

Wassara News

Newsletter no. 1, March 2007

Water-powered drilling

The natural alternative



Your guide to water-powered drilling
CONSTRUCTION
AND MINING



From R&D to market focus

Just a few weeks before my recent appointment as CEO of Wassara, the company had celebrated, with its biggest customer, LKAB, the milestone of 10 million metres of successful drilling in LKAB's mines. More than anything else, this convinced me that Wassara had moved on from the era of basic R&D and was now ready to forge ahead with a greater focus on our customers. My very devoted colleagues and I are convinced that customers in the mining and construction industries could benefit by using our water-powered drilling systems. Up to now, Wassara has not had the resources to demonstrate the advantages of our system on the markets where we want to have a presence. But today, with the backing of a determined owner who is prepared to invest, we can view the future with fresh confidence. It's my job to see that this happens and I'm looking forward to it. ➤

Peter Johansson, CEO

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Electra Mining Africa, 2006

Market activities, autumn 2006

During the autumn of 2006, Wassara took part in numerous events on the Swedish market, such as the Climate Day, the SVR Society Building Days, Well Drilling Day, Focus on Procurement 2006, the VBT Day 2006, Field Geophysics on the Surface and at Depth, the autumn 2006 meeting of the Association for Advanced Drilling, and the SveMin meeting in Umeå.

In the international arena, Wassara

took part in the following events:

Pile Foundations in the Light of New Pile Guidance at Sarpsborg, Electra Mining Africa in Johannesburg, the 31st Annual Conference on Deep Foundations in Washington, Geofluid 2006 at Piacenza, Rock Blasting Day and Rock Mechanics/Geophysics Day at Oslo, Civils 2006 at London, and finally the Franco-Swedish seminar on environmental technologies at Nice. ➤



Foto: Norrfjärdens Brunnborringar

Refrigeration plant at Kirseberg, Malmö, Sweden

Combined drilling for a telephone exchange

Description of the project:

The main purpose of the plant is to cool the environment where the telecommunications equipment is located. Norrfjärdens Brunnborring was commissioned by TeliaSonera to drill 23 holes 200 metres deep. The first 100 metres were drilled with pneumatic hammers. Drilling between 100 and 200 metres was done with Wassara W100 water-powered hammers. The

reason for combining these two drilling methods was that the formation contained large quantities of groundwater at depths below 100 metres.

Result:

In all, 2300 metres were drilled with water hammers. These tools work very well in this type of formation, with large amounts of water and some flints. ➤



Read more at: www.wassara.com/casestudies.asp



Citybanan rail link, Stockholm

Predrilling for jet grouting – safe and environmentally friendly

Description of the project:

A subproject of the Citybanan rail link project is the construction of a working tunnel at the track areas adjacent to Stockholm Central Station. The contractor used W100 water-powered hammers for jet grouting of a total of 500 holes 10 to 20 metres deep. When a number of holes had been drilled, the technique was switched to jet grouting. The same rig and pump are used for Wassara drilling and for jet grouting. The client is Banverket/Projekt Citybanan, consultants include Golder Associates, the contractor is Züblin-Oden Constructors HB and the drilling contractor is Züblin/Insond.

The reasons for choosing Wassara were:

- The ground conditions were extremely difficult, with old spoil masses, high groundwater and polluted ground. Since the ground is polluted, the water must be pumped to a treatment plant before it is discharged into Stockholm Water's wastewater system.
- The proximity of Stockholm Central Station and track areas means that pneumatic drilling is risky.

Wassara drilling went as expected and the project is progressing as planned. ✨



Read more at: www.wassara.com/casestudies.asp

Yesterday–Today–Tomorrow

Three questions for Rolf Karlsson

Site Manager at Hercules Grundläggning, Stockholm Region



Photo: Hercules Grundläggning

Yesterday

1. *When did you first come into contact with Wassara technology?*

“My first contact with water-powered down-the-hole drilling technology from Wassara was soon after the beginning of the 2000s. “At Hercules, we’d heard of and looked at the technology and its advantages, so we decided to take the lead and invest in it, as a complementary technology for jobs where there are restrictions on pneumatic drilling,” Rolf explains.

