
CLEANCUT CONSTRUCTION PRODUCTS Pty Ltd.

13/03/2019

Health & Safety Innovative Improvement Report

“Cleancut Construction Products Self-Driven Large Walk Behind Concrete Road Saws”

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EXECUTIVE SUMMARY

BACKGROUND

Due to the nature of their operation, Concrete Road Saws are a substantial piece of portable plant. The combination of the design and construction of current machines on the market, gross weight, and operating parameters limit their easy manoeuvrability. Consequently there is an increased reliance on concrete saw operators to use their physical strength to compensate for this lack of manoeuvrability to ensure the safe and effective operation of the saw. The necessity for concrete saw operators to lift and lower this machinery in operation mode whilst in many situations twisting or turning in the same action can place excessive force on the operator's arms, legs and lower back. These repetitive stresses and forces can cause operators to sustain acute or cumulative injuries, the extent of which can be influenced by a range of human factor variables such as variations in operator age, physical size and agility.

The innovative design and construction of the "Cleancut" Road Saw product range has brought about a significant reduction in manual handling that will lead to an improved level of safety in concrete saw operation. A claim that is substantiated by objective data embodied in the Manual Handling Risk Assessment Report prepared by an independent and appropriately qualified Workplace Health and Safety Professional. A summary of the aforementioned data is provided in this document at Tables 4 and 5 and a full copy of the report is also attached.

SCOPE OF INNOVATION

The benefits of the Cleancut Road Saw product range do not end here. In 2015, Cleancut Construction Products Pty Ltd ("Cleancut") received an "Accelerated Commercialisation Grant" from the Australian Federal Government in recognition of its innovative design and moreover its capacity to improve safety and minimize environmental risks associated with concrete saw operation. "Cleancut's" ability to think outside the box has led to the following additional improvements:

The static centre of gravity of the Cleancut saw product range which greatly reduces operator manual handling loads and ensures these lesser loads are maintained at all times throughout all modes of operation of the saw.

High quality hydraulic rather than belt driven operation that has substantially reduced concrete saw vibration and minimized the resultant adverse impact on saw operators;

Advanced and highly effective slurry clean-up technology that capitalises on water recycling to limit slurry and airborne pollutants that are a byproduct of existing concrete saw operation.

Cleancut Road Saws will be entirely manufactured in Brisbane using best quality German and American Diesel/Hydraulic pumps and motors and Cleancut has a number of patents, either pending or granted in many countries around the world to protect its cutting-edge technology.

"Cleancut's" competitive price structure coupled with a product range capability to improve workplace safety presents as a viable alternative to existing concrete saws.



PART 1 - WORKPLACE SAFETY FACTORS

1.1 Manual Handling Issues

Lifting & Turning

Large concrete saws must be lifted using handles at the back of the saw then realigned with a new cut or cut line using a twisting motion. This turning procedure requires the operator to lift, in most cases, between 90 kg and 135 kg when the blade is raised to allow turning.

Lift Weight

The weight required to be lifted varies depending on the model of saw used. Due to the design of existing saws, the Centre of Gravity (C of G) of the saw moves back toward the operator when the blade is lifted out of the concrete. These saws are light to lift when the blade is lowered which often causes slipping but as previously stated above they become extremely heavy when the blade is lifted to allow turning.

Vibration

Vibration issues are a recognised safety concern. Long term injury to hands and arms can be caused by excessive machinery vibration.

Most concrete saws currently on the market use belts to drive their blade. This prevents the use of factory vibration mounts on their diesel power units as the installation of anti-vibration mounts would result in excessive belt failure. The vibration of the diesel motor is, therefore, transmitted directly to the operator as well as to the blade causing long term injury as well as increased blade wear and slower cutting.

Belts are used on existing saws as a cost saving exercise and the resultant vibration to the operator is treated as a necessary consequence.

Manual Handling Risk Assessment

The independently prepared Manual Handling Risk Assessment indicated that the use of existing Concrete Road Saws constituted an "extreme risk". (Refer to tables 4 & 5).

