Preliminary Hazard Analysis

Of XYZ Dairy

By

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Abstract

Risks to employees on a dairy farm are varied and can include hazards ranging from working with large animals, using chemicals to clean the milking system, working with medications to treat animals, working with mechanical equipment, to ergonomic injuries. The company studied in this research is in need of determining what hazards exist, prioritizing the hazards and generating a plan to mitigate the most severe risks. Through inspection and a brief survey, the researcher was able to determine the severity and probability of hazards on the farm and categorize them into high, medium, and low risks using a preliminary hazard analysis (PHA). The high risk hazards included accidents arising from slips, trips, and falls, lack of mechanical guarding, and lack of visibility from areas of heavy sawdust. It is the conclusion of this paper that the owners institute a regular and deliberate safety policy on the farm. It is recommended that other farms institute a hazard identification program like the one used in this

research. Not only would injuries and fatalities be prevented but money lost from accidents would be saved.

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Bryan Beamer and risk control staff.

XYZ Dairy owner and employees

Table of Contents

Chapter I: Introduction

The owner and operator of XYZ Dairy in Wisconsin has concerns about risks associated with his 16 full-time employees' work at the large dairy operation. The dairy operation has 3,000 acres of crop land, 900 milk cows, 800 heifers, and 80 heifer calves to be managed and cared for around the clock. A typical day of operation involves preparing 140,000 pounds of feed to be rationed to cows and heifers. Nine-hundred milking cows are milked three times a day in two separate milking parlors. Eighty heifer calves need to be hand fed twice a day and on average two to three calves are born each day at the dairy.

Injuries in the Dairy Industry

Agriculture consistently ranks among the most hazardous U.S. occupations. The overall fatality rate in the U.S. in 2007 was 3.7 per 100,000 workers, but the rate for those with farming or ranching as a major occupation was 38.4 per 100,000. (Tevis, A father's safety message, 2010) Farm equipment is involved in a majority of fatalities. Older machinery often lacks effective safety guards. (Tevis, A father's safety message, 2010) In a study on New York dairy farms, the injury rate was 166 injuries per just 1,000 workers a year.(Pratt, Marvel, Darrow, Stallones, May, & Jenkins, 1992) The people most likely injured in this study were the owners who were older, most experienced, knowledgeable, and worked more than 60 hours a week. The most common time an injury occurs is in the afternoon. The time of year when injuries most likely happen are in the growing and harvesting seasons where working long hours with machinery increases the danger.(Pratt, Marvel, Darrow, Stallones, May, & Jenkins, 1992)

Farm accidents resulting in death are common in Wisconsin because of the large amount of farms, almost 15,000 of them with over a million cow's total.(Successful Farming, 2010) Examples of news reports; a 10-year-old rural Evansville boy died Tuesday of injuries he

suffered in a Monday morning farm accident on May 8, 2003.(News Wire, 2003) A 31-year-old Kaukauna area man who was killed Tuesday when he became trapped in a feed mixer on May 26, 2010.(The Post-Crescent, 2010) A 79-year-old male farm worker died after becoming entangled in the rotating driveline of a portable hay elevator on September 23, 1995. (NIOSH, 1995) A 31-year-old male migrant worker died in a farm accident Monday in the town of Eau Galle after the skid steer he was operating went into a manure pit and overturned in about 7 ½ feet of manure on October 26, 2009. (The Leader-Telegram, 2009) Farm fatalities can hit the manager, worker, elderly, or even the young.

Overview of the Problem

Jobs around the dairy operation include a wide range of hazards that employees need to be careful about. Hazards can come from a variety of causes including the environment, ergonomics, machinery, or even hazards stemming from chemicals used. The company does not have a clear grasp of the potential severity and probability of hazards. Therefore, no clear plan of action for mitigating hazards on the diary farm currently exists.

Statement of the Problem

Risks to employees on a dairy farm are varied and can include hazards ranging from working with large animals, using chemicals to clean the milking system, working with medications to treat animals, working with mechanical equipment, to ergonomic injuries. The company is in need of determining what hazards exist, prioritizing the hazards and generating a plan to mitigate the most severe risks.

Purpose of the Study

The purpose of the study is to give managers/operators insight into ways to improve the operation of a large dairy farm from a risk control perspective. Since there is a wide range of hazards at the operation, a preliminary hazard analysis (PHA) should be used to identify the hazards and assess the risks that can be diminished.

Goals of the Study

- Effectively identify risks to employees at XYZ Dairy.
- Grade risks on a scale to address the more serious hazards.
- Create a preliminary hazard analysis for owner/operator to use on continuous basis.
- Identify countermeasures to reduce risks to employees.

Significance of the Study

The study places risk control tools in owner's hands to manage the hazards at his facility. Many large dairy operations have similar set ups and can also benefit from this study. Reducing potential risks reduces potential future losses. Reduced losses increase profitability in tough economic times.

Limitations

- The preliminary hazard analysis identifies probable risks and not improbable risks.
- Reliability and accuracy of researcher.
- Summertime readings in the time frame involved, may differ in other seasons.

Assumptions of the Study

The preliminary hazard analysis can reduce potential losses in the future.

Definitions of Terms

- Preliminary – coming before and usually forming a necessary prelude to something.
- Hazard – an activity or condition which poses threat of loss or harm.
- Analysis – an examination of the elements of a system, separation of a whole into its component parts.
- Mishap – a loss event.
- Threat – a potential for loss.
- Target – a thing having worth threatened by a hazard.
- Risk – long-term rate of loss – the product of loss severity and loss probability.
- Severity – how bad?
- Probability – how likely? How often?