Today

2. *How do you view Wassara technology today?*

“It has turned out to be a very good drilling method, especially in an urban environment, where there is a need to minimise disturbance to the surroundings,” Rolf continues.

Tomorrow

3. *What do you think the future holds for water-powered down-the-hole hammer drilling technology?*

“I believe it will become more and more established, considering its advantages in terms of the environment and, as I said, its minimal impact on the surroundings, says Rolf, in conclusion. ✨

Dam projects with Wassara in the USA and the UK

A number of dam reinforcement projects are about to start in the USA and the UK. In most cases these involve predrilling for jet grouting. One of the reasons for choosing Wassara was that the technology minimises the risk of disturbing the

soil strata by pressurising them. Other contributing factors include hole straightness and high productivity. Visit www.waterpowermagazine.com/storyprint.asp?sc=2030139 under the heading Foundation improvement to read more about comparative tests between Wassara and other drilling technologies at the McCook Reservoir outside Chicago. ➤



Read more at: www.waterpowermagazine.com/storyprint.asp?sc=2030139 och www.wassara.com

Johan Jeansson, Head of Marketing at Wassara

Straight holes – easy with Wassara technology

One of the major advantages of Wassara is the ability of the hammer to drill straight holes. The secret is in the low velocity of the return water, 0.5–1.0 metres/second, which keeps wear of the hammer guide ribs to a minimum. This means that the clearance between the guide ribs and the wall of the drilled hole only increases very slowly, giving good hole straightness.

The hole straightness is not improved if the drilling penetration rate is reduced by reducing the pump flow rate and thus the working

pressure of the hammer. Reducing the drilling penetration rate means that the hammer and drill bit spend more time than necessary in the hole, and this tends to increase the diameter of the hole slightly. This in turn results in increased clearance between the guide ribs and the wall of the hole, leading to poorer hole straightness. So it is important to keep up the pressure and the drill penetration rate.

When drilling long holes, 100 metres or longer, the recommendation is to use guided drill pipes in the drill string since this is a further guarantee of hole straightness. ➤





FAQs

Q1: How many metres can I drill with a Wassara hammer before it needs servicing?

A1: There is no general answer to this question. The number of metres between services depends on the properties of the rock/formation, the capacity of the pump and the quality of the water. Take blasting hole drilling with a W100 at the LKAB iron ore mine at MalMBERGET as an example. On average, the compression strength of the iron ore is about 110 MPa. The water is of drinking water quality. Overall, this gives a service interval of about 2300 metres.

Q2: How can there be a relationship between the capacity of the pump and the service interval?

A2: A new W100 uses about 200 litres/minute at 180 bar. When the hammer is running, normal wear will cause the hammer to demand a higher flow rate to maintain full working pressure. Wassara recommends that the hammer should be serviced when a flow rate of about 350 litres/minute is needed to achieve 180 bar. But if the pump is not capable of supplying 350 litres/minute, this means that the hammer will need servicing sooner. Otherwise, the lower flow rate will result in a lower pressure across the hammer and therefore lower productivity.

Q3: What parts will I have to replace in the hammer at every service?

A3: Once again, this depends on factors such as the properties of the rock/formation and the quality of the water. As an example, at MalMBERGET they usually replace the piston, piston bushing, valve, valve housing and seals at the first service. At the next service, the piston case is also usually replaced.



The Bothnia Line, Sweden

Strengthening of a railway bridge abutment

Description of the project:

The purpose of the drilling operation was to strengthen an abutment of a railway bridge on the Bothnia Line, 20 km south of Umeå. In all, 14 liner pipes with a diameter of 193 mm were drilled. The average depth was 10 metres. Steel cores were then grouted into the liner pipes. Water for the high-pressure pump was taken from the wa-

tercourse adjacent to the drilling site, using a submersible pump.

The drilling contractor was PEAB Grundläggning and the client was Banverket.