The author of the report stated "*While I understood that operating a road saw could be very strenuous, particularly when lifting and turning the machine, I was quite surprised by the results. I looked at a number of other road saws for comparison, and these machines required the operator to bend and lift up to and well beyond 100kg (56.9 – 134.4kg).*"

Due to the design of all existing Concrete Road Saws, the operator's lifting handles lower as the blade is raised. The handles are directly attached. This means that as the blade is raised for turning, the saw not only becomes extremely heavy but also the position of the handles lower forcing the operator to stoop, lift and twist to turn the machine. This operation is extremely arduous and well outside what would normally be acceptable manual handling practice.

This Manual Handling Risk Assessment is attached as a separate document for your information.

RESULTS FROM THE MANUAL HANDLING RISK ASSESSMENT

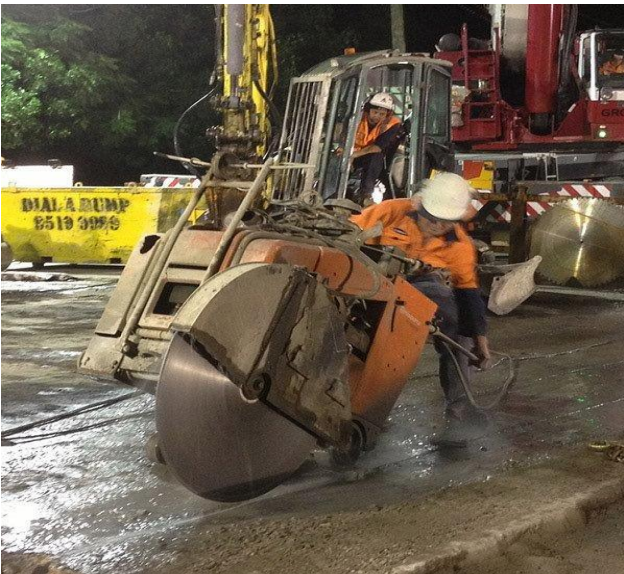
Table 4 - "CLEANCUT" 7500 ROAD SAW

	Exertion	Exposure	Posture	Movement	Vibration	Acute Injury Risk	Cumulative Injury Risk
Back	4	4	2	2	0	No	Moderate
Hand & Arms	4	4	2	2	1	No	Moderate
Shoulders	4	4	2	2	0	No	Moderate
Legs	2	4	2	2	0	No	Moderate

Table 5 – OTHER SELF-DRIVEN WALK BEHIND ROAD SAWS ASSESSED

	Exertion	Exposure	Posture	Movement	Vibration	Acute Injury Risk	Cumulative Injury Risk
Back	8	4	4	2	0	Yes	High
Hand & Arms	8	4	2	2	2	Yes	High
Shoulders	8	4	2	2	1	Yes	High
Legs	8	4	2	2	0	Yes	High

Fig 1: MANUAL HANDLING REPORT. FROM MANUAL HANDLING RISK ASSESSMENT REPORT, 12TH FEBRUARY 2018.



The handles lower and the weight is transferred to the rear of the saw as the blade is raised on current model Road Saws.

1.2 Manual Handling Solutions

What is the solution to the manual handling issue? How was it determined and eliminated on the “Cleancut” saw?

Lifting, Turning and Weight

Bob Irvine owned and operated a concrete cutting business in Queensland for 30 years and has patents pending in USA, Europe, South Korea and Australia that address this manual handling issue. A patented and simple mechanism has been developed that means that the Centre of Gravity of the saw moves approximately vertically when the blade is lifted. This means that the lifting weight at the handles of the “Cleancut” saw, during the turning operation remains approximately the same and does not change significantly as the blade is lifted. The result of this is that the operator’s lift weight does not vary and can therefore be controlled. Trials and feedback have indicated that an operator’s lift weight of between 35 kg and 40 kg is comfortable, so this is where we set the lift weight in the factory. It could be made lighter if required but this would result in less stability.

Due to its design advantage, the handles on the “Cleancut” saw remain level at all times and do not lower towards the ground when the blade is raised as is the case with all other similar saws.



The patented Lifting Mechanism on the Cleancut Road Saw enables the Centre of Gravity of the saw moves approximately vertically when the blade is lifted and ensures the position of the handles and the lifting weight remain in the same when the blade is raised and lowered.

