INTERVIEW

Setting the right Tone in sonic drilling

Masayoshi Maeda, chairman and COO of Tone Boring, based in Tokyo, Japan, describes the company and its activities in an interview with GDI

Q What is your background and how did you start in your line of business?
I was born in 1947 in Sapporo, Hokkaido, Japan. I graduated from the mining course of the faculty of engineering of Hokkaido University in 1970 and entered Tone Boring Co Ltd in the same year and worked in the international division. I was appointed director in 1997, president in 1999 and, since 2003, I have served as chairman of the company.

Q Tone Boring is licensed by the Sonic Drill Corporation to service the Asian marketplace and manufactures the same patented drill head as those manufactured by its developer. How did this come about?
High-frequency vibrating drilling ranks as a 21st-century engineering method that evolved from a number of drilling methods which existed in the 20th century. I first came across Sonic Drilling Ltd in the magazine GeoDrilling International. It attracted my interest and I contacted the company myself. The company acquired the licence for the high-frequency vibrating drill in 2002 and started the manufacture and sale of the drill in Asian markets as well as in Japan. At the start of the 21st century, there was a significant increase in experimental projects in geothermal snow-melting in Japan, but a major problem was how to reduce the drilling cost in the total project cost. In particular, the strata in Japan mainly consist of tertiary deposits and it was necessary to develop a rig capable of drilling diverse strata at a depth of 100 m/d. After the introduction of the sonic drill, this hurdle was cleared through drilling tests in various sites in Japan. At the present time, this method is widely used in vertical drilling for geothermal wells, waterwells and large-size deep wells, and in horizontal and inclined drilling for anchoring, groundwater collection and draining wells.

“We are planning local production of the sonic drill in a tie-up with a Chinese partner in the near future. I believe that the introduction of the sonic drill into China will have a major impact on the country”

Q What trends in the drilling industry in Japan and in Asia are you currently observing?
Most noticeably, projects for elevated and underground railroads are being implemented in Japan. The company has succeeded in designing compact civil engineering machines, which are highly valued for work in narrow areas where the emphasis is placed on safety. In addition, overhead piles are becoming larger in diameter and technical innovation by our company has enabled the construction of large piles 2-3m in diameter. The Chinese market is the largest of the Asian markets surrounding Japan. In this age when a global-scale response to global warming is required, the use of geothermal energy has also started to gain momentum in China, which is a country of mass coal and oil consumption. Water shortages in inland regions of China as a result of abnormal weather worldwide will become a serious problem linked with global warming. We are planning local production of the sonic drill in a tie-up with a Chinese partner in the near future. I believe that the introduction of the sonic drill into China will have a major impact on the country.

The company has also been involved in projects for the supply of safe drinking water in Africa through Official Development Assistance by the Japanese government since 1979 but, notwithstanding our achievements over the past nearly 30 years, there is still a long way to go. I think that the further supply of drinking water is an urgent need to improve living conditions in Africa with the assistance of the UN Refugee Agency and UNICEF. I expect that the introduction of the sonic drill, with its ability to drill 100 m/d in such regions, will contribute greatly to the success of projects implemented within a limited time and budget and I hope to demonstrate the effectiveness of this machine in the near future.
INTERVIEW

Q Succeeded in stable operation of 20.9 kW of

and completed in March 2005.

IN THE Akita prefecture of northwest Japan, a
ground grid is being used to keep the entrance
to a tunnel bare and dry in the area’s high Shirakami
mountain range.

Thermal characteristics and
effects of snow-melting system using geothermal
heat in Akita prefecture

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mountain range.

A Tone-Sonic drill rig was used to drill the
ground holes for this project.

The project was commenced in September 2004
and completed in March 2005.

Ten employees were taken
on in the pile and slurry-wall
construction division.

Mainly in their mid-30s, they
are expert engineers with 10
years’ or more experience ranging from construction planning and
design to work supervision. We
regularly appoint our employees
through introductions by university professors with whom we have had
a long-term relationship and we
select universities and departments
according to the type of job.

We are developing a database of the technologies
that we have accumulated based on our history
and achievements over the years and we are
directing our efforts towards training engineering
and manufacturing personnel and developing the
capabilities of technical personnel.

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Describe the process by which you develop
your products.

Development of many of our machines and
engineering methods has been made through joint
development and joint application for patents with
major Japanese general contractors and through the acquisition of
construction information on actual
work projects from constructors. Our
construction division and
design division are developing
machines to meet the needs of the
time. The typical service life of our
machines is about 20 years. Until
about 2000, core components
were manufactured within the
company, but, with changes in the
market, there is now a marked
tendency toward limited production of a wide
variety of products. The production of machines
such as machine tools has been reduced to cut the
maintenance costs of internal production facilities.
At present, we use outsourcing, except for the
manufacture of boring rods and urgently required parts. We outsource to about 200 companies.

Case study: Akita

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It was ordered and financed by the government of
Akita prefecture.

Project scheme

<table>
<thead>
<tr>
<th>Snow-melting area</th>
<th>Area A</th>
<th>Area B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road 700 m²</td>
<td>Pavement 840 m²</td>
<td></td>
</tr>
<tr>
<td>Heat flux required</td>
<td>105 W/m²</td>
<td>180 W/m²</td>
</tr>
<tr>
<td>Meteorological conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow fall rate</td>
<td>1.7 cm/h</td>
<td>2.4 cm/h</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-4.2°C</td>
<td>-5°C</td>
</tr>
<tr>
<td>Snow temperature</td>
<td>-4.2°C</td>
<td>-5°C</td>
</tr>
<tr>
<td>Density of snow</td>
<td>0.08 g/cm²</td>
<td>0.07 g/cm²</td>
</tr>
<tr>
<td>Wind speed</td>
<td>2 m/s</td>
<td>2 m/s</td>
</tr>
<tr>
<td>Thermal conductivity of the ground</td>
<td>1.92 W/m-kelvin</td>
<td>1.79 W/m-kelvin</td>
</tr>
<tr>
<td>Type of ground heat exchanger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single U-tube</td>
<td>without heat-pump</td>
<td>Double U-tube with 45 kW heat-pump</td>
</tr>
<tr>
<td>Length of heat exchanger</td>
<td>100 m</td>
<td>150 m</td>
</tr>
<tr>
<td>Number of heat exchangers</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>Type of rock</td>
<td>Andesite</td>
<td>Andesite</td>
</tr>
<tr>
<td>Drilling performance</td>
<td>8 in surface casings are installed up to 30 m and drilled by 6/8 in Sonic ring bit up to 100 m (six hours)</td>
<td></td>
</tr>
</tbody>
</table>

Data prepared by Japan Ground Water Development Co Ltd for Cold Region Technology Conference 2005

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