

HAL THE HEALTHY ALTERNATIVE LUBRICATOR

NEW LUBRICATING SYSTEM VIRTUALLY ELIMINATES ENVIRONMENTAL OIL MIST

In 1992, the industry was faced with a potentially costly and technically challenging situation when new exposure standards were proposed in Ontario. In order to reduce the health risks associated with exposure to oil mist, the new standards proposed that exposure to oil mist be reduced from 5 to 1 mg/m³.

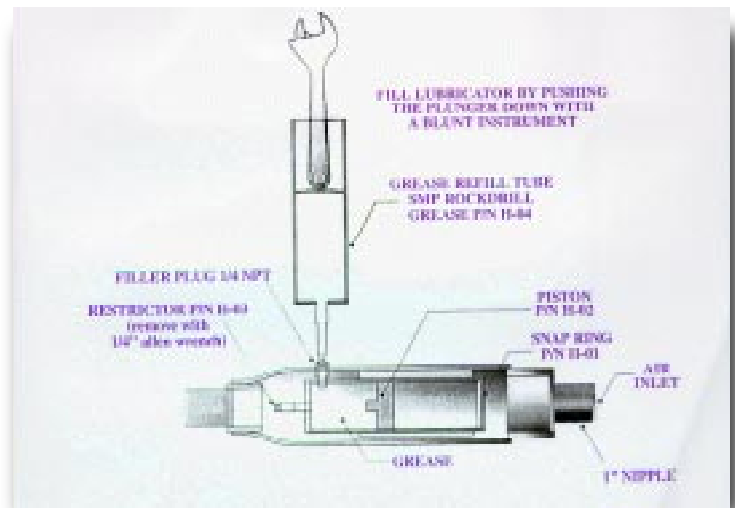
The development of a possible solution was exciting news for the industry. The Healthier Alternative Lubricating System or HAL, developed by a Sudbury based manufacturer, Sudbury Mining Products Limited, is the only known lubricating system on the market that actually will meet or exceed proposed workplace exposure standards.

Where did this idea come from?

The use of grease was first developed in South Africa in 1954 to combat excess water wash conditions. Upon the realization of the substantial savings of nearly 20 to 30 percent when they converted from oil to grease, the Anglo Americans changed to 100% grease lubrication by the 1960's. Today, all the 55,000 hand held drills in South Africa are lubricated with grease. Grease, in fact, is recommended by the world's largest manufacturer of pneumatic drills. Unfortunately, the South African lubricators are not suitable for the North American market, therefore Sudbury Mining Products designed the HAL lubricator to suit our needs.

How does HAL work?

There are numerous advantages to using HAL rather than oil for lubrication. When grease is used it coagulates at the cold exhaust, therefore reducing atomization. It is more efficient, resulting in a better seal. HAL has also proven to demonstrate superior lubrication qualities when used at higher temperatures. Oil is prone to water wash, whereas grease adheres to the metal which allows for a lesser need of lubrication. Fabricated to meet pressure vessel registration, HAL is simple, safe and best of all very low maintenance. As shown in the diagram below, HAL is made of three parts, only one of them moves, making it easy to service and refill.

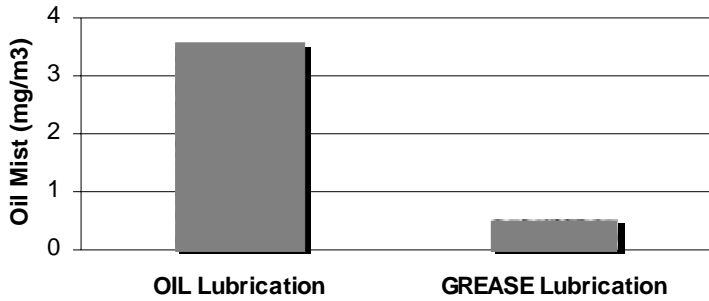


Putting HAL to the test

Proto type testing began on HAL in mid 1994 making it ready for the market by July 1996. In October of that same year, they began to test HAL at the Copper Cliff South Mine. The testing at Inco was performed by a long list of individuals such as John Dewulf, Rick Teahen, Len Van Eyk, Robert Kaven, Thomas White, Tom Mehes, John Mahon, Doug O'Connor, Terry Turcotte, Francis St.Cyr, Henry Narduzzi, Orvil Dillenbeck, Robert Larocque, Phil Salo all of which were quickly convinced of the benefits of HAL's grease lubricator. Between October 1996 and August 1997, testing was performed at the Copper Cliff South Mine on the 3500 Level Scissor Truck, the 4250 Level Drift Crew and the 2050 Level BCI-2 Longhole Jumbo.

