Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Wearable Technologies Project

Manual Task Risk Assessment utilising JAS Wearable Technology

Project Code
2022-1147

Prepared by
Garry Gosling

Date Submitted
1/8/2023

Published by
AMPC

Date Published
27/09/2023

Contents

Project Code	Milestone No.	Prepared by	Date Submitted
2022-1147	5	David Bick	1/8/2023
2022-1147	4	David Bick	1/4/2023
	3	David Bick	30/12/2022
	2	David Bick	9/9/2022
	1	David Bick	1/6/2022

1.0 Executive Summary

The partnership between Stanbroke management and the Innovations Team at AMPC which has delivered successful outcomes to minimise workplace manual handling injuries and to aid in returning workers back to work more quickly using wearable sensor technologies.

Stanbroke has invested in worker safety programs over many years. The management recognised that they needed to do more but did not have sufficient data regarding work-related musculoskeletal injury risks from which to make informed decisions about risk controls without adverse effects on production. The Stanbroke team were aware that Wearable Sensor Technologies were available in the market but were unsure of their effectiveness.

In July 2022, Stanbroke was awarded a PIP to engage with Wearable Assessment Technologies - Joint Action Solutions (WATJAS) to undertake manual handling task risk assessments at their Stanbroke site in Queensland. Assessors, Tim Elvery and David Bick, with guidance from Ergonomists Michael Lawrance and Brendon Grimes, conducted risk assessments of all operational manual tasks. Very High-Risk Tasks were to be reviewed by the ergonomist and feedback provided

From the initial assessment it was recognised by workers that the company was serious about their wellbeing and were engaged in the process. The initial hesitation about interrupting production while workers were fitted with sensors and the assessor asked questions about the work task was quickly overcome as both workers and management saw the advantages of rapid, accurate manual task risk assessments and a genuine desire to change the workplace. Management made the decision to bring supervisors into the process which proved successful.

As staff shortages and production demands grew, management recognised that they needed the results and actions quickly. The wearable sensors were capturing manual tasks risk exposures rapidly and some initial risk controls were identified and actioned.

The Appendix 1 Significant Findings report identifies the status of the tasks assessed, the contributing factors to risks from Very High Risks tasks and some recommendations about risk controls implemented and some yet to be developed.

The process has been successful in so far that worker engagement has improved, disruptions to production are minimal, some tasks were identified as very high risk that were not considered so and there are some simple risk controls implemented, such as handles on trolleys, to reduce these risks.

During this phase of the project Stanbroke implemented several of the risk controls and tested them to verify their beneficial impact as well as monitoring production issues.

The process remains ongoing as risk controls are implemented and staff engagement in the safety process is continuing to identify further risk reductions.

This final Milestone Report of the findings and outcomes was delivered to the AMPC team following signoff by the Stanbroke team.

There are plans to monitor the risk controls and measure the savings in injury claims as a further stage of the process currently outside the scope of the project.

2.0 Introduction

The Wearable Technologies Project was undertaken at the Stanbroke Beef QLD between June 2022 and June 2023. Its goal is to access the effectiveness of wearable sensors for manual handling risk analysis and the impact on the business beneficially and to identify any issues that may arise.

The project involved applying wearable sensors to workers while they performed a range of manual tasks to the contributing factors to risks. Assessments were performed by staff from Wearable Sensor Technologies (JointAction Group) with support from Stanbroke Management and staff. During the project 123 manual handling tasks were examined and 170 task assessments undertaken in 19.2 hours of data capture.

The Wearable Sensor Project had three objectives. To see the impact on business processes from using wearable sensor technologies to identify risks, to determine the level of worker engagement in safety, and; to identify and rectify key hazards within the plant.

The reasoning behind this process is:

- The meat industry is a highly hazardous manual handling environment with high WMSD injury rates and claims costs. Traditional manual task risk assessments have been expensive, subjective, slow and disruptive.
- The purpose of the project is to examine the impact on the business and the workers in using wearable sensor technologies to accurately, quickly and cost effectively identify risks and measure the effectiveness of risk controls.
- Labour and skills shortages have amplified the business imperative to keep workers healthy. Plants are engaging in cultural change to protect workers and therefore maintain productivity levels and reduce costs.
- The mining industry went through similar challenges in the past few years, however the question remained about how those benefits would translate to the meat industry with its cost pressures and lack of FIFO workers.