Read more at: www.wassara.com/casestudies.asp

The T140 hammer breaks the ten-million-metre barrier

On 31 October 2006, LKAB's drilling operations with Wassara hammers passed the milestone of ten-million metres drilled.

Hammer:T140
 Rig number: 703
 Designation of drilled hole:5
 Bit number:21
 Area and level:AI 932, location 4870



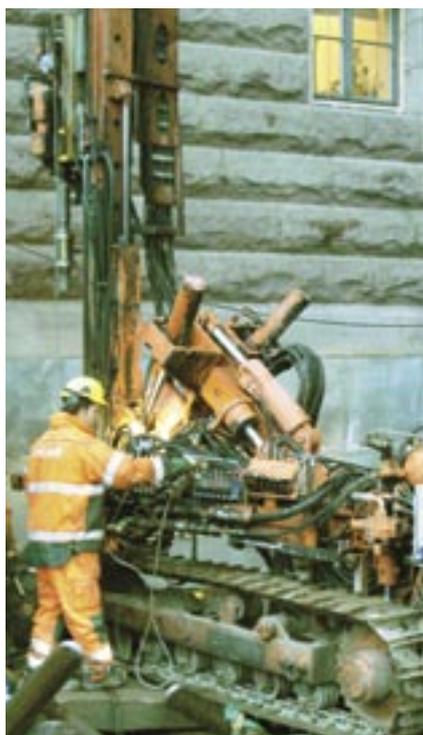
Do you have any questions about the Wassara system? Or do you want to discuss drilling projects? Please contact us in one of the following ways:

info.wassara@lkab.com
 or
www.wassara.com

Technology from Wassara is providing solutions for more and more projects.

Reference project	Hammer	Application	Country	Roads	Investigation holes	Investigation/draining	Tunnel driving	Blasting holes	Casing advancing	Sensitive/urban environ-	Cluster/raise/slot	Railways	Grout holes/grout curtain	Horizontal holes	Mines	Geothermy	Geophysics/investigation	Gas draining	Freezing holes	Strengthening/reinforce-	Predrilling for jet grouting	Energy	Dams/rivers	Coiled tubing	Bridges	
1	W100	Energy hole drilling with W100 at Räcksta	Sweden																							
2	W150	Energy hole drilling with W150 at HofWeissbad	Switzerland																							
3	W100	Geothermy drilling with W100 and coiled tubing	Iceland																							
4	W150	Freezing hole drilling with W150 at Årsta	Sweden																							
5	W100	Energy hole drilling with W100 at Danderyd	Sweden																							
6	W80	Investigation drilling with W80 at Mitholz	Switzerland																							
7	W150	Raise 700 in the Kiruna iron ore mine with W150 cluster	Sweden																							
8	W100/150	Slot drilling with W100/W150 at Malmberget	Sweden																							
9	W100	Straight blasting holes with W100 at Malmberget and Kiruna	Sweden																							
10	W100	Freezing hole drilling with W100 at McArthur River	Canada																							
11	W100	Casing advancing with W100 at Helsinki	Finland																							
12	W100	Predrilling for foundation works with W100 at Göteborg	Sweden																							
13	W100	Opening drilling at Avgolds Target Mine	South Africa																							
14	W100	Methane gas extraction with W100	Germany																							
15	W100	Energy drilling with W100 and Tubex	Sweden																							
16	W100	Reinforcing works with W100 during the construction of Södra Länken	Sweden																							
17	W100	Bridge strengthening works with W100 at Leipzig	Germany																							
18	W100	Blasting holes with W100 at Williams Goldmine	Canada																							
19	W150	1850 mm cluster drilling with W150, Oslo	Norway																							
20	W80	Deep hole grouting with W80, Chicago	USA																							
21	W100	Foundation strengthening with W100, Bancohuset, Gamla Stan, Stockholm	Sweden																							
22	W80	Opening drilling with W80 at the Beatrix goldmine	South Africa																							
23	W100	Wassara saved the energy well	Sweden																							
24	W150	Bridge strengthening with W150 at Fagersta	Sweden																							
25	W100	Predrilling for jet grouting, Parliament Building, Stockholm	Sweden																							
26	W80	Investigation holes with W80, Chikushi Tunnel	Japan																							
28	W80	Predrilling for grouting, Malmö City Tunnel	Sweden																							
29	W80	Investigation drilling with W80, Tara Mines	Ireland																							
30	W80	Grout holes with W80, Ohra Dam	Germany																							
31	W100	Investigation drilling with W100, Kiruna	Sweden																							
32	W100	Energy strata drilling with W100, Lund	Sweden																							
33	W80	Blasting holes with W80 in the Mittersill tungsten mine	Austria																							
34	W100	Freezing hole drilling with W100, Hallandsåsen Ridge- Part 1	Sweden																							
35	W100/150	Foundation strengthening with W100 and W150, Munin District, Stockholm	Sweden																							
36	W100	Predrilling for jet with W100, Södra Länken, Stockholm	Sweden																							
37	W100	Energy strata drilling with W100 for Brf Tunahus, Lund	Sweden																							
38	W100	Preconditioning with W100, Andina	Chile																							
39	W100	Predrilling for jet grouting, Citybanan, Stockholm	Sweden																							
40	W100/150	Foundation laying of Rosenlundsterrassen secured with proven technology from Wassara	Sweden																							
41	W150	Strengthening of a railway bridge abutment with the W150 hammer, Bothnia Line	Sweden																							