The results of the first series of tests on the 3500 Level Scissor Truck indicated numerous benefits when comparing grease to oil. The observations indicated that there was no oil mist in the atmosphere and a definite improvement of the torque on the bolts allowing for more drilling use out of the machines. When using grease, they found that they only needed to fill up once a day, therefore reducing the handling and storage. Grease proved to be cleaner, with no spillage and did not leave the truck slippery or get their clothes dirty.

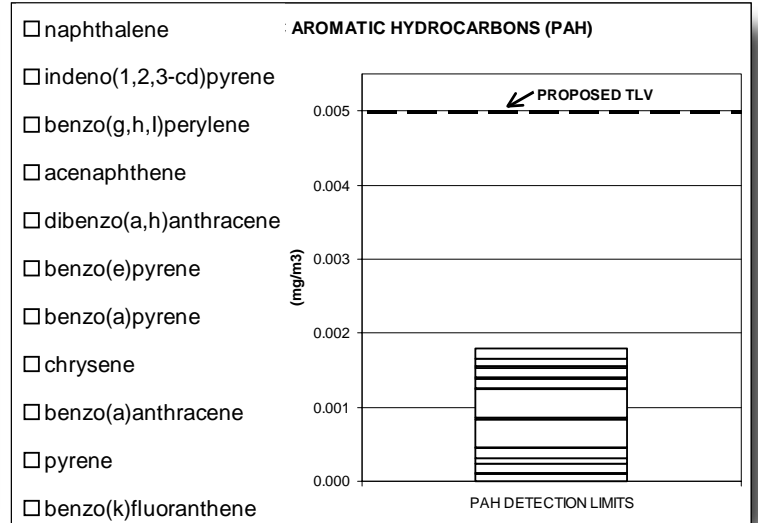
**OIL MIST RESULTS
INCO COPPER CLIFF SOUTH MINE
Scissor Truck -3500 Level**



Tests on the 3500 Level Scissor Truck indicated a significant decrease in oil mist exposure when using grease rather than oil as a lubricant.

The second test site at the 4250 Level which is considered to be a test of the worst case scenario due to its poor ventilation, demonstrated improved air quality and an increase of the torque on the bolts.

Air sampling at the third test location at the 1950 Level tested the possibility of grease releasing other contaminants into the air. From May 15 to 27 1997, Inco conducted tests on oil mist and McGill University carried out sampling and analysis for PAH's (Polycyclic Aromatic Hydrocarbons). For approximately 3 hours a day for 5 days they collected samples in three locations; the intake air, the operator air and the exhaust air. The results of the study indicated a significant decrease in oil mist in all three locations.