3.0 Project Objectives

A primary objective of the project is to determine the benefit of wearable sensor technologies in identifying risks to workers from hazardous manual handling injuries.

In addition to the safety outcomes, which have been proven in other industries such as mining, the purpose of the project was to examine the impact on personnel, business processes and productivity from the investigative process.

The project identified some very high-risk tasks and enabled risk controls to be implemented quickly with a task list of potential future solutions that will justify the investment and time to undertake the project.

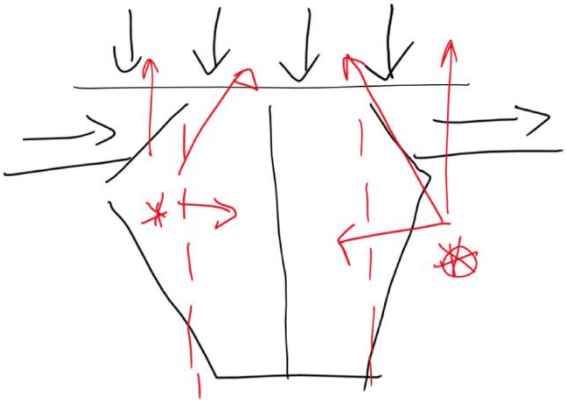
Direct benefits form the project include identification and rectification of 8 very high-risk tasks which added value to practicable risk minimisation to manual tasks in Stanbroke processing facility and the wider red meat industry.

Analysis of the data, development and review risk controls were applied using the hierarchy of hazard management strategies, which may include engineering solutions. An objective was to identify the top five highest risks in each area of the plant and discuss strategies for practicable risk minimisation to identified hazards.

- Assess results that could be incorporated into training and return to work modelling
- Develop best practice model
- Refer top 8 Very High Tasks for ergonomic review
- Examine the level of worker engagement in the safety program

3.1 Examples of worker engagement.

An example of a staff-initiated solution came about when workers saw the level of flexion and rotation required at the slicing table. They quickly put together a design suggestion to minimise these impacts without loss of production.



Example of Worker redesign of slicing table to reduce rotation, flexion and reaching without loss of productivity.

3.2 Examples of equipment change.

Further examples of customizing the workplace include utilsiing the Wearable technology to establish which step height is the most appropriate for which person at the Multi Vac Lines. Same tasks were performed in 3 different settings – at floor level, on a 20cm step and on a 30cm step. The same person did the same task and risk scores were calculated with particular attention to the low back. From this finding the following is recommended for consideration[#]:

Persons Height	Step height
Less than 160cm	30cm step
160-170cm height	20cm step
170-185cm height	10cm step – (currently none available)
Greater than 185cm	Floor ONLY

 # Refer to Appendix 1 (9.1.1) for full

4.0 Methodology

The team at Stanbroke engaged assessors from Wearable Assessment Technologies (WAT- JAS) to undertake hazardous manual handling task risk assessments using wearable sensor technologies across eight (8) areas of the plant over a 12 month project from July 2022 to July 2023.

Wearable sensors are worn by workers whilst they perform their usual manual tasks. A machine learning application gathers data on the actions, load, duration, repetition, and other factors to calculate manual handling hazards using the Australian Code of Practice Hazardous Manual Handling 2018 codes and standards to define the risk, key contributing factors and physical demands of the task.

Workers provide data input post task assessment via responses to standardised questions about elements of the task. This includes full task duration, task repeats per shift, perceived load (how heavy the load/force feels for the person being assessed) and time exposure expressed as a percentage of the task the load is being handled. Multiple observations were made about other elements of the task including the use of PPE, a physical environment descriptor (chill vs frozen) and further fine-grained detail such as whether loads were stable or animated (unpredictable) or required to use gloves for example to add significantly more information and hence detail about the manual task being assessed. Each of these factors contributes to the risk score calculation.

The results are reported immediately to provide feedback to the worker who was invited to make contributions to possible risk controls for evaluation.

During the project 170 risk assessments were undertaken across 123 manual tasks over 19.2 hours of assessments. Tasks were assessed in eight areas of the facility at Stanbroke. Boning, Slicer Boning, Processing, Load Out, Value Add, Maintenance, Chiller Frozen and Other.