(Mohr, 2002)

Chapter II: Literature Review

Introduction

The types of literature reviewed in this chapter include: Hazards in the Dairy Industry, Judging Severity and Probability, Identifying Controls, and Preliminary Hazard Analysis. Developing an understanding of the hazards through past experiences and how to judge them indentifies what needs to be addressed. How to reduce these hazards through controls and formatting them into a preliminary hazard analysis is also key to safety of the farm.

Hazards in the Dairy Industry

A typical farm has all the common hazards found in industrial locations plus additional hazards specific to the dairy farm. The hazards include Traffic, Power and Electrical, Environment, Manual Handling, Confined Spaces, Chemicals, Dust Inhalation, Tractors, Machinery, and Equipment.

Traffic

The farm has a wide range of vehicles from tractors to milk trucks coming and going throughout the facility. Reducing the chances of collision between, vehicles, people, and animals is important in preventing a serious injury. Wide roads, corners, and clear visibility in traffic areas help a great deal. (Victorian Farm Safety Center)

Power and Electrical

Poorly maintained installations and electrical equipment could result in fires or electrocution. (Victorian Farm Safety Center) The best way to control electrocution from happening is to make sure electrical sources are covered and out of the way of working areas. Damaged cords, outlets, power tools, and leads must be repaired or replaced immediately before using again.(Victorian Farm Safety Center)

Environment

Further occupational hazards include the chronic exposure to allergens, pathogens, and other respiratory irritants leading to allergies, asthma, and other chronic lung diseases and chronic exposure to loud farm equipment, eventually resulting in hearing loss.(Ahonen, Venalainen, Kononen, & Klen, 1990) The farm is located in Wisconsin and is subject to all seasons of weather. Hot and cold climates can bring about sickness or injury by changing the climate the worker is in at the time. Poor climate can reduce function and perception in manual handling resulting in common workplace incidents such as slips, trips, and falls.

Manual Handling

Hazards on dairy farms primarily include acute injuries from interactions with the cattle, as well as chronic injuries from the physical labor of milking and maintaining the farm. (Ahonen, Venalainen, Kononen, & Klen, 1990) Manual handling is a big part of working in the dairy industry, especially with the closeness needed to work with cattle every day. Manual handling includes not just lifting items, but also activity that requires a person to use force to push, pull, roll, hold, restrain or carry an object or animal, and includes repetitive tasks such as using hand tools, operating machinery and even milking. Injuries can include: muscle sprains and strains; back injuries, including injuries to nerves, ligaments and tendons in the wrists, arms, shoulders, neck or legs; abdominal hernias; and chronic pain. (Victorian Farm Safety Center) Working with cattle can bring about incidents such as being pinned, crushed, gored, or kicked resulting in injury or death.

Confined Spaces

Less common, injury and death can occur from entering confined spaces (e.g. –silos, manure pits), drowning in manure lagoons, or through the use of farm machinery near the

manure pits. (Ahonen, Venalainen, Kononen, & Klen, 1990) Manure pits are common on large farms for the disbursement and storage of waste from cattle. They are also known as effluent ponds and solid traps. They can be drowning hazards resulting in death, are breeding grounds for insects, bacteria, and pose risks to nearby waterways.

Chemicals

Exposure to farm chemicals has also been on the forefront of current concerns. Dermatoses, certain cancers and zoonotic infections are also important problems that are under investigation. Chemicals can be dangerous at any time, but particularly when people are exposed to a chemical concentrate. Aside from direct ingestion, chemicals can be absorbed into the body through exposure to skin, breathing in fumes when applying, cleaning, decanting or mixing. Farms use variety of chemicals such as acids, alkalines, iodine teat sprays, formalin, antibiotics, vaccines, drenches, lice treatments, and veterinary chemicals, including hormones.

Dust Inhalation

Dust can be hazardous if inhaled over time or in a short time with highly concentrated dust that can be found in confined spaces. Dust on the farm is commonly generated by cattle feed, dirt, and bedding. Regularly inhaling dust can reduce a person's lung function and cause health problems such as hay fever, asthma and 'farmer's lung'. Grain dust in confined spaces such as feed rooms increases these risks.

Tractors, Machinery, and Equipment

Working with machinery is also at issues on the farm. Large machinery like tractors can easily cause traumatic injury or death in an instant if the right precautions are not followed. Blind corners, accountability of surroundings, and the use of handling material with bucket loaders are areas to look into when looking at using large equipment. Guards on tractors,

machinery, and equipment are also vital in preventing serious injury or death. Many moving parts such as power take offs (PTO), chains, belts, and pulleys can grab clothing in an instant to take a person's life.

Judging Severity and Probability

A commonly used definition of risk is: Probability of a particular hazard occurring × Severity of the outcome when the hazard or associated event occurs = RISK. Reducing the severity and/or probability in essence reduces risk. Severity of consequences includes personnel illness/injury, equipment loss in dollar values, down time, product loss, and environmental effect. Severities of the hazards are categorized into separate levels and are determined by managing influences in the company when defining the severity of the outcomes. Another aspect of the equation to be determined by management is life cycle of the analysis. The life cycle is usually in years and judging probability takes in to account how likely something will happen in that life cycle. Reducing probability is called prevention, and many efforts to reduce risk are focused on prevention of unexpected events.(Mohr, 2002)

Identifying Controls

The best way to eliminate or reduce risk is through engineering the workplace so that incidents and injury do not happen through design changes, engineering safety features, safety devices, or warning devices.(Mohr, 2002) Engineering controls for prevention is also the most costly and are likely used when it benefits safety on the bottom line or is required by law. It is the first thing to look at when reducing risk. Another way to control risks on the farm is through procedures and training. An informed worker on hazards in the workplace and how to safely conduct his work in this environment is some of the best prevention in a loss a manager can have at his disposal. Training in reporting hazards and in emergency response is also important.

