* required \*\**

---

Do you use a dust suppressant on grain?

- Yes
- No

Further comments about your response:

**Page 26**

---

Fill out this page only if you answered:

- Yes on question 62. Do you use a dust suppressant on g.. on page 25 .

**Question 63 \*\* required \*\***

---

Do you keep documentation of usage?

- Yes  
 No

Further comments about your response:

**Question 64 \*\* required \*\***

---

How often is your mineral oil system calibrated?

- Weekly  
 Monthly  
 Yearly  
 Other:

Further comments about your response:

**Page 27**

---

**Question 65 \*\* required \*\***

---

Carriers refers to trucks, rail cars, trailers, or barges.

Is there a written procedure for inspecting all inbound and outbound carriers?

- Yes  
 No

Further comments about your response:

Fill out this page only if you answered:

- No on question 65. *Is there a written procedure for i..* on page 27 .

**Question 66**

If you do not have a procedure for inspecting inbound and outbound carriers, how many people do you think you would need to hire in order to implement this program? Implementation would include training, inspecting, and constructing a written program for inspections.

- No employees, you can implement with the current amount of employee work hours
- No employees, but will have to increase current employee work hours
- 1 employee
- 2 employees
- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

**Question 67**

If this program were implemented, would you require any new equipment and supplies? Equipment and supplies would include a computer for documentation, rail car probing equipment, tools, harnesses, and other safety equipment.

Characters Remaining: 500

Fill out this page only if you answered:

- Yes on question 65. *Is there a written procedure for i..* on page 27 .

**Question 68 \*\* required \*\***

Are all points of access on bulk shipping containers sealed with a verifiable numbered seal, and the seal numbers written on the bills of lading?

- Yes
- No

Further comments about your response:

**Question 69** *\*\* required \*\**

---

Are all distribution records kept and maintained?

- Yes
- No

Further comments about your response:

**Page 30**

---

**Question 70** *\*\* required \*\**

---

Preventative maintenance is maintenance completed periodically to ensure equipment is lubricated, screens are changed, and overall productivity is ensured to prevent unexpected down time on equipment.

Do you have a written preventative maintenance program?

- Yes
- No

Further comments about your response:

**Page 31**

---

**Fill out this page only if you answered:**

- **No** on question **70. Do you have a written preventative..** on **page 30** .

**Question 71**

---

If you do not have a written Preventative Maintenance Program how many people do you think you would need to hire in order to implement this program? Implementing this program would include training, monitoring of equipment, maintenance, lubrication, and documentation of the program.

- No employees, you can implement with the current amount of employee work hours

- No employees, but will have to increase current employee work hours
- 1 employee
- 2 employees
- 3 to 5 employees
- 5 to 8 employees
- more than 8 employees

Further comments about your response:

---

**Question 72**

If this program were implemented, would you require any new equipment and supplies? Equipment and supplies would include a computer for documentation, extra equipment parts, lubrication equipment, tools, and machinery to ensure proper maintenance.

Characters Remaining: 500

---

**Page 32**

Fill out this page only if you answered:

- [Yes](#) on question [70. Do you have a written preventative..](#) on [page 30](#) .

---

**Question 73 *\*\* required \*\****

Do you have a work order system to prioritize work that needs to be completed?

- Yes
- No

Further comments about your response:

---

**Question 74 *\*\* required \*\****

Do you have a written maintenance schedule for inspection and replacement of grain cleaning equipment screens and parts?

- Yes
- No



Further comments about your response:

**Question 75** *\*\* required \*\**

Do you have a written equipment lubrication program?

- Yes
- No

Further comments about your response:

---

**Page 33**

**Question 76**

If you require more employees or new equipment not previously listed to implement these programs, please list below.

Characters Remaining: 750

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**Closing Message**

Thank you so much for your time and attention! If you are interested in the results of this survey, or you have any questions or comments, please contact me at [sev1872@ksu.edu](mailto:sev1872@ksu.edu).

- End of Survey -

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