MUSCULOSKELETAL DISORDERS IN THE NEW ZEALAND LOG SAWMILLING INDUSTRY

Marion Edwin
Optimise Limited, PO Box 38076, Christchurch, New Zealand
Marion.OT.Erg@xtra.co.nz

David Tappin
Centre for Human Factors and Ergonomics, Albany, Auckland, New Zealand
David.Tappin@cohfe.co.nz

Tim Bentley
Department of Management and International Business, Massey University Campus, Albany, Auckland, New Zealand
T.A.Bentley@massey.ac.nz

ABSTRACT
The incidence and nature of musculoskeletal disorders (MSD) within the NZ log sawmilling industry are not well defined. No single body collates injury and incident data to a sufficiently detailed level, and there is little reported New Zealand research that has sought to identify key risk factors for wood processing work. Anecdotal reports from industry do, however, refer to musculoskeletal disorders, lacerations and wood dust as significant problems. This is further illustrated through a summary of ACC claims data (Laurs, 2000).

Current literature reveals that the contributing factors for MSD are wide ranging (Code of Practice for Manual Handling, 2001). This fact is reflected in a recent literature review (Karsh et al, 2001) that identified that the interventions most successful in reducing work-related musculoskeletal disorders were those with multiple component interventions.

A survey of one year’s accident register data from 37 sawmills was undertaken. The survey identified various table or chain tasks (pulling and stacking sawn timber) as having the highest incidence of reported MSD injuries.

A multiple-factor assessment method was used to analyse the risks associated with musculoskeletal injuries at the sorting tables of four New Zealand sawmills. Potential interventions arising from these work system assessments were developed and presented to the health and safety committee at each sawmill. Their feasibility was then evaluated by mill staff, with additional input from the project ergonomists. Interventions are being put in place independently by each mill as time and resources allow, and these will be formally evaluated in the next 18 months.

INTRODUCTION
In the year ended March 2001, 19.3 million cubic metres of wood is estimated to have been harvested from plantation and natural New Zealand forests (NZ Forest Industry, 2002). Approximately 20% of the annual harvest is processed by log sawmills into sawn lumber. More people are engaged in sawmills than any other forest and wood processing sector, and constitute around one third of the total workforce of 23,570 (MAF, 2001).

This sits alongside ACC injury data from the four year period 1994/1995 to 1998/1999 (Laurs, 2000) that places log sawmilling as the wood processing sector with the highest level of new claims (42%).
Of these claims, most were soft tissue injuries: strain/sprain (51%), along with back injuries (17%), laceration (14%). The primary causes of injury in the wood products sector were listed as ‘work property or characteristics’ (more than one third), ‘lifting/carrying/strain’ (approximately one sixth), with ‘loss of balance/personal control’, and ‘other or unclear cause’ also frequently reported.

Possible reasons for the high frequency of injury claims reported to ACC for sawmilling tasks include the fact that it has the largest workforce, and that more of the workforce are involved in timber handling compared with other processing sectors where there is greater mechanisation.

Similar data from the British Columbia Workers’ Compensation Board (1999) lists overexertion claims in sawmills as causing 27% of injuries and repetitive motion at 5%. Overexertion claims were 18% of the total cost of time-loss claims in sawmills. Mill labourers and labourer material handlers comprised 51% of the workforce affected.

This study aimed to determine the prevalence of musculoskeletal problems among log sawmilling workers; to identify high risk log sawmilling tasks; and to design and evaluate measures to prevent or alleviate musculoskeletal problems in this work area. Intended study outcomes were:

- the reduction of risk factors for MSD in the log sawmilling industry
- increased awareness of the operations and contributory factors associated with the risk of MSD in this industry
- and improved understanding and potential adaptation of the measures which reduce the risk of such injuries in log sawmilling.

**ACCIDENT REGISTER SURVEY**

**Aims**

From a sample of participating sawmills:

1. Identify which sawmilling tasks are incurring the most reported injuries, and the nature of these injuries.
2. Identify which sawmilling tasks health & safety staff in these mills see as those most likely to lead to injury.

**Method**

An Accident Register Survey methodology was adapted from one previously used by Moore, Tappin, Vitalis (personal communication). Accident Register data requested included: injury date, department, job title, task, injury type, and body part affected for all injuries occurring between 1 September 2000 and 31 August 2001. The person responsible for health and safety at each mill was also asked to provide their ‘best guesses’ for the top five tasks most likely to cause MSD in sawmills.

In New Zealand there are approximately 340 sawmills operating that employ more than five people. Some 83% of 2000 production was from 42 sites and the combined production volume of 172 mills was less than 0.5% (MAF, 2001). The decision was made to concentrate on mills producing more than 5,000 cubic metres annually as this was likely to involve the largest percentage of the workforce in the survey. Of the 53 mills contacted, 50 agreed to participate in the survey.

**Results**

37 mills returned accident register data for the 12 month period. Based on 2000 production data these mills represent approximately 26% of the New Zealand sawmill workforce and 45% of the production volume (MAF, 2001).
Log sawmilling tasks defined as ‘sawmilling’ were identified, with reference to the Australia and New Zealand Standard Industrial Classification data as used by Statistics New Zealand. Job titles and injury types were also categorised to provide a level of consistency across the data.

The total number of reported MSD’s was 505. Of these back injuries accounted for 37%, wrist and hand injuries 15.2%, arm injuries at 10.3%, shoulder injuries 9.9%, leg injuries at 8.5%, and neck and head injuries at 6.5%. It was noted that whilst 37% of injuries were to the back, a total of 35.4% of injuries occurred to the upper extremity, indicating a significant prevalence of MSD’s in this body area.