Properly responding to emergencies can save people, property, and time from becoming a loss. Planning for emergencies can be difficult, but a little training on hazards can reduce the likely hood of an improper response from happening and making the situation worse.

Child Safety

Another area to look into is child safety. Farms are commonly owned and operated by families living on the farm and necessary precautions should be taken. A common way farmers keep their children from harm is designating NO-GO zones that they need to stay away from until they are older and trained in those areas. Another important lesson to teach children is to make eye contact and acknowledgment of being there whenever approaching someone on farm equipment or vehicles.

Preliminary Hazard Analysis

A well done preliminary hazard analysis: Identifies hazards and their potential consequences, Assesses risk to develop an expected loss rate, and Guides cost-effective resource deployment. The preliminary hazard analysis is a line-item inventory of all system hazards and their risks. It may be carried out at any point in the system life cycle. (Mohr, 2002) An accumulation of what was discussed. Identifying hazards on the farm, and then determining the severity of consequences and probability of mishap. Putting the hazard into a risk assessment matrix, the hazard is categorized into acceptable and non-acceptable levels. The controls to the hazards are identified and the most effective countermeasure is to be used in reducing the risk into acceptable levels. The preliminary hazard analysis final report conveys all this information onto one report that can easily be accessed for status on risks in the system indentified on the report. The report is very structured and easy to work with when dealing with new or old hazards on the farm.

Chapter III: Methodology

Overview

The research focuses on the milking facility at XYZ Dairy in Wisconsin. Operations observed may also include surrounding areas supporting the facility where work is also done.

Regarding implementation, the researcher will use the internet to gather information regarding hazards in the dairy industry. Also for on-site analysis, the researcher will use pen, paper, clipboard, and camera with video to document operations and/or interviews with the owner on the farm.

Data Collection Procedures

The owner and researcher will observe farm operations, gathering information for the benefit of this project. Notes, clues, pictures, and video will be taken from an observation stand point and interaction with employees will be at a minimum as to not disturb work processes. Questioning will be directed at the owner to gather input on hazards currently known and in the past. Looking at targets of potential hazards; personnel, product, environment, equipment, productivity, other, it can be examined how they interact with each other in the working environment.

The following is a list of specific procedures for generating a complete list of hazard:

1. The researcher will generate a list of operations/work tasks based on his own work experience and based on the knowledge of the owner.
2. The researcher will use the checklist of hazard found in appendix E to verify the existence of hazards on the list.
3. The researcher will brainstorm with the owner regarding hazards by using the questionnaire located in appendix F.

Data Analysis

After identifying the hazards in place at the farm, the probability and severity of the specific hazards needs to be categorized. Using the guidelines set in severity of consequences (appendix A); the hazards can be put into different levels of severity. The highest level described as catastrophic, would be such cases as a death to damage that can put the farm under. The lowest level being negligible hazards that are almost forgotten over a short period of time, and marginal, critical levels are the in-betweens. The levels will be calibrated specifically to what the owner feels is right for the farm. The amount in equipment loss, product loss, or any category could be changed to reflect the standards set at the farm.

Probability of mishap (appendix B) also puts hazards into levels of how likely a loss would occur over a 25 year period. Exposure duration, target population, and operational phases can increase or decrease the probability. Records or accounts of near hits of the hazard can give insight of how likely a loss will happen next time.

Appendix C (risk assessment matrix) is a cross reference of the severity of consequences and probability of mishap. The matrix has three levels of hazards that are necessary to prioritize which hazards should be addressed first.

The preliminary hazard analysis (appendix D) puts the research together and introduces countermeasures that will reduce hazards needed to be addressed. Looking at a single hazard, researcher can judge its severity and probability by the knowledge gained through study of dairy industry hazards and its common occurrences of injury or illness. The risk assessment matrix quantifies hazard into a risk code of one, two, or three. Through preliminary hazard analysis the hazard is addressed, countermeasures used with the purpose of reducing the hazard to a one risk code on the risk assessment matrix.

Limitations

The physical boundaries in the tour of the farm will be the production facility that houses all cattle, feeding areas, traffic areas, and any places of storage. Fields and land that support the facility not in walking distance will be excluded. The tour will be conducted during milking and feeding times. Operation or draining of manure pit may not be observed given the day as these are drained only a few times a year. Recorded data will consist of hazards that could or should be addressed and very low risk areas or concerns that are assumed to not need any countermeasures will be overlooked and left alone.

Chapter IV: Results

Inspection

The following data was developed with the owner of XYZ Dairy on June 16, 2010 at 1pm. The dairy farm safety initial safety report (appendix E) took approximately one hour to generate. Details of the hazard report can he found in Appendix H.

Independent of the research of this report, the Occupational Safety and Health Administration inspected the facility the previous week and went over many records with the owner. OSHA stated that they are showing interest in inspecting farms since dairy farm-related incident in Eau Galle, WI last year. (The Leader-Telegram, 2009).

