



wassara

**STRAIGHT
FORWARD
DRILLING**



WATER-POWERED DRILLING SCALED UP IRON ORE PRODUCTION IN LKAB MINES

When LKAB scaled up their production in 1990, they needed a drilling technology that could provide 60 meter long blast holes with a deviation of max 1.5% and to a lower energy cost. Today, all production drilling at LKAB is operated with the water-powered DTH hammer from Wassara.

A total of 18 million meters (11 200 miles) blast holes has been drilled with Wassara in the LKAB iron ore mines.



Optimising as a lifestyle

From the very start in 1890, when the Swedish mining company LKAB was founded, major focus is set on optimising the operation in the sublevel caving mines. The biggest paradigm shift in production drilling came to pass in 1990.

Layout of the mine and borehole length

In order to scale up the ore iron production, the length of the blast holes was increased from 28 (92 ft) to 56 meters (190 ft). This gives 28 meters between the levels and drifts from the current 12 meters (42 ft); this would lead to reduced numbers of development drifts needed by 70%. The outcome from each blast has gone from 1 200 tonnes to today's 10 000 tonnes, or 8.3 times more.

Borehole accuracy gets crucial

The longer the borehole we get, the more important the straightness gets. Less deviation is simply crucial to maintain good fragmentation of the ore when blasting. The maximum allowed borehole deviation in LKAB is 1.5%. Wassara meets this requirement every day.

Why is water better than air when powering a DTH hammer?

As water cannot be compressed, it's optimal for use as power transmission in percussion drilling. A high-pressure water pump is far more energy efficient than an air compressor, leading to minimised energy consumption. And since water is fully natural, it will not pollute the environment in any way.

LKAB drilling today

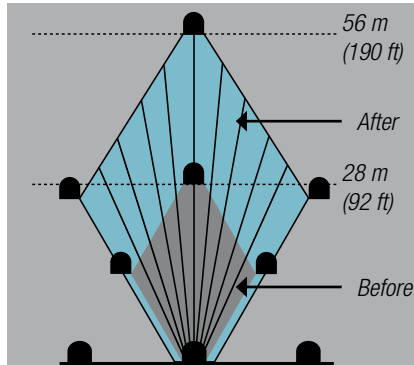
Today, all long production drilling in LKAB mines is running with water-powered equipment from Wassara. The boreholes are up to 56 meters (190 ft), depending on the shape of the ore body. The rate of penetration is up to 1.2 meter (4 ft) per minute with 115 mm (4.5") drill bits. Apart from production drilling, media holes and slots are also drilled with Wassara.

A total of 18 million meters has been drilled with Wassara in the two iron ore mines that LKAB operate.



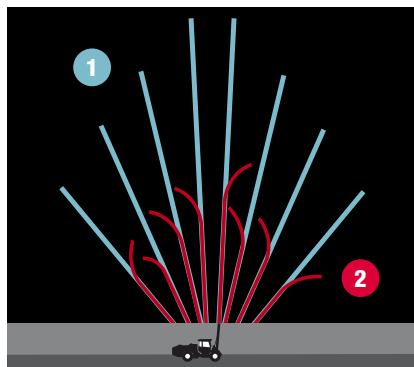
CASE STUDY

WATER-POWERED DRILLING SCALED UP IRON ORE PRODUCTION IN LKAB MINES



Scaling up from 12 to 28 metres between levels and drifts:

- Drifting reduced by 70%
- Volume per drilled meter increased by 500%
- Reduced costs in all steps from planning to operation.

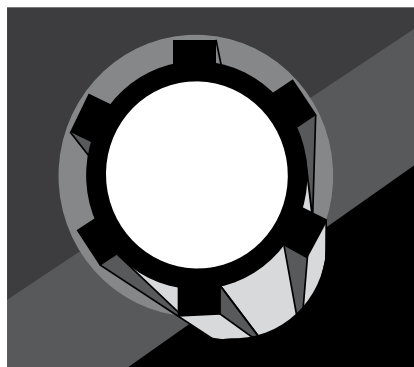


The main challenge is drilling accuracy.

Wassara normally keeps the holes within 1% deviation!

- Consistent fragmentation and dilution for optimal flow and processing.
- Safer mining thanks to outstanding accuracy even for the longer holes.

1. With Wassara
2. With other solutions



Tight clearance

The low velocity of the return water minimizes the wear on the hammer guide ribs, enabling a tight clearance between the hammer and the wall.

– This gives straight boreholes.

Equipment used	
DTH hammer	Wassara W100
Drill bit	Ø115 mm
Pump	Kamat / Hammelmann
Drilling fluid	Clean water
Rig	Atlas Copco / Sandvik
Borehole length	Up to 56 meters (190 ft)
Scope of drilling	1.8 million meters (1 120 miles) in 2013
Geology	Iron ore and waste rock

January 2013

CASE STUDY