Vibration

The “Cleancut” Road Saw almost eliminates this problem by driving its blade hydraulically which allows the use of factory vibration mounts on the diesel motor. “Cleancut” considers the extra cost of the hydraulic blade drive system worth the vibration reduction advantages. Europe’s concrete cutting industry is adopting similar hydraulic blade drive technology which places it and “Cleancut” the forefront of this advance in product design.

Another significant advantage of the hydraulic blade drive is that the operator has the ability to change blade speed and gear while the saw is actually cutting. In other words, blade speed can be changed to maximise cutting speed and minimise blade wear.

PART 2 - ENVIRONMENTAL FACTORS

2.1. Airborne Exposure Risks

What are the airborne exposure issues for saws using existing technology?

Road saws produce dust when the blade is in operation. The level of dust produced depends on the type of material being cut and the amount of water used to cool the blade.

It is, unfortunately, common practice in the concrete cutting industry for operators using other manufacturers Road Saws to reduce the amount of water feed below the recommended 10L per minute during cutting to reduce clean-up time and cost. This results in significant dusting from the blade and real long-term health issues.

Whenever people inhale airborne dust at work, they are at risk of occupational disease. Year after year, both in developed and in developing countries, overexposure to dusts causes disease, temporary and permanent disabilities and deaths. Dusts in the workplace may also contaminate or reduce the quality of products, be the cause of fire and explosion, and damage the environment.

Unless its generation is prevented, or it is removed from the air, dust may move with ambient air and reach even persons who are remote from the source and whose exposure is unsuspected.

The risk of injury to the lungs is dependent on the following factors:

- Source of the dust
- Work area – open air or confined space
- Frequency and duration



“Dusting” caused by operators reducing water feed to the blade when using Road Saws currently on the market in an effort to reduce slurry clean-up.

2.2 Airborne Exposure Solution

How is Airborne Exposure minimized with the “Cleancut” saw?

Dusting and Silicosis are serious issues in the concrete cutting industry.

The Slurry Recycling Guard used on the “Cleancut” Saw was first developed in 2008 by “Cleancut” and effectively reuses water and slurry up to 5 times as blade coolant. This means that the water feed can be reduced to as low as 2 L/M with no dusting from the blade. The Cleancut Road Saw also has a flowmeter and water tap on the dashboard that allows the operator to regulate the amount of water required during cutting. This ensures there is no dusting during operation. Manufacturers of other saws on the market recommend up to 10 L/M of water feed to achieve this.

As mentioned earlier, to save on clean-up cost and time, current practice adopted by operators is to reduce water feed. This practice has the unintended consequence of creating a large amount of airborne dust. The “Cleancut” saw with its slurry recycling technology and flowmeter provides a method to address this serious problem while managing clean-up time and costs for the operators.

There is no need to reduce water feed and to minimise clean-up costs when using the “Cleancut” saw. The operators will have no incentive to create dust off the blade as the water feed and consequent clean-up cost is significantly reduced without dusting due to the saw’s in-built water recycling system.

The saw in the picture below is using about 5 L/M of water feed without any dusting. This could be reduced to 2 L/M at the operator’s discretion. If this were done with existing technology, large amounts of dust would be created with all the recognised hazards associated with dust exposure.



The Cleancut Slurry Recycling System and Flowmeter solves the “Dusting Issue.”

2.3 Slurry and Joint Clean Up

As previously mentioned, the “Cleancut” saw incorporates a patented Slurry Recycling Guard, the design of which enables the operator to reduce water feed to approximately 2 L/M in large road saws during cutting. Existing saws need about 10 L/M for dust free operation. The reduced water feed to the “Cleancut” saw results in a significantly reduced slurry line at the back of the saw after the saw has passed during the cutting operation.

The Slurry Recycling guard was a finalist in the Australian Innovation Challenge in 2011.

In addition to the Slurry Recycling Guard, the “Cleancut” saw has an industrial grade Vacuum Wand attached at the rear of the saw. This vacuum wand cleans this narrow slurry line automatically as the saw is cutting leaving the pavement with only a minimum amount of dry slurry. If required, the cut itself can then be water blasted and totally cleaned out by a second, smaller vacuum unit that can be attached to the standard wand. This secondary wand injects water under pressure to the base of the cut, that is then vacuumed up by the second wand leaving a clean cut for sealant application.

