Using participatory ergonomics to decrease injury costs and increase production in New South Wales quarries

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1. Introduction & Background

The “don’t make yourself bloody useless” participative ergonomics (PE) Program was developed by the New South Wales (NSW) Mine Safety Advisory Council and NSW Trade & Investment, Mine Safety to tackle the issue of the high number of musculoskeletal disorders within the NSW mining and extractives industry. Participatory ergonomics has been identified as the best approach to reducing hazardous manual tasks and decreasing the incidence of musculoskeletal disorders (Morken, et al., 2002) (Maciel, 1998) (Vink, 2006).

The concept of participatory ergonomics provided a perfect opportunity for the department to tackle the issues of hazardous manual tasks within the mining sector. The department developed a training package to assist mines and quarries to implement a participatory ergonomics program at the grass roots level that engaged workers as the task experts. The program equipped workers with the knowledge and tools to identify and control hazardous manual tasks and provided them with guidance to assist them to implement these controls in the workplace.

Previous participatory ergonomics programs have typically only involved a small number of workers in a project team with limited site level engagement. Manager and worker attitudes to manual tasks and behaviour have been identified as a barrier to successful implementation of participative ergonomics in the workplace (Haslam, 2002). To improve worker engagement and address sustainability, the department also included a communication strategy which comprised of videos and posters encouraging workers to “Speak up, don’t make yourself bloody useless”. The aim of the communication strategy was to provide an emotional hook so that mine and quarry workers would remember the program and be motivated to act (Gross, et al., 2010).

2. Method: Quarry sector success

The “don’t make yourself bloody useless” participatory ergonomics program was completed at a number of New South Wales quarries during the last twelve months. The challenge for the department was to make the concept of participatory ergonomics workable for not only large quarry operations but also the small family owned quarries. A trial model, which was originally implemented with the assistance of the Institute of Quarrying in the central west and north coast regions of NSW, involved representatives from different quarries and companies meeting over a period of six sessions to address the common issues of hazardous manual tasks.

The participants, as a part of the sessions, were required to undertake homework activities within their workplace. This included consulting and championing with their work colleagues the risk factors associated with hazardous manual tasks, developing and implementing a communication strategy, and completing a risk assessment on identified hazardous manual tasks, including the implementation of a control. The inclusive model format challenges all participating quarries to implement at least one initiative.

3. Results: Specific Quarry Initiatives

Most of the quarries that took part in the program implemented an initiative to control at least one hazardous manual task. Some of these controls have reduced exposure to the risks associated with hazardous manual task whilst also increasing production. In some cases task duration was reduced by more than six to eight hours. Some examples of the initiatives include:

3.1 HyTec Yarrabee- Liner Change Cone Crusher.
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**2015 IEA Case Study Abstract**

**Issue:** A cone crusher liner change out is a frustrating and time consuming task which can take more than a day to complete. The participants at Yarrabee undertook the challenging task of eliminating the safety risks involved in changing the liners in a MVP380X cone crusher. One of the sub tasks required in the liner change out is the loosening of a nut by smashing a hitting spanner with a 28lb sledgehammer. Sometimes the nut will loosen with two hits, but on most occasions it can take up to two hours of hitting to loosen. In addition the person swinging the sledgehammer is required to stand on the rim of the crusher (about 15cm wide), which is positioned about 1.5 metres above a platform which is located another 3 metres above the ground.

**Solution:** The participants utilising the PErforM (Burgess- Limerick et al, 2007) risk assessment tool identified the liner change out as high risk in exertion, posture and repetition and moderate risk for vibration and duration. Participants in consultation with their workmates and respective experts have designed and implemented a platform to prevent falls and re-engineered the cone nut so a power tool can be used instead of a sledgehammer. In addition, the quarry is also in the process of buying a hydraulic torque multiplier to assist with the removal of a number of mantle bolts. 

**Benefit of the initiative:** The platform has decreased the risk of falling as well as provided a level work surface to undertake hot work. In addition, the re-engineer of the cone nut has also eliminated the hazardous manual tasks and has decreased the time taken to undertaken the maintenance activity. The work undertaken by this quarry, particularly around the new nut configuration has the potential for an Australian wide impact as a number of quarries around Australia have the same or similar cone crusher.

**Figure 1. Standing on the rim of the crusher**

**Figure 2. The new platform**

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**3.2 West Limes Parkes- Augur Unblocking System**

**Issue:** Westlime Parkes in western New South Wales is a family owned company that produces high quality lime and road base product. The company had difficulty when their augur became blocked or chocked from small mill balls of lime due to increased moisture in the product. Unblocking the augur would involve working at heights with an elevated work platform. The operator would be required to use a heavy hose to unblock the augur, or if this was unsuccessful use a needle gun that would require exposure to vibration for long periods of time

**Solution:** Westlime installed a reverse switch on the augur control board. When a blockage occurs, the switch is placed in reverse for about 5 seconds, and then placed back in the forward motion with a 90% success rate of the blockage being cleared. If the augur remains blocked an air activated door at the bottom of the augur is opened and the augur is then run in reverse until emptied. This clears the blockage.

**Benefit of the initiative:** It has eliminated the manual task and risk from working at heights. Furthermore there has been a significant cost saving due to less downtime of the augur. The previous method of clearing the augur would take about four to six hours to clear depending on the size of the blockage.

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**3.3 Metromix Marrangaroo- Clearing out the C9 tail drum roller**

**Issue:** A build-up of material in the guard of the C9 tail drum roller. An individual is required to remove the guard bolts and guard, full of material and shovel the material from under the tail drum. This task can take about 1 hour and shuts down production at the quarry. If the quarry has a period of wet weather this blockage can occur a couple of times per week.

**Solution:** The design and development of a shute that attaches to the guard that directs fines
material to the back of the tail drum and onto the ground. The material then can be removed by a bobcat or skid steer. The shute has a small opening for the fines to escape but does not allow an operator access to the equipment.

**Benefit of the Initiative:** The shute was developed and made by an apprentice and cost the quarry about $300 to install. The shute has now eliminated the hazardous manual task, in addition it has increased production for the quarry as the screening plant does not have to be shut down due to buildup of material.

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**References**