Because the OSHA inspection may have affected this research, the fixes made after the OSHA inspection were noted in the initial safety report (appendix H). Most of the fixes were electrical and in response to minor offenses. The severity of consequences was adjusted accordingly in appendix G.

Initial Safety Report

The checklist for the dairy farm safety initial safety report (appendix H) tackled every area of the farm. Areas that need to be addressed are; a few electrical problems that had been fixed since the previous week's OSHA inspection, a couple of low hanging object that are not sharp, gates dragging on the ground, putting gas in the correct red containers, locking up a pistol, installing an eye wash station, vehicular safety, emergency response training and plans. Another hazard requiring vigilance is preventing slips, trips, and falls. Questioning revealed that an elderly person fell and broke his leg in the shop after washing his hands. Essentially, he tripped on a piece of iron on the floor, then stepped on a creeper, and then fell on a couple items that should have been picked up. Poor lighting contributed to the incident.

Questioning

Using the questions in appendix E, several hazards were identified that were not previously uncovered by the checklist. The owner's wife is a veterinarian and works with cows manually every day. She has been taken to the emergency room three times in the past, once when a cow sat down on her when she was taking a leg wrap off, another time when climbing a ladder that slid out, and lastly when she thought she had a stroke, had double vision and light headed. The first two incidents ended in bruises with no broken bones, and the last incident may have been caused by dehydration. Other incidents with cows include a cow stepping on a man's foot and breaking several bones, workers being taken to the emergency room after being kicked by a cow, and an incident when a cow attacked the owner's wife for no discernable reason. The owner reported that the cow attack would have been much worse, but the wife curled into a ball in a non-threatening way until someone came to help. In the sawdust and bedding area, heavy traffic involving skid steer loaders moving sawdust has raised concerns on visibility around a corner in the vicinity. Other hazards include a robbery in which two masked men came into the milking parlor and robbed the workers in the middle of the night. Fortunately no one was hurt and little was taken.

One potential hazard the owner worries about is a manure spill resulting in injury or death, in spite of the fact that this hazard has produced no accidents yet. The lagoon holds massive amount of waste and many redundant safety measures are taken to reduce a spill from happening. However, there is always a risk of a potential spill when trucks haul manure to be spread on land. A spill into waterways such as a creek would be environmentally and fiscally damaging to the farm. Questioning of the owner revealed that another area of worry would be a

terrorist attack on the farm. Attacks would include: people that could open gates and chase cows off the property which is close to a heavily traveled highway; or poisoning animals.

Identified Risks

The identified hazards severity, probability, and risk code are analyzed in XYZ Dairy Hazard List (appendix I). The Risk Assessment Matrix (appendix J) shows the numbered hazards from appendix I and their corresponding risk codes.

High Risk Hazards

- Accidents arising from slips, trips, and falls
- Lack of mechanical guarding
- Lack of visibility from areas of heavy sawdust

Medium Risk Hazards

- Head high objects that can cause injury if bumped into
- Dragging gates that can cause ergonomic injuries
- Lack of appropriate emergency planning, including identification of emergency response
- Lack of proper firearm storage
- Lack of injury/illness policies
- Lack of safety training process of contractors and visitors
- Lack of hazard reporting process
- Lack of rollover protection
- Not clearly posting load limits for skid steer

Chapter V: Discussion

Conclusions

The purpose of this research was to complete a Preliminary Hazard Analysis of XYZ Diary. The PHA process included identification of hazards, determination of severity and probability for these hazards, and defining which hazards posed the highest risk. As was shown in Chapter 4, the highest risk hazards include the following:

- Accidents arising from slips, trips, and falls
- Lack of mechanical guarding
- Lack of visibility from areas of heavy sawdust

Furthermore, several hazards were present that posed a medium level risk. These risks should also be considered in the long run:

- Head high objects that can cause injury if bumped into
- Dragging gates that can cause ergonomic injuries
- Lack of appropriate emergency planning, including identification of emergency response
- Lack of proper firearm storage
- Lack of injury/illness policies
- Lack of safety training process of contractors and visitors
- Lack of hazard reporting process
- Lack of rollover protection
- Not clearly posting load limits for skid steer

Recommendations

Reducing the risks for the preceding hazards need not be costly or time consuming. Slips, trips, and falls will require workers to more vigilant in house cleaning in all areas of the farm. Better lighting in dark areas will help visibility. In regards to improper guarding, guards must be in place, maintained, and in operating order on mechanical parts. Pulleys, chains, augers, and power take offs have taken many lives on the farm, keeping guards on will save potential loss of life. The heavy traffic in the sawdust area can be safer by cautioning people working and passing through there. Making sure operators are looking where they're heading, posting caution or slow signs, and putting up large convex mirrors on sharp corners will help greatly.

The medium risk hazards should be addressed in a timely fashion after the high risk hazards are reduced. Several of the medium risk hazard countermeasures are quick fixes and the owner will need to make plans on bringing safety procedures, training, and awareness into the workplace.

Most importantly however, it is the conclusion of this paper that the owners institute a regular and deliberate safety policy on the farm. First and foremost, continuing periodic risk assessments will be important in identifying hazards in the future and providing a safe environment for all on the XYZ Dairy farm. Secondly, the owners will have to set money and time aside to introduce engineering controls into the workplace – especially for high hazard risks. Lastly, where engineering controls are not financially or practically feasible, the owners will have to dedicate time and effort to a better training program. Also the owners should rely least of all on personal protective equipment and warning signs, using them as sparingly as possible.

