Mining Business Explanatory Meeting  August 31, 2018

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Executive Officer,
President, Mining Group
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Mining Business Explanatory Meeting

Contents

1. HCM Mining Business
2. Efforts Related to Mining Products
3. Expanding the Solution Business and the Parts and Services System
History of HCM (1910-1987)

1910
Establishment of Hitachi, Ltd.

1949
Development of U05, the first cable-operated excavator model

1