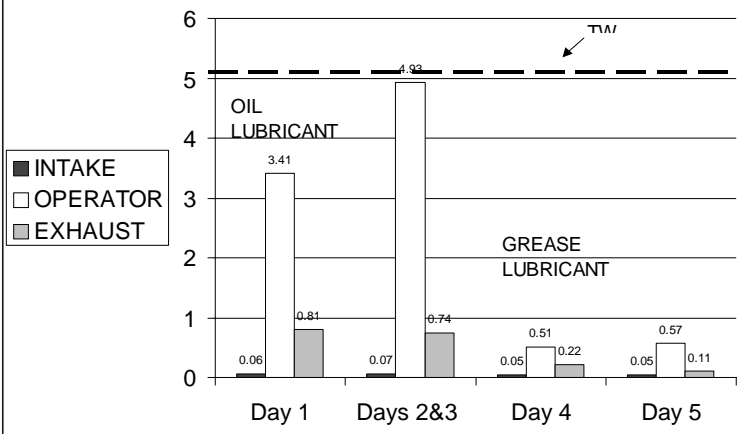
POLYCYCLIC AROMATIC HYDROCARBONS

LOCATION	OIL LUBRICANT		GREASE LUBRICANT	
	DAY 1	DAYS 2&3	DAY 4	DAY 5
INTAKE	none detected	none detected	none detected	none detected
OPERATOR	none detected	none detected	none detected	none detected
EXHAUST	none detected	none detected	none detected	none detected

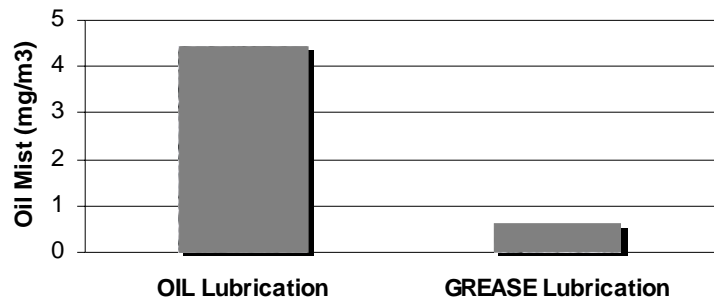
POLYCYCLIC AROMATIC HYDROCARBON PROPOSED TLV = 0.005 mg/m³

Further tests were done on the BCI-2 Longhole Jumbo at the 3500 Level which indicated a drastic decrease in oil mist when they converted from an oil to a grease lubricant.

OIL MIST (mg/m³)



**AIR MISTS RESULTS
INCO COPPER CLIFF SOUTH MINE
BCI-2 Longhole Jumbo - 3500**

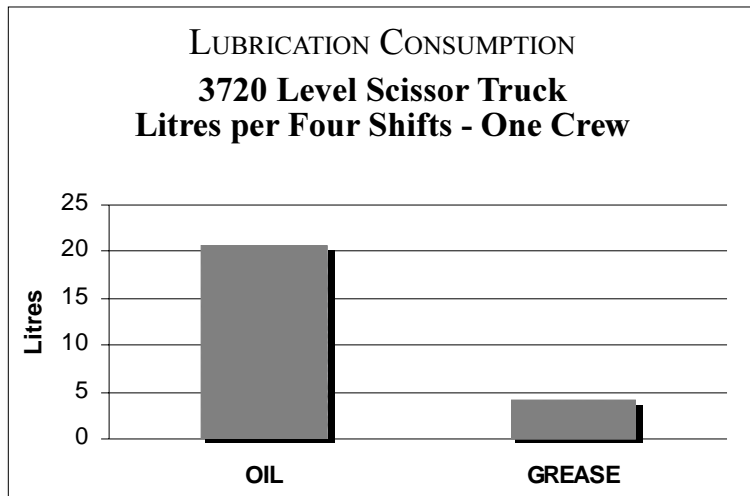


The Test Results

Based on the consistency of the results, these tests were found to be reliable and repeatable. It was found throughout the testing that grease lubrication reduces oil mist by 83 to 90%. It was also noted that PAH's (Polynuclear Aromatic Hydrocarbons) are not detectable in oil mist when using a grease lubricant. What is even more astounding is that oil lubrication results in a mist that approaches and even exceeds the present exposure limit of 5mg/m³.

What is the bottom line?

Through extensive testing, HAL has proven to offer a long list of benefits. It allows a safer and cleaner work environment with cleaner machinery and clothing. HAL is considered to be financially feasible not only with the reduction in rock drill but also with the expense of handling materials, spillage and waste due to scrap such as oil pails.



Using HAL offers less petroleum products in the milling process and in the clean water treatment process. Most importantly, HAL complies to the standards of limited oil mist exposure from 5mg /m³ to 1 mg/m³, resulting in a reduced health risk. In short, HAL meets and exceeds proposed workplace exposure standards.