For the future, it is recommended that other farms institute a hazard identification program like the one used in this research. Not only would injuries and fatalities be prevented but money lost from accidents would be saved.

References

Ahonen, E., Venalainen, J., Kononen, U., & Klen, T. (1990). The physical strain of dairy farming. *Ergonomics* , 1549-1555.

Bentley, T., Tappin, D., Moore, D., Legg, S., Ashby, L., & Parker, R. (2005). Investigating slips, trips and falls in the New Zealand dairy farming sector. *Ergonomics* , 1008-1019.

Brison, R., & Pickett, C. (1992). Non-fatal farm injuries on 117 eastern Ontario beef and dairy farms: A one-year study. *American Journal of Indutrial Medicine* , 623-636.

Chapman, L., Schuler, R., Wilkinson, T., & Skiolaas, C. (1996). Work Hazard Control Efforts by Wisconsin Dairy Farmers. *Journal of Agricultural Safety and Health* , 7-13.

Dairy Australia. (n.d.). *Farm Policies & Systems.* Retrieved May 10, 2010, from The People in Dairy: http://www.thepeopleindairy.org.au/farm-policies-systems/

Mohr, R. (2002). Preliminary Hazard Analysis. *UW-Stout* (p. 74). Menomonie: Jacobs Sverdrup.

News Wire. (2003, May 8). *Farm Accident Kills 10-Year-Old Boy.* Retrieved from The Wisconsin State Journal.

NIOSH. (1995). *Farmer Dies From Being Entangled in Unguarded PTO Unit on Hay Elevator.* Retrieved from NIOSH FaceWeb: http://www.cdc.gov/niosh/face/stateface/wi/95wi096.html

Nordstrom, D., Layde, P., Olson, K., Stueland, D., Brand, L., & Follen, M. (1995). Incidence of farm-work-related acute injury in a defined population. *American Journal of Industrial Medicine* , 551-564.

Pratt, D., Marvel, L., Darrow, D., Stallones, L., May, J., & Jenkins, P. (1992). The dangers of dairy farming: The injury experience of 600 workers followed for two years. *American Journal of Industrial Medicine* , 637-650.

Soliman, F. (n.d.). Application of knowledge management for hazard anlysis in the Australian dairy industry.

Stallones, L., & Beseler, C. (2003). Farm work practices and farm injuries in Colorado. *Injury Prevention* , 241-244.

Stallones, L., Keefe, T., & Xiang, H. Y. (1997). Characteristics associated with increased farm work-related injuries among male resident farm operators in Colorado, 1993. *Journal of Agricultural Safety and Health* , 195-201.

Successful Farming. (2010, April). *Rural Health.* Retrieved from Agriculture Online: http://www.agriculture.com/ruralhealth

Tevis, C. (2010, May 3). *A father's safety message.* Retrieved May 2010, from AgricultureOnline: http://www.agriculture.com/ag/story.jhtml?storyid=/templatedata/ag/story/data/12729044 96671.xml

Tevis, C. (2010, January). Good Health and Safety Make Sense. *Successful Farming* , pp. 53-56.

The Leader-Telegram. (2009, October 26). *Man dies in Eau Galle farm accident.* Retrieved from leadertelegram.com: http://www.leadertelegram.com/news/front_page/article_55efff60-c267-11de-835e-001cc4c002e0.html

The Post-Crescent. (2010, May 26). *Timothy J. Lund killed in accident at Tidy View Dairy in Town of Kaukauna.* Retrieved from postcrescent.com: http://www.postcrescent.com/article/20100526/APC0101/5260622/Man-killed-in-farm-accident-identified

Victorian Farm Safety Center. (n.d.). *Hazards in the Dairy.* Retrieved March 10, 2010, from Safety in the Dairy: http://www.dairysafety.org.au/centres/dairysafety/index.php

Von Essen, S. G., & McCurdy, S. A. (1998). Health and safety risks in production agriculture. *Western Journal of Medicine* , 214-220.

Watrin, S. (2010, March 25). We're in a risky business. *Hoard's Dairyman* , p. 230.

Appendix A (Mohr, 2002)

Severity of Consequences					
Category/Descriptive Word	Personnel Illness/injury	Equipment Loss ($)	Down Time	Product Loss	Environmental Effect
I. Catastrophic	Death	>500k	>4 months	>2 weeks production	Long-term 5 yrs or greater environmental damage
II. Critical	Severe injury or illness	100k to 500k	2 weeks to 4 months	1 week to 2 week production	Medium-term 1-5yrs environmental damage
III. Marginal	Minor injury or illness	1k to 100k	1 day to 2 weeks	1day to 1 week production	Short-term <1yr environmental damage
IV. Negligible	No injury or illness	<1k	<1 day	<1 day	Minor environmental damage, readily repaired

Appendix B

(Mohr, 2002)

Probability of Mishap (25 years)

Level	Descriptive Word	Definition
A	Frequent	Likely to occur repeatedly
B	Probable	Likely to occur several times
C	Occasional	Likely to occur sometime
D	Remote	Not likely to occur
E	Improbable	Very unlikely to occur

Appendix C (Mohr, 2002)

Risk Assessment Matrix

	Probability of Mishap (25 years)				
Severity of Consequences	E	D	C	B	A
I. Catastrophic					
II. Critical					
III. Marginal					
IV. Negligible					
Risk Code/Actions	1. Imperative to suppress risk to lower levels		2. Operation requires written, time-limited waiver, endorsed by management		3. Operation permissible

Appendix D (Mohr, 2002)