Reports created a priority chart (Table 1)* of very-high to low risk tasks. The focus of the project was on analysis of the very highest of these tasks so that risk controls could be implemented.

A key objective was to determine the attitude of workers in participating in the program and therefore workers were questioned about their willingness to participate in the exercise.

Worker's main concerns were about being "performance monitored" or identified. When workers saw the results of the assessments for themselves, they quickly recognised that the management at Stanbroke were primarily concerned for their

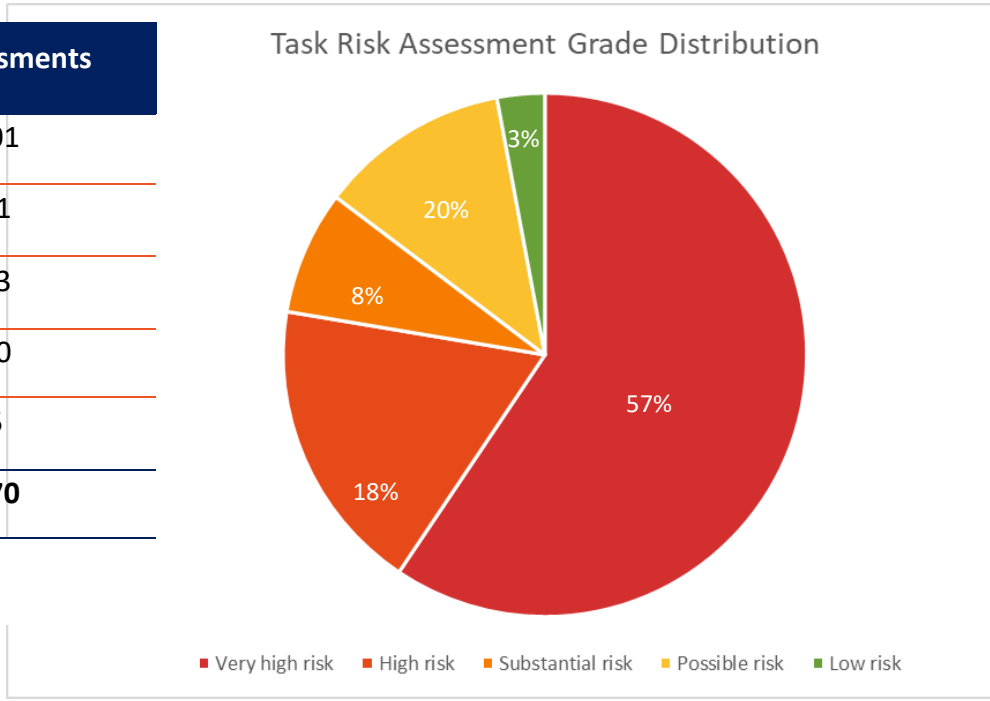
wellbeing and they became proactive in identifying potential risks, make suggestions and volunteering to undertake more analysis including testing risk controls.

The initial focus was on work tasks that the management suspected were high risk.

To avoid disruption to production, Stanbroke used supervisors to step in and maintain the lines while the workers were consulted about their participation and had the sensors fitted. Since this process took less than a minute or two, there was minimal impact.

Risk Grade	# Assessments
Very High Risk	101
High Risk	31
Substantial Risk	13
Possible Risk	20
Low Risk	5
TOTALS	**170**

Table 1. Assessment Summary



There are significantly more Very High-Risk tasks than initially thought which has extended the review processes resulting in a refined process for task assessments for minimum impact on production and maximum engagement with workers. The table is skewed toward very-high risk assessments scores because they were to focus of risk controls and they were re-tested several times whereas low risk tasks were not retested.

5.0 Project Outcomes

The project successfully achieved its objectives within the timeframe of the project. It can be concluded that efficiencies, engagement, detailed actionable data and cost benefits were achieved at level equal to or greater than those experienced in the mining sector using the wearable sensor technology.

Minimal disruption to production and high levels of worker engagement demonstrated that the use of this technology would be beneficial to other plants in the meat sector. There were some learning outcomes that can be applied to future projects and this project created an opportunity to scope an industry benchmark for manual handling risk scores.