Read more at: www.wassara.com/casestudies.asp



Wassara drilling at the Riksbron Bridge in Stockholm

Dramatic increase in water-powered drilling in the construction sector

Several projects are currently in progress in Stockholm, Malmö and elsewhere – and more are waiting to start.

In these projects, Wassara technology is used for drilling RD piles, pre-drilling before foundation strengthening and jet grouting, and for filter pits.

“Other fields of application are emerging, such as casing advancing with strand bar anchor drilling,” says Håkan Hurtig, Sales Manager for Wassara and Symmetrix at GEOMEK AB.

“More and more people are becoming convinced of the advantages of water-powered technology. We see it as our task to find more fields of application and customer segments,” concludes Håkan.

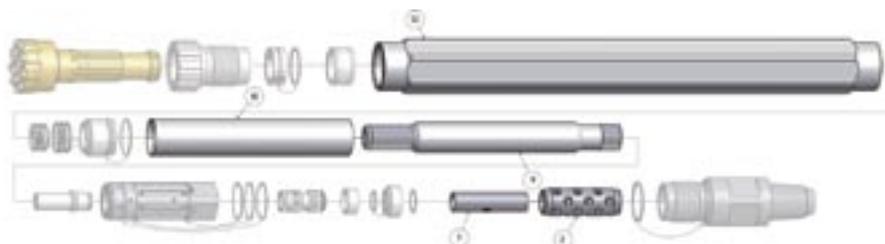
GEOMEK
Stockholms Geomekaniska AB



Håkan Hurtig,
Geomek, Sales Manager for Wassara and other products

NEW!

Wassara W80 HD



The new Wassara W80 HD is a more powerful hammer than the old W80. The working pressure has been increased from 160 bar to 180 bar and the piston has been made longer and therefore heavier. This yields a 12 % increase in output power. A 30 % increase in the penetration rate has been measured in field tests. The following components are new compared with the W80 (see exploded diagram): no. 2 filter support, no. 3 filter, no. 9 piston, no. 10 inner tube and no. 12 piston case.

The other components are the same as in the W80.