Preliminary Hazard Analysis

Brief Descriptive Title (Portion of System/Sub-system/Operational Phases covered by this analysis): XYZ Dairy										
Probability Interval: 25 years	Date: 1 May 2010		Risk Before				Description of Countermeasures		Risk After	
System Number: MC	Analysis: Initial / Revision / Addition	Hazard Target	Severity	Probability	Risk Code	Identify countermeasures by appropriate code letters): D = Design E = Engineered Safety Feature S = Safety Device W = Warning Device P = Procedures/training	Severity	Probability	Risk Code	
Hazard No. / Description										
Prepared by/Date: 1 May 2010	Target Codes: P - Personnel E - Equipment T - Downtime R - Product V - Environment								Approved	

Appendix E (Dairy Australia)

DAIRY FARM SAFETY
initial safety report

Dairy farm		YES	NO / NA	Level of Risk	Status of the Hazard
Traffic					
1	Is clear direction given to visitors?				
2	Are trucks and tankers provided clear access?				
3	Are people and traffic separated or protected?				
Power and electrical					
4	Is power underground or clear of working areas?				
5	Are RCDs (safety switches) fitted to cover all outlets?				
6	Are all electrical leads, including power tools, equipment, and extension, in good condition?				
7	Is electrical installation in good condition and protected from possible damage?				
Environment					
8	Is noise exposure controlled?				
9	Are slip, trip and fall hazards minimised and controlled?				
10	Is dust minimised and controlled?				
11	Are head high and sharp projections eliminated?				
12	Are ventilation adequate and heat and cold protection provided in dairy/buildings?				
13	Is sun protection provided?				
14	Are clean toilets, washing and eating areas provided?				
15	Is clean drinking water provided?				
16	Are solids traps, effluent pits and ponds covered or fenced off to prevent child access?				
17	Are tractors prevented from accessing steep-sided ponds?				
18	Are fan-forced recirculated water cooling towers registered and a risk management plan in place?				
Manual handling - dairy and other areas					

19	Are mechanical aids used, e.g. trolleys, FEL, hoists, forklift?				
20	Is the platform height appropriate for the milkers at cups on and off position, minimising bending, over reaching and stretching?				
21	Are automatic cup removers used?				
22	Are clusters mounted between hip and shoulder level?				
23	Do gates move freely without dragging?				
Dairy hazards					
24	Are moving parts guarded?				
25	Are emergency stops provided on rotaries?				
26	Is hot water exposure controlled?				
Confined spaces: vats, silos, tanks					
27	Does the design of the vat/silo exclude the need to enter it?				
28	If entering, are confined space procedures followed?				
29	Is working from heights minimised and controlled?				
Farm chemicals including dangerous goods, hazardous substances					
30	Are MSDSs available for all chemicals and fuels?				
31	Are all chemicals and fuels stored as per MSDSs?				
32	Are detergents and chemicals in use areas designed to minimise handling and exposure to workers and others?				
33	Is PPE, including face and eye shield, gloves, apron, respirator, available and used when handling chemicals or dairy detergents?				
34	Are eye wash and shower facilities available in the event of chemical splashing and exposure?				
35	Are spills contained and a cleanup kit available?				
36	Are all chemicals stored in clearly labelled containers? No food or drink containers.				
37	Are there clear warning signs posted on outside of storage and in use areas?				
38	Are flammables stored away from sources of ignition?				
39	Is LPG, oxy acetylene bottles stored and secured vertically?				

40	Are flash back arrestors fitted to Oxy bottles?				
41	Have all workers involved in the chemical work been trained in safe chemical application?				
42	Are tractors used for spray application fitted with a cabin and charcoal air filter?				
43	If asbestos is present has an asbestos management plan been established?				
44	Is employee health monitored? • noise exposure • chemical exposure (see MSDSs) • dust exposure				
Emergency response					
45	Is there a plan to ensure health and safety in the event of an emergency?				
46	Are there adequate fire extinguishers and fire control measures?				
47	Is first aid equipment available?				
48	Are people trained in emergency response?				
49	Do you maintain records of incidents, injury and illness on your farm?				
50	Do you know to notify OSHA of fatalities, serious injury and serious incidents?				
51	Do you have a return to work policy and plan for injured workers?				
52	Are firearms located in a purpose built lockable cabinet?				
Workplace policies					
53	Do you have a Work cover policy and publically display an "If you are injured" poster?				
54	Do you have policies for discrimination and harassment, sexual harassment and drugs and alcohol?				

55	Do you have a formal safety induction / training process for new and existing employees?				
56	Do you have an induction process for contractors and visitors?				
57	Is there a standard process for employees to report identified hazards?				
58	Are there designated "no go" areas for children and are children supervised when visiting the dairy and other hazardous areas?				
Tractors, machinery and equipment					
59	Are all tractors fitted with approved rollover protection structures (ROPS)?				
60	Are all guards (protecting moving parts, PTO, auger, belts, pullies and chains) including manufacturer's guards in place and in good condition?				
61	Are passengers kept off tractors, quads and attachments?				
62	Are routine checks and maintenance completed and records kept for all tractors, vehicles, machinery and quads?				
63	Prior to working under raised machinery is power off, equipment secured and chock/ supports used?				
64	Are tractors only ever started from the operator's seat?				
65	Is it an observed policy that no one is to get on or off moving tractors or machinery?				
66	Are earmuffs or ear plugs available to tractor and machine operators if they have to raise their voices to be heard?				
67	Do all tractors fitted with a front end loader; have four post ROPS and/or roll back protection?				
68	Have all people who use equipment on the property had training/instruction in safe use of the particular equipment?				