Following the assessment phase eight “Very High Risk” tasks were actioned with Risk Controls across five areas. A sixth area, Load Out Chiller and Frozen Palletising, was not assessed in Stage 1 as the decision has been made that these tasks will be significantly automated with the creation of an automated picking system and robotic devices. Assessments will be undertaken after the refurbishment in the future Stage 2 of the project.

However, challenges will remain when loading containers both in the load out docking bay and containers already located outside where boxes are manually packed into containers from pallets.
Each task’s risk control was evaluated against pre-control risk scores to determine their effectiveness in risk reduction.

The data was able to be used to develop risk controls around step heights based on outcomes from different workers without the need to put workers through greater risk from trialling the changes over time. This both reduced the risk for workers and saved production times.

Some high risks were identified that could not be tested without infrastructure changes and these are highlighted in the Significan Findings Report (Appendix 1). Recommendations were made based on the assessment results and action for the next stage is to test these.

Maintenance and other aspects of the plant contributed to some higher risk scores. The outcomes are identified in the findings.

An evaluation of potential risk controls included Strong Arm Straps and trolley handles was undertaken, and significant risk reductions were identified. The straps are not yet implemented in the plant. However, the evaluation can be used to cost justify expenditure in the straps or an alternative such as a metal rod.

6.0 Discussion

The program was successful in rapidly identifying manual handling risks that resulted identified some serious manual task risks, implementing some risk controls and reducing the company wide risk profile. These have been referred to the ergonomic team for assessment and comment and will form part of the ongoing report and review.

It was agreed that the methodology of engaging workers, having supervisors step-in to minimise production disruption worked well.

The process has been valuable in understanding the benefits of using data analysis to make informed decisions and to overcome perceived barriers to improvement.

The questions that remain are:

1. Who is going to perform ongoing assessment of work tasks to monitor the risk controls?
2. When will validation be undertaken?
3. What is the reduction in injury claims costs within the identified sectors over the next two years?

Each of these are management questions now that the project has identified reductions and further areas of investigation.

7.0 Conclusions / Recommendations

The engagement has been successful in reducing risk in several areas, establishing priority for further risk controls, identifying investments required and changes to maintenance schedules.

Excitingly the engagement of the workers in the process has seen them identify low-cost risk controls and become active in making suggestions to management.

The naming of work tasks using the industry codes will provide future ease of task understanding for AMPC.

8.0 Bibliography

Codes of Practice.

Publisher: WorkSafe Australia

Publication name: Model Code of Practice: Hazardous manual tasks

Publication Date: 20 Mar 2020

Publication type: Model Codes of Practice

.

9.0 Appendices

9.1 Appendix 1: Significant Findings and Recommendations

1. Multi Vac Area

The problem identified was that assessments of different workers had different risk scores. The Contributing Factors report identified that the main cause was differences in bend and reach forward. Bend Forward and Side Bend Load Handled both had contributing risk scores of 150 bring the task into the very high risk category.

Observations by assessors identified that these differences were based on the height of the workers at the work bench. (See Reports for Multi Vac for details).

Since the bench height is not adjustable, the decision was made to implement a physical step as a risk control to replace the hazard.

Analysis of different step heights by undertaking additional risk assessments of the control and the following table was developed for step height to match employee height. Essentially match the step height with the person's height based on the assessments.

This is an example of not just using equipment because it is there but use of the right piece of equipment for that person's height in this example.

The recommended considerations include:

Persons Height	Step Height
Less than 160cm	30cm step
160-170cm height	20cm step
170-185cm height	10cm step – (currently none available)
Greater than 185cm	Floor ONLY

1. Steps of the different heights for the different height workers made available for use not compulsory.
2. Step standing area needs to be sufficient for foot movement and placing in the event of mis-stepping/overbalancing.
3. The lower steps appear sufficient. The higher step needs replacing with a platform size about the same or greater than the lower steps.

Wearable Assessment Technology can help evaluate equipment purchases. Do the same task with and without the equipment or different types of equipment to evaluate if using such equipment results in a lower manual task risk score for that task. This aids decision making with objective data regarding choice of fit for purpose equipment for productivity and risk minimisation for justification of expenditure aligned to effective risk management.

Fig 1. Lower, larger area step

Fig 2. Higher step, requires more area

Fig 3. Step area sufficient for worker.

