*CLEANCUT CONSTRUCTION PRODUCTS Pty Ltd.*

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# Health & Safety Innovative Improvement Report

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

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# EXECUTIVE SUMMARY

## BACKGROUND

Concrete road saws are a significant piece of portable equipment due to their design, construction, weight, and operating parameters, which limit their maneuverability. As a result, concrete saw operators often need to use physical strength to manage the equipment effectively. Operators may need to lift and lower the machinery while twisting or turning, putting strain on their arms, legs, and lower back. These repetitive motions can potentially cause acute or cumulative injuries, which may be influenced by various factors such as operator age, physical size, and agility.

The innovative design and construction of the "Cleancut" Road Saw has significantly reduced manual handling, thereby enhancing safety in concrete saw operation. This claim is supported by objective data presented in the Manual Handling Risk Assessment Report, prepared by an independent and certified Workplace Health and Safety Professional. A summary of the relevant data is included in this document at Tables 4 and 5, with the full report attached for further reference.

## SCOPE OF INNOVATION

The advantages of the Cleancut Road Saw extend beyond initial expectations. In 2015, Cleancut Construction Products Pty Ltd ("Cleancut") was awarded an "Accelerated Commercialisation Grant" by the Australian Federal Government. This grant recognized Cleancut's innovative design as well as its potential to enhance safety and reduce environmental risks associated with concrete saw operations. Cleancut's forward-thinking approach has resulted in the following additional advancements:

The static centre of gravity in the Cleancut saw significantly reduces operator manual handling loads. This ensures that these reduced loads are consistently maintained across all modes of operation of the saw.

The use of high-quality hydraulic operation, as opposed to belt-driven mechanisms, has significantly reduced concrete saw vibration and minimized its negative impact on operators.

Advanced slurry clean-up technology effectively recycles water, reducing slurry and airborne pollutants from concrete saw operations.

Cleancut Road Saws will be manufactured in Brisbane using high-quality diesel/hydraulic pumps and motors.  Cleancut holds several patents in various countries to protect its technology.

Cleancut offers a competitively priced product that enhances workplace safety, making it a viable alternative to traditional 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

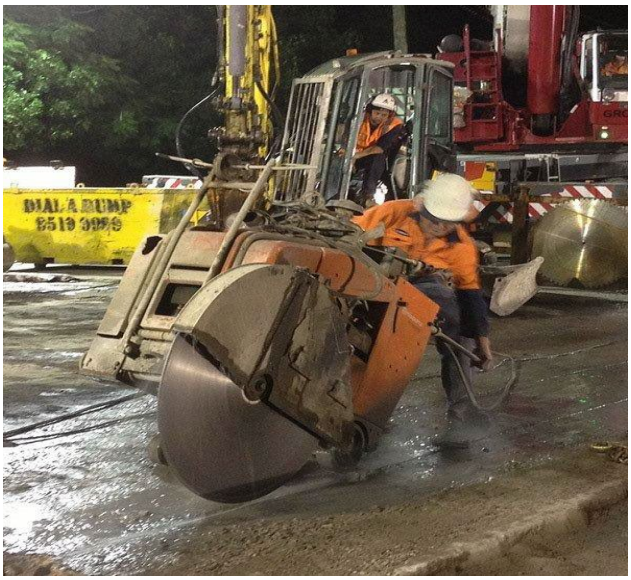
**Table 4** - "CLEANCUT" 7500 ROAD SAW

| | 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?**

The amount of dust Road saws generate depends on the material and amount of water used to cool the blade.

In the concrete cutting industry, it is a common practice for operators using existing road saws to reduce the water feed below the recommended 10 litres per minute during cutting to minimize clean-up time and cost. This practice results in increased dust from the blade and potential long-term health issues.

Inhalation of airborne dust in the workplace poses a significant risk of occupational disease. Annually, excessive exposure to dusts results in diseases, both temporary and permanent disabilities, and fatalities in both developed and developing countries. Workplace dust can also lead to product contamination, reduced product quality, fire and explosion hazards, and environmental damage.

If not controlled or removed from the air, dust can disperse with ambient air currents and affect individuals far from the source who may be unaware of their exposure.

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?**

Dust generation and the risk of silicosis are significant concerns within the concrete cutting industry.

The Slurry Recycling Guard on the "Cleancut" Saw, introduced in 2008, recycles water and slurry up to five times as blade coolant. This reduces the water feed requirement in most situations to just 2 L/M without generating dust. The Cleancut Road Saw includes a flowmeter and a dashboard water tap for precise water control during cutting, thereby preventing dusting. In comparison, manufacturers of other saws currently available recommend up to 10 L/M of water feed as blade coolant.

As previously stated, operators currently reduce water feed to minimize cleanup costs and time. This practice inadvertently generates significant amounts of airborne concrete dust. The "Cleancut" saw, equipped with slurry recycling technology and a flowmeter, offers a solution to this issue, effectively managing both dust reduction and cleanup efficiency for operators.

Using the "Cleancut" Road Saw, operators are less likely to create dust from the blade because the water feed and consequent clean-up cost are significantly reduced, thanks to the saw's in-built water recycling system.

The saw in the picture below uses approximately 5 L/M of water feed without producing dust. This amount can be reduced to 2 L/M at the operator's discretion. If this reduction were implemented using existing technology, significant amounts of dust would be generated, along with the recognized 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 noted, the "Cleancut" saw features a patented Slurry Recycling Guard. This design allows the operator to minimize water usage to approximately 2 L/M in large road saws during cutting operations. In contrast, existing saws require about 10 L/M to operate dust-free. Consequently, the reduced water usage of the "Cleancut" saw results in a substantially diminished slurry line behind the saw after it has passed during the cutting process.

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

The "Cleancut" saw includes a feature that allows for an industrial-grade vacuum wand to be attached at the rear. When connected, this vacuum wand automatically cleans the narrow slurry line during cutting, leaving minimal dry slurry on the pavement. Future plans anticipate the potential for water blasting and complete cleaning of the cut by using a second, smaller vacuum unit that can attach to the standard wand. This secondary wand injects water under pressure to the base of the cut, which is then vacuumed up, resulting in a clean cut ready for sealant application.

We anticipate that the cutting and comprehensive cleaning process will be executed by a single operator in one complete 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.

The industry has recognized slurry control and clean-up as a significant challenge for many years. Due to the hazards that slurry poses to concrete saw operators and the environment, several manufacturers and owner-operators have sought innovative methods to minimize it. However, these efforts have achieved limited success to date.

As stated in the manual handling section, manufacturers have attempted to manage extremely heavy raised lifting weights by designing the saws to be very light when fully lowered. However, this results in the back wheels slipping when the blade is fully lowered into the cut. Operators often respond to this design limitation by standing on the back of the saw or sitting or bouncing on the saw handles to get the back wheels to grip. This practice is potentially dangerous. Furthermore, operators frequently use their body weight to slide saws in scenarios where there is excessive slurry buildup, or the weight of the saw or angle of the handles makes the machine too heavy to lift. This not only creates a slip hazard for the operator but may also be impractical on rough surfaces or at the beginning of a job when there is no slurry.

Slipping on ramps is an occupational health hazard for operators using current road saws due to insufficient weight on the rear wheels.

The Cleancut Road Saw's patented design includes 4-wheel drive, ensuring that the saw's weight is on the drive wheels to prevent 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 CLEANCUT 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.