69	Are the keys of all tractors, quads and vehicles removed and stored away from children and other unauthorised persons when not in use?				
70	Is there a known policy that only persons nominated / approved by management are permitted to operate tractors, quads and other machinery?				
71	Is there a policy in place that prohibits persons from riding, unrestrained, in the back of utilities or trucks?				
72	Is there a zero tolerance alcohol and drug policy in place for persons operating vehicles and machinery in the workplace?				
73	Are load limits known and followed for FEL and quads?				
74	Are motorcycle helmets used when operating motorbikes and quads?				
75	Is PPE supplied and used for workshop equipment, chainsaw use and materials handling?				

Appendix F

Questions to owner

1. What injuries, illnesses, and near hits have you experienced on the farm?
2. What is the state of knowledge about that hazard and the chance of it occurring again?
3. What is the availability and suitability of ways to remove or reduce that risk?
4. What would be the cost of eliminating or reducing that hazard or risk?
5. What hazards or potential hazards do you think would harm farm operations enough to reduce its sustainability?
6. How likely would these hazards arise and do you worry about them?

Appendix G

Severity of Consequences					
Category/Descriptive Word	Personnel Illness/injury	Equipment Loss ($)	Down Time	Product Loss	Environmental Effect
I. Catastrophic	Death	>1M	>4 months	>2 weeks production	Long-term 5 yrs or greater environmental damage
II. Critical	Severe injury or illness	100k to 1M	2 weeks to 4 months	1 week to 2 week production	Medium-term 1-5yrs environmental damage
III. Marginal	Minor injury or illness	1k to 100k	1 day to 2 weeks	1day to 1 week production	Short-term <1yr environmental damage
IV. Negligible	No injury or illness	<1k	<1 day	<1 day	Minor environmental damage, readily repaired

Appendix H

DAIRY FARM SAFETY
Initial Safety Report
June 16, 2010

Dairy farm		YES	NO / NA	Level of Risk	Status of the Hazard
Traffic					
1	Is clear direction given to visitors?	YES			
2	Are trucks and tankers provided clear access?	YES			
3	Are people and traffic separated or protected?	YES			
Power and electrical					
4	Is power underground or clear of working areas?	YES			
5	Are RCDs (safety switches) fitted to cover all outlets?		NO		Couple openings in switch boxes, fixed already
6	Are all electrical leads, including power tools, equipment, and extension, in good condition?		NO		Few cords torn up, fixed after OSHA inspection
7	Is electrical installation in good condition and protected from possible damage?	YES			
Environment					
8	Is noise exposure controlled?	YES			Ear protection provided in generator room
9	Are slip, trip and fall hazards minimised and controlled?		NO		Pick up and put away object on floor, hand rails are in place
10	Is dust minimised and controlled?	YES			Cabs on equipment filter the air in dusty areas
11	Are head high and sharp projections eliminated?		NO		Feed bin area, conduct pipe hangs low
12	Are ventilation adequate and heat and cold protection provided in dairy/buildings?	YES			
13	Is sun protection provided?	YES			
14	Are clean toilets, washing and eating areas provided?	YES			Cleaned once a week
15	Is clean drinking water provided?	YES			
16	Are solids traps, effluent pits and ponds covered or fenced off to prevent child access?	YES			
17	Are tractors prevented from accessing steep-sided ponds?	YES			
18	Are fan-forced recirculated water cooling towers registered and a risk management plan in place?		N/A		

Manual handling - dairy and other areas					
19	Are mechanical aids used, e.g. trolleys, FEL, hoists, forklift?	YES			Just in the shop
20	Is the platform height appropriate for the milkers at cups on and off position, minimising bending, over reaching and stretching?	YES			8" adjustable
21	Are automatic cup removers used?	YES			
22	Are clusters mounted between hip and shoulder level?	YES			
23	Do gates move freely without dragging?		NO		4 gates need to be welded and fixed
Dairy hazards					
24	Are moving parts guarded?	YES			
25	Are emergency stops provided on rotaries?		N/A		
26	Is hot water exposure controlled?	YES			
Confined spaces: vats, silos, tanks					
27	Does the design of the vat/silo exclude the need to enter it?	YES			
28	If entering, are confined space procedures followed?	YES			Sub contractors do the cleaning and entering under their procedures
29	Is working from heights minimised and controlled?	YES			Have a 60 ft boom truck to reach areas
Farm chemicals including dangerous goods, hazardous substances					
30	Are MSDSs available for all chemicals and fuels?	YES			Missing some, replaced after OSHA inspection
31	Are all chemicals and fuels stored as per MSDSs?	YES			
32	Are detergents and chemicals in use areas designed to minimise handling and exposure to workers and others?	YES			Automated pumps take detergent out and measure
33	Is PPE, including face and eye shield, gloves, apron, respirator, available and used when handling chemicals or dairy detergents?	YES			Face shield and gloves provided for Iodine usage
34	Are eye wash and shower facilities available in the event of chemical splashing and exposure?		NO		Shower in barn, shop and office No eyewash stations
35	Are spills contained and a cleanup kit available?		NO		Spills drained to the lagoon
36	Are all chemicals stored in clearly labelled containers? No food or drink containers.		NO		Couple gas cans not red in colour
37	Are there clear warning signs posted on outside of storage and in use areas?	YES			