Fig 4. Step area too small to allow foot movement to minimize slip and fall risk.

NB: For detailed assessment data refer to the Stanbroke Risk Assessment Details Report (August 2023) not included in this package or online at the Stanbroke Portal.

2. Mackie Bins and Castors

The analysis of the job role of “Floor Boy” tasks identified high degree of bend forward and exertion from a worker using Mackie Bins. Assessments were taken with a variety of bins and the load was significantly less on well maintained bins than those where castors were failing.

The hard plastic wheels deteriorate and affect the smoothness of travel over the floor and therefore force required - see photos and ideas around castor types. Essentially an incidental finding but created improved maintenance.

Poorly maintained casters that lead to increased load, unbalanced load and higher risk.

Optional caster style that is more resilient. Lower maintenance and less load.

3. Mackie Bins and Handles

The 16th Feb 2023 manual task risk assessment provided objective information which influenced all parties to look into other options on how to push and pull the bins. Using a handle to pull the bin results in significantly lower loads on the low back.

- Assessment 16th Feb 2023 - No Handle - Floor Boy in Boning Room - 1389 Risk score and 1048.5 is from the low back
- Assessment 29th June 2023 - Handle - Floor Boy in Boning Room - 670.5 Risk score and 530 is from the low back
- A near 50% reduction in low back risk score by using a handle

Fig 1 & 2. Pre Risk Control: Mackie bins used with no handles leading to higher risk for back injury.

Fig 3 & 4. Risk Control: Bin handles fitted to increase height and reduce forward bend.

Fig 5 & 6. Post risk control: Handles fitted. Significant reduction in forward bend and risk to back injury.

4. Mackie Bins and “Strong Arm” Strap

During a run to empty all the red tubs on the floor the “Floor Boy” repeatedly bends his back and reaches to gather and then empty the tubs into the Mackie bin.

A risk control was investigated and tested to reduce the significant and repeated elements of trunk/low back flexion with combined twist and side bend. A device, such as a “Strong Arm Strap”, can be used. Its benefit was evaluated.

Fig 1 & 2. Pre Risk Control Assessment 17th May 2023 - No Strong Arm Strap - Risk Score of 1137 and the low back contributes 890 to the total risk score.

Fig 3 & 4. Post Risk Control Assessment 17th May 2023 - Using a Strong Arm Strap - Risk Score 657.5 and the low back contributes 505 to the total risk score.

The conclusion is that using a piece of equipment such as the Strong Arm Strap reduced the demands on the low back by 43%.

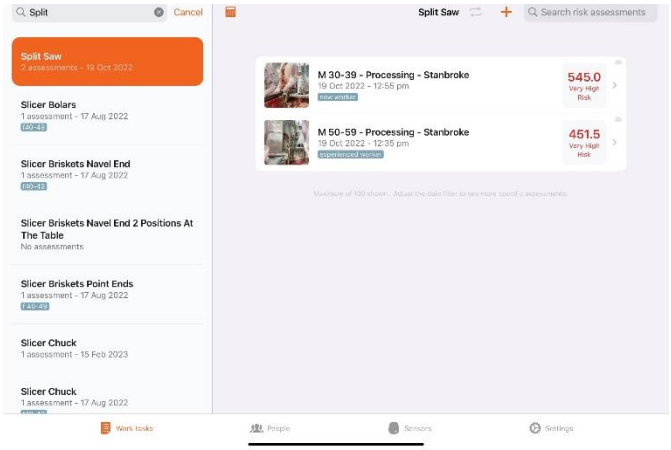
5. Experienced worker vs New worker doing the same task.

Feedback from a worker was that after a shift they were experiencing soreness in the top of their shoulder and lower back was a bit uncomfortable. The work task they were undertaking was operating Split Saw.

Engagement with other, more experienced workers, found that they did not have this soreness.

The decision was made to test Experienced Workers and New Workers to see whether there were any significant differences in work practices and to identify any possible risk controls, include administrative risk controls.

5.1 Split Saw



Experienced Worker Risk Score of 451.5 **vs** **New Worker Risk Score of 545**

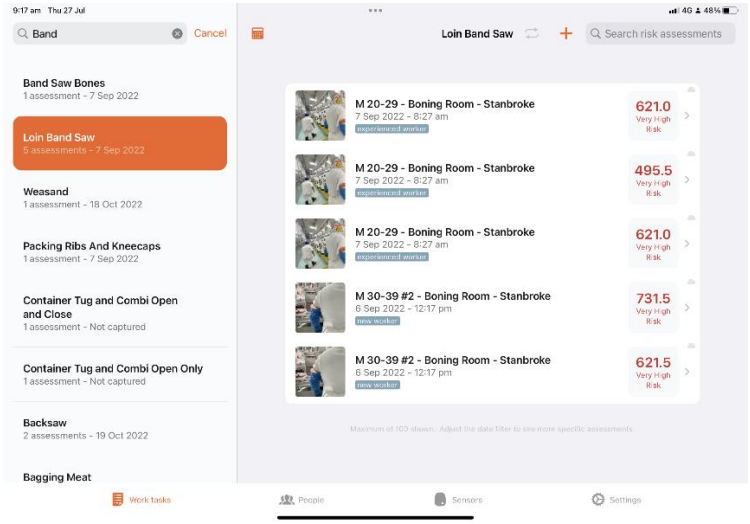
Contributing Factors:	Neck	59	Contributing Factors:	Neck	80
	Shoulders	115		Shoulders	115
	Back	277.5		Back	350

The experienced worker used more arm action in undertaking the task than the new worker who used back muscles to manage the load.

This was a great tool for training and supervising the newer worker in the task - often in neck and low back extension too frequently causing the upper shoulders/trapezius and Low back to be over loaded. The newer worker was leaning back to lift the saw instead of using the mechanism to assist his lift and then lower.

5.2 Loin Band Saw

Further analysis of Experienced and New Workers in other areas of the plant identified similar variations in risk. To test this hypothesis, workers performing a task at a workstation that were of similar height, used similar weighted product and the equipment was not modified were tested.



Experienced Worker Risk Score of 495.5 vs New Worker Risk Score of 621.5

Contributing Factors:	Neck	56	Contributing Factors:	Neck	50
	Shoulders	131		Shoulders	135
	Back	440		Back	540

The newer worker held greater ranges of low back flexion that were repeated and sustained in order to watch the loin band saw physically closer as it was passing through the meat. The experienced worker was able to maintain a more erect position as they had confidence in their work.

The proposed risk control is to allow new workers more training with the Band Saw under supervision of an experienced worker or to consider the use of Virtual Reality training techniques to enable new workers to build confidence without interruption to production.

New workers can be tested using the technology at any time and the experienced worker videos can be examples of best practice technique.

6. Raised Meat Trolley (transport) Options

A potential risk control recommended is that alternative meat transport trolleys be used rather than the Mackie Bins throughout all areas such as between workstations.

The use of Mackie Bins requires workers to load into and unload out of low bins that leads to increased bending and carrying load at lower heights or product being “dropped” into bins.

Alternative meat transport trolleys are available for purchase. They are raised to allow the loads to be accessible from a higher position and minimize repetitive bending and reaching to the bottom of the bins.

The current practice involves repetitive flexion, extension and twisting of the lower back particularly when reaching into the lower section of the bins. Often the bins are only one quarter to one half full, resulting in reaching into the bottom of the bins repetitively.

An example of a potential solution using a raised floor in the trolley below:

7. Slicing Table (Re) Design

Engineering modifications (re-design) of the slicing tables in the boning room is proposed to the leadership team for consideration. The existing angled design of the tables is reported to assist with pushing the offcuts onto the conveyor. However, they obstruct the operator reaching for cuts that slide down the boning shelves, resulting in overstretching/reaching whilst twisting and side bending to drag large cuts of meat onto the slicing table. This in turn contributes significantly to the overall high-risk scores in these areas.

By removing the angled section and making the table straight, and/or turning the tables 90 degrees to be running along the same direction as the boning shelves (and removing the angles), it is suggested that the reach distance to access cuts of meat would reduce and result in overall reduction in trunk twisting and side bending. Thus, reducing the lower back injury risk.