Technical data for W80 HD

Hole size	88–105 mm
Working pressure (max)	180 bar (lower pressure for casing advancing)
Water consumption at max pressure (new/worn)	130/200 litres/minute
Hammer output	14 kW
Energy per impact	210 joule
Frequency at max pressure	65 Hz (3900 impacts/minute)
Feed pressure (depends on rock)	7000–10000 N
Rotation speed (depends on rock)	50–90 rev/minute
Rotation torque (depends on rock)	800–1500 Nm
Drill pipe (O-ring system/pressure-tested)	Diameter 76 mm, thread API 2 3/8" Reg
Water pump	0–200 litres/minute, max pressure 200 bar
Motor power, water pump	77 kW
Water filtration	10–100 mikron
Bit shank	Wassara 3,5
Hammer weight (without drill bit)	32 kg



Product	A (mm)	B (mm)	C (mm)	Weight (kg)	Water cons.. New/worn (litres/min)	Rek. wkng. pr (bar)
W50	895	950	Ø 54–58	13,5	80–130	150
W80 HD	977	1049	Ø 80–92	32	130–200	180
W100	1185	1270	Ø 102–111	56,5	200–350	180
W150	1495	1605	Ø 140–162	165	350–500	150

Read more at: www.geomek.com and www.wassara.com/products.asp

Agenda 2007 Q1/Q2

(Some events at which Wassara will be represented)

- ✦ "The British Embassy's Urban Regeneration Seminar", 14 Feb, Stockholm
- ✦ The potential for Swedish environmental technology, under the auspices of Stockholms Miljöteknikcenter, SMTC, 5 March, Stockholm
- ✦ Foundation Laying Day, 8 March, Stockholm
- ✦ Rock Mechanics Day, 12 March, Stockholm
- ✦ BK Rock Blasting Committee, 13 March, Stockholm
- ✦ Swedish Mining and Tunnel Group (SMTG), 14 March, Stockholm
- ✦ Spring meeting of the British Drilling Association, 18 April, UK
- ✦ Bauma, 23–29 April, Munich
- ✦ "Stora Exportdagen", 7 May, Stockholm
- ✦ World Tunnel Congress & 33rd ITA General Assembly (ITA), 5–10 May, Prague
- ✦ Annual Meeting of the Association for Advanced Drilling – with a study visit to The City Tunnel, 10–11 May, Malmö
- ✦ The Swedish National Board of Housing, Building and Planning's forum "Hållbart är inte dyrt" (Sustainable is not expensive), 15–16 May, Stockholm
- ✦ Swedish Mining and Tunnel Group (SMTG), 24 May, Stockholm
- ✦ Bergforsk, 23–24 May, Luleå
- ✦ Machinery Expo, 31 May–2 June, Barkarby Airfield, Stockholm

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Water Powered Drilling Systems
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byrå

Rolf Karlsson, Site Manager at Hercules Grundläggning, Stockholm Region

"Foundation laying of Rosenlundsterrassen secured with proven technology from Wassara"

Description of the project:

For its client NCC Bostäder, Hercules is carrying out foundation drilling with Wassara W100 and a prototype of the new W120 for a new carpark and a new seven-storey building on Rosenlundsterrassen on the Stockholm island of Södermalm. The drilling operations are taking place next to the "Tax Skyscraper" and run parallel to the concrete wall of the Söderleden Tunnel.

With the previous foundation work in mind, Hercules did not want to risk disturbing the surroundings and they were therefore keen to avoid introducing large amounts of air into the formation.

Hercules have plenty of experience of this technology, including their drilling work next to the Swedish Parliament Building and on the City Tunnel in Malmö. So it was a natural op-

tion to use water-powered technology from Wassara, even though the method was not specified in the paperwork.

In stage 1, 45 holes 3 to 6 metres deep were drilled (RD pile Ø168.3x12.5). The formation consisted of spoil mass on a stratum of cracked rock, below which virgin rock was encountered.

Stage 2 consisted of 60 holes which were drilled with W100 (RD pile Ø140x10.0) and 40 holes which were drilled with a prototype of Wassara's new W120 pipe driving hammer (RD pile Ø170x12.5). These holes were drilled to a depth of 4 to 24 metres and through two existing parking decks.

Result:

According to Rolf Karlsson, the W120 prototype hammer and the model W100 work very well and "go like clockwork". ✦



HERCULES
GRUNDLÄGGNING ■ ■ ■



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