38	Are flammables stored away from sources of ignition?	YES			
39	Is LPG, oxy acetylene bottles stored and secured vertically?	YES			
40	Are flash back arrestors fitted to Oxy bottles?	YES			
41	Have all workers involved in the chemical work been trained in safe chemical application?		N/A		
42	Are tractors used for spray application fitted with a cabin and charcoal air filter?		N/A		
43	If asbestos is present has an asbestos management plan been established?		N/A		No asbestos
44	Is employee health monitored? • noise exposure • chemical exposure (see MSDSs) • dust exposure	YES			Methane exposure is monitored

Emergency response

45	Is there a plan to ensure health and safety in the event of an emergency?		NO		Just to call 911
46	Are there adequate fire extinguishers and fire control measures?	YES			Fire extinguishers in place and checked monthly, yearly for pressure. Water hose next to area for grinding hay.
47	Is first aid equipment available?	YES			4 kits available
48	Are people trained in emergency response?		NO		
49	Do you maintain records of incidents, injury and illness on your farm?		N/A		Ag exempt
50	Do you know to notify OSHA of fatalities, serious injury and serious incidents?	YES			
51	Do you have a return to work policy and plan for injured workers?	YES			On an individual basis
52	Are firearms located in a purpose built lockable cabinet?		NO		In office, used for euthanizing

Workplace policies

53	Do you have a Work cover policy and publically display an "If you are injured" poster?		NO		Will be put up along with other information in break room walls

54	Do you have policies for discrimination and harassment, sexual harassment and drugs and alcohol?		NO		One case of sexual harassment ended in firing of employee
55	Do you have a formal safety induction / training process for new and existing employees?		NO		
56	Do you have an induction process for contractors and visitors?		NO		Contractors need proof of insurance Visitors are escorted
57	Is there a standard process for employees to report identified hazards?		NO		
58	Are there designated "no go" areas for children and are children supervised when visiting the dairy and other hazardous areas?		N/A		No kids, supervised if visiting
Tractors, machinery and equipment					
59	Are all tractors fitted with approved rollover protection structures (ROPS)?		NO		An old tractor has no roll bar
60	Are all guards (protecting moving parts, PTO, auger, belts, pullies and chains) including manufacturer's guards in place and in good condition?		NO		Couple shields missing
61	Are passengers kept off tractors, quads and attachments?	YES			
62	Are routine checks and maintenance completed and records kept for all tractors, vehicles, machinery and quads?	YES			No specific schedule on maintenance and records are separated to equipment
63	Prior to working under raised machinery is power off, equipment secured and chock/ supports used?	YES			
64	Are tractors only ever started from the operator's seat?	YES			
65	Is it an observed policy that no one is to get on or off moving tractors or machinery?	YES			
66	Are earmuffs or ear plugs available to tractor and machine operators if they have to raise their voices to be heard?	YES			Provided
67	Do all tractors fitted with a front end loader; have four post ROPS and/or roll back protection?		N/A		No front end loaders Skid steers all have full cabs

68	Have all people who use equipment on the property had training/instruction in safe use of the particular equipment?	YES			Tractors firsthand trained, Ag exempt Truck drivers have CDLs
69	Are the keys of all tractors, quads and vehicles removed and stored away from children and other unauthorised persons when not in use?		NO		
70	Is there a known policy that only persons nominated / approved by management are permitted to operate tractors, quads and other machinery?	YES			
71	Is there a policy in place that prohibits persons from riding, unrestrained, in the back of utilities or trucks?		NO		Employees hold calves down in back of truck for short distance when moved
72	Is there a zero tolerance alcohol and drug policy in place for persons operating vehicles and machinery in the workplace?	YES			
73	Are load limits known and followed for FEL and quads?		NO		Skid steers sometimes do a nosedive when lifting wet hay bales
74	Are motorcycle helmets used when operating motorbikes and quads?		NO		Have a ATV and Gator utility vehicle
75	Is PPE supplied and used for workshop equipment, chainsaw use and materials handling?	YES			Could make available Aprons

Appendix I

XYZ Dairy Hazard List				
Hazard	Description	Severity	Probability	Risk Code
1	Outlets covered	II	D	3
2	Electrical Connections	II	D	3
3	Slips, Trips, and Falls	II	B	1
4	Head high objects	III	B	2
5	Dragging Gates	III	A	2
6	No eye wash station	II	D	3
7	Spill Cleanup	II	D	3
8	Gas container color	III	C	3
9	Emergency plans	I	D	2
10	Emergency response	I	D	2
11	Firearm storage	I	D	2
12	Injury/illness policies	III	B	2
13	Worker policies	III	C	3
14	Safety training	III	C	3
15	Induction process	III	B	2
16	Reporting Hazards	II	C	2
17	Rollover protection	I	D	2
18	Mechanical Guarding	I	B	1
19	Vehicle security	IV	D	3
20	Calf transfers	II	D	3
21	Load Limits skid steer	III	B	2
22	Helmets	II	D	3
23	Sawdust area visibility	II	B	1

Appendix J

Risk Assessment Matrix

	Probability of Mishap (25 years)				
Severity of Consequences	E	D	C	B	A
I. Catastrophic		9,10,11,17		18	
II. Critical		1,2,6,7,20, 22	16	3,23	
III. Marginal			8,13,14	4,12,15,21	5
IV. Negligible		19			
Risk Code/Actions	1. Imperative to suppress risk to lower levels		2. Operation requires written, time-limited waiver, endorsed by management		3. Operation permissible