We expect that the process of cutting and total cleaning will be done by one operator in one single pass of the concrete saw.



Husqvarna R & D Team in Gothenburg reviewing the Cleancut Slurry Recycling Guard in Gothenburg, Sweden in 2012

2.4 Slips and Trips

The water required to be fed to the blade while cutting, when mixed with the concrete dust turns to “Slurry”. Large amounts of “slurry” create hazardous working conditions for the operator along with expensive clean-up costs for the contractor.

Slurry control and clean-up has been identified by the Industry as a major problem for many years. Due to the recognized hazards that slurry presents to concrete saw operators and the potential harm to the environment several manufacturers and owner operators have attempted to find innovative ways to minimise it. However all attempts to date have resulted in limited success.

As mentioned in the manual handling section, manufacturers have tried to control extremely heavy raised lifting weights by making the saws excessively light when they are fully lowered. However this causes the back wheels to slip when the blade is fully lowered in the cut. Operators adopt the practice of standing on the back of the saw or sitting or bouncing on the saw handles in an attempt to get the back wheels to grip. This potentially dangerous workplace practice is the operator’s response to offset current design limitations. In addition, operators will often use their body weight to slide saws in situations where there is excessive slurry build up or the weight of the saw or angle of the handles make the machine too heavy to lift. This practice not only creates a slip hazard for the operator but it’s not always possible i.e. on rough surfaces or at the start of a job when there is no slurry.

Slipping on ramps is another occupational health hazard for operators using other manufacturers Road Saws due to the lack of weight on the rear wheels.

The patented design of the Cleancut Road Saw has addressed all these slipping hazards by enabling all “Cleancut” machines to be fitted with 4-wheel drive. This feature ensures that all the weight of the saw is on the drive wheels which always prevents the saw from slipping.



Typical slurry build-up on job using existing technology.



Clean-up using the Cleancut Slurry Clean Up System.

CONCLUSION

Workplace safety is an important part of every job tender! Therefore contracts should be awarded to contractors that demonstrate a capacity to achieve a higher safety standard at a reasonable and competitive price.

STANDARD INNOVATIVE IMPROVEMENTS INCLUDED ON THE CLEAN CUT ROAD SAWS.

- Manual handling risks and associated issues with existing large walk behind road saws are extreme. The patented lifting mechanism on the “Cleancut” saw virtually eliminates this problem as well as allowing the saw to include the 4-wheel drive feature which prevents slipping especially when the saw is being loaded onto ramps etc.
- The patented “Cleancut” Slurry Clean Up System enables the saws to use approximately a quarter of the water needed by other machines on the market. The Slurry Clean Up system will enable cut joints to be water blasted and vacuumed in one pass of the saw, saving time and clean-up costs and ensuring work schedules can be adhered to.
- The flowmeter on the dashboard enables the operator to increase or decrease the water flow during cutting to virtually eliminate dusting while at the same time the slurry recycling system minimizes clean-up time and cost.
- Vibration issues are dealt with by driving the blade on the “Cleancut” saw hydraulically. This comes at an extra cost but was considered worthwhile by the “Cleancut” team.
- Road marking time and costs will also be reduced with the use of the Tiger Eye Pointer System.
- Research and design innovation that has led to the manufacture of the “Cleancut” saw places it at the forefront of change within the concrete cutting industry sector. Innovative design and construction that:
 1. Improves the maneuverability of the saw during operation.
 2. Minimise operator’s risk of exposure to personal injury by reducing the level of manual handling/effort required to operate the saw. A reduction in manual effort that also decreases the risk of slips or trips;
 3. Effectively decrease vibration of the saw during operation and the potential for related personal injury;
 4. Minimise the dust and associated airborne pollutants produced by the operation of the saw; and
 5. Minimise the risk of harm to others and the surrounding environment through design control measures that decrease the quantity of dust and associated airborne pollutants created during operation of the saw;

The Manual Handling Risk Assessment undertaken by a private consultant on the 12th February 2018 is attached as a separate document.

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