The highest number of injuries was to millhands at 30%, followed by tablehands at 26%, and sawyers at 23%.

Data from industry personnel on ‘best guesses’ for the five tasks most likely to lead to MSD’s clearly highlighted timber handling associated with table operations as the most at-risk tasks. This includes: pulling timber, packeting, sorting, stacking, filleting, defilleting and grading.

**Limitations**
- The nature of the sample and its size may have lead to it being skewed.
- The extent of bias in the ‘best guesses’ and data accuracy is unknown.
- There was some difficulty consistently determining job classifications/tasks, and job title or work role due to differing reporting systems and classifications in use.

**Conclusions**
The tasks most likely to lead to MSD in log sawmills are those associated with timber handling on green or dry table/chain tasks. A second group of high risk tasks concerns filleting/defilleting, sawyers, saw doctors and maintenance staff tasks. The decision was made to focus on timber handling at both green and dry tables.

**WORK SYSTEM ASSESSMENTS**

**Aim**
The aim of this study was to determine the manual handling risk factors associated with the tasks at the green or dry chain, such that appropriate control measures could be identified and put in place.

**Methods**
Access to two North Island and two South Island mills was granted for the study. Two mills had dry chains, one a green (long) chain, and another a green round table design. A consideration in approaching mills was the interest shown in the project by key personnel, and therefore the likelihood of the mill to consider putting in place the interventions identified in the course of this research.

Both researchers made initial exploratory visits to each sawmill. These visits helped to gain staff support, improved understanding of the tasks, and allowed planning of the assessment methodology. Formal consent was gained from company management and individual workers before commencement of the on-site assessment work.

Specific assessment protocols were followed for:
- Archival data collection – production, employment, injury and sickness, induction and training, remuneration, maintenance records, proposed changes.
- Semi-structured interviews – workers, leading hands, management.
- Observation – task verification, participating in the task, video/photos.
- Collection of worker schedules and timber handled statistics.
- Force measurement (to commence horizontal movement of boards).
- Rapid Entire Body Assessment (REBA) of aspects of pulling/stacking tasks.
- Borg Rating of Perceived Exertion (RPE) Scale for parts of one work period.
- Discomfort rating scale for parts of one work period (modified Nordic Questionnaire format).
- Anthropometric data collection and selected dimensional analysis.
- Lifting strength (South Island mills only).
- Manual Handling Code Risk Score(s).
- Recording and measurement of personal protective equipment.

On site data was collected over the course of one-two days at each mill, involving tablehands (31), supervisors, engineers, health and safety and management personnel.

**Results**

Data was collated from all the above sources at each mill, with some key findings including:

- Horizontal distances between timber ends and the packets they are placed on varied between 860 – 3300 mm.
- Table heights varied from 600-850mm (both within and between mills)
- Completed packet heights were up to 400mm above the height of the table (from where the timber is transferred).
- Wrist/elbow discomfort (71% in last 12 months) and lower back (48% in last 12 months) discomfort were the most commonly reported problems (all four mills).
- The chain design with lowest force to get boards moving horizontally off the table was a roller chain (average of 3.4 kg required to move 240x45mmx6.0m dry boards), and the highest force required was on a round table with a timber base (average of 27.8 kg required to move 200x25mmx4.8m green boards).
- Wearing of PPE is consistent for footwear, but somewhat inconsistent with glove wear, hearing protection, eye protection and the wearing of protective aprons.
- Difficult tasks were identified as including: pushing out full packets, working with large boards, working very quickly (particularly with small dimension boards).
- Maintenance issues (chain and trolley) were felt by staff to be key in making the work tasks easier to manage.

**Limitations**

- Only four mills were involved in the study.
- The assessment period was relatively brief (between 8-14 hours at each mill).
- Unknown affect on work practices / responses due to our presence on site (prior visits and documentation sent through to each mill was intended to minimise this).
- Between-mill comparison was limited by differences in work systems.

**Conclusions**

The contributory factors identified via assessment formed the basis of suggested interventions. These varied for each mill, depending on their specific findings. The main groups of interventions included:

- Workspace geometry changes – ensuring that working heights, transfer distances, legspace are matched to the workforce and tasks.
• Workflow management – task rotations, matching workforce to workload, giving consideration to workload associated with different timber sizes, set guidelines.
• Task technique training – providing information and training on the full range of work scenarios staff will face, and the range of techniques to perform them.
• Table design – optimising timber position on the table, ensuring regular maintenance is carried out, reducing friction and assisting timber movement.
• Glove design – achieving the best balance between performance and protection through good fit for all hand sizes, availability and replacement, task specific, etc.

FEASIBILITY EVALUATIONS
A list of interventions, prioritised by their likely effect on reducing MSD risk, was presented to the relevant personnel at each mill. The rationale behind each of them was also presented. Discussion on the feasibility of the suggested interventions was conducted. Follow up meetings and further contact with the mills took place to assist with answering any questions and providing further information.

The four sawmills have subsequently acted on those interventions thought most relevant to them. Implementation is taking place over time to suit their specific operational situations. Follow-up assessments of these interventions will be conducted over time. The main findings from this study are being made available to the sawmilling industry.

References


Workers Compensation Board of British Columbia (1999). Forest Products Manufacturing: focus report on preventing injuries to workers.