Diagram 1: Current table design

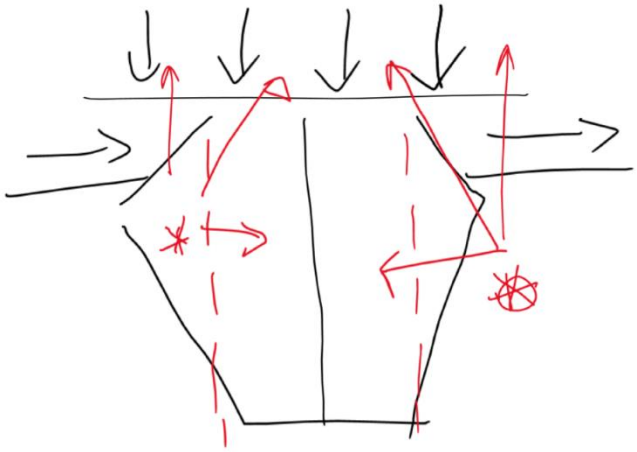


Diagram 2. Rough sketch of slicing table

This is only one option, and the team at Stanbroke has commenced investigation into a prototype modification for testing.

8. Task Rotation Strategy

As discussed in previous reports, task rotation should be considered as a long-term musculoskeletal risk reduction strategy, allowing for regular rotation between positions in one area/job (e.g. positions at a slicing table, or on the Multivac line), and between areas/jobs (e.g. between slicing tables or Multivac lines).

Task rotation between tasks that require different muscle groups reduces physical fatigue and increases mental stimulation leading to a possible increase in productivity as well as reduced claims.

Results from other meat plants strongly indicate that the return on investment of implementing this over a period of time would be realized in the reduction of injuries and workers compensation costs within the areas assessed. This has also been found to improve staff and job satisfaction and morale along with a reduction in psychosocial hazards in the workplace.

The cost associated with task rotation is an increase in the training of workers. The increased training can be offset by greater flexibility of workers in times of staff shortages.

9.2 Appendix 2: Action Plan Stage 2

Ongoing monitoring of risk

1. Background

Following the successful PIP project Stage 1, a number of Very High-Risk Tasks were identified and some risk controls recommended for eight of the tasks. Further risk controls were identified by the ergonomist and the workers at Stanbroke that have not yet been implemented.

To measure the effectiveness of the risk controls, the controls need to be measured regularly.

Stanbroke has been equipped with a set of wearable sensors and a license to use the Etiscope (JAS) applications for a period of 12 months.

2. Outstanding Task Assessments

Within the Significant Findings Report several risk controls were suggested. Following the implementation of the controls they should be monitored for effectiveness.

These include Task Rotation, Alternative Meat Trolleys and the use of Strong Arm Straps.

Following the re-engineering of the Slicing Tables, a series of assessments should be performed to verify the control.

Modifications to the plant are underway and those areas should be retested within the Load Out Chiller and Frozen Palletising work tasks.

3. Action at Stanbroke

We recommend that during Stage 2 that Stanbroke supervisors be trained in the use of the wearable technology to undertake task risk control reviews on a quarterly basis or that they engage a service provider to undertake the task manual handling risk assessments on their behalf.

There is no cost to Stanbroke for the ongoing use of the technology until June 30, 2024.

Training in the use of the technology can be performed on site or by video training at a cost of $2,200 plus travel and accommodation.

4. Future Action for AMPC and the industry

During the project it became clear that many of the tasks performed were like those in other red meat plants. There were variations based on equipment used, levels of automation, techniques and product processed.

It became clear that there is an opportunity to develop an industry benchmark by which other plants may measure themselves to ascertain levels of worker safety.

Within the industry there are common tasks identified in the Mintrack training system that could be used for job and task standardisation.

By having several organisations measure their risk from manual handling tasks using the Mintrack naming convention, they can ascertain whether they need to invest on better processes and risk controls for their business, or rather, where the priorities should focus.

There is software available to assisting this process from Staunch Technologies (JobFit) that has been successfully used in the mining sector for similar purposes that has resulted in significant reductions to injury risk by sharing anonymised data of risks for a task.

To undertake a project of this nature, AMPC would need to encourage at least 3 and ideally 5 red meat plants to undergo a similar process. The anonymous data could be averaged and made available to members to assess their safety standards for WMSD against the database.

This process has worked successfully in coal mining operations and resulted in very high reductions in workplace risk (up to 65%).

We recommend that AMPC investigate further the cost, value and process involved in achieving an industry benchmark,.

- END -