



Aussie hole opener a hit

Hard Metals' Wombat hole opener successfully tested in Alberta

BY ANDREW TOPF, EDITOR

The introduction of polycrystalline diamond composites (PDC) to Hard Metals' Wombat line of hole openers and reamers can be traced back to the Australian company's first forays into trenchless technology in 2007.

Now, Hard Metals' technology has crossed the Pacific Ocean to North America, with the company setting up shop in Calgary and recently testing the latest generation of the Wombat hole opener at a job in Crossfield, Alberta.

The first hole-opener was a fixed-wing type similar to existing fabricated offerings in the market. Though an effective and successful unit, the design presented engineering problems with axial accuracy and radial run-out of the cutter segments. A cost issue also arose when the hole-opener was being used for different size bores at a site, or when the worn cutters had to be replaced. The entire body had

to be removed and sent to a specialized engineering facility for the cutter wings to be cut off and new ones welded on.

Looking to tackle these problems head on, Hard Metals Australia resolved to increase the rate of penetration (ROP) and reduce costs.

Better put a ring on it

The first step in the evolution of the tool was to replace the fabricated cutter wings with ones that could be changed in the field. They were fitted to a standard body, similar to imported roller cone bodies. Additionally, the cutters were PDC rather than the tungsten carbide ones that were generally used for hole-opening and reaming through difficult strata at the time.

PDC is up to 30 times more wear resistant than tungsten carbide but it is not as robust, making stability a key factor. These early units were very successful in generating ROP rates and excellent bore quality on small diameters and over

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short distances. However, difficulties were encountered with bores over 33 cm and reaming further than 200 metres.

After investigations revealed the problem centred on the wing fasteners, a stabilizing ring was used to hold the wings together and improve structural stability. The innovation was successful and in 2008 a 46-cm ream was made off a 6.75-inch (171-mm) pilot bore over 530 metres in a single pass.

“As Beyoncé says, when we joke around with contractors, ‘You should have put a ring on it,’” says Ervin Bata, Hard Met-

als' Canadian general manager. "It gives us structural integrity and added stabilisation down the hole. This is the defining difference between ours and other PDC hole openers around and it works brilliantly. That's why we have international patents on the feature as well as other aspects of our Wombat hole opener."

Another feature that distinguishes the Wombat hole opener and secures the integrity of the assembly is a type of lock washer known as the Nord-lock washer. This washer is the preferred locking system used by NASA and is the most reliable under the Junker Vibration Test. The special step pattern requires more torque to release the tension on the bolt than was initially applied to tighten it up.

An increase in the number of blades – from three to six – produced another major advance in ROP: a 61-cm ream off a 24-cm pilot over 500 m through sedimentary and broken rock was completed in five days. However, while this unit ticked most of the boxes, it still wasn't easy to service in the field. Hard Metals Australia set about making more improvements, and the Wombat series was born.

PDC more wear-resistant than tungsten

Evolving through four iterations, field trials included a 280-m bore through sandstone on the New South Wales Central Coast in 2012, a 700-m bore through sandstone and ironstone under the Nepean River in 2013 and a 630-m bore through sandstone in Galston in 2015. All of the case studies were performed using Vermeer D100 drill rigs.

The evolution of the Wombat series disproves the long-held belief that PDC cutters are only suitable for soft sedimentary rock in trenchless drilling. Thanks to advances in stabilizing PDC at the bit-rock interface, PDC is now a leading choice in oilfield and gas drilling through a wide range of strata.

While PDC is less impact-resistant than conventional tungsten carbide cutters, PDC's capacity for wear resistance can exceed that of tungsten by more than 30 times. By creating a more stable environment at the cutting face, PDC's excellent wear characteristics can be exploited to the great benefit of the drilling operation.

Of course, seeing is believing, so when Hard Metals was given the chance to test the Wombat hole opener at a job in Crossfield, just north of Calgary, the company jumped at the opportunity to prove its technology to the Canadian market in a field-tested situation.

Clean Harbors was contracted to install a new pipeline in a combination of soils including mudstone, topsoil, mud/clay, sandstone and cobbles/boulders.

The contractor upsized the 6 1/4-inch pilot hole over the length of the 853-foot (260-m) shot, using the 16-inch Wombat hole opener and a Vermeer 80x100 drill rig.

Using 15-foot rods, the hole was opened at an average rate of 6 minutes 46 seconds per rod, with the best time clocking in just over two minutes (2:02). The one aberration was a drill rod that took 39:28 to open the hole, but that was due to a hard formation encountered, necessitating the help of a backhoe, ac-



The Wombat hole opener features changeable cutter wings, a stabilizing ring, and a Nord-lock washer, the same locking system used by NASA.

ording to results shared by Hard Metals.

"I could push harder than any tricone reamer," says driller Erik Larsen.

Bata, in charge of Hard Metals' Canadian operations, said the Wombat hole opener is currently available to a maximum 36 inches, but the company is also looking at developing a 48-inch opener that could handle large-diameter piping.

For now, he said Hard Metals is enjoying introducing the Wombat to contractors that haven't worked with the tool before. So far the reception has been positive:

"You take this thing out, and you put it in front of guys that have never seen it, and everyone starts taking pictures," he said. "It's pretty neat to see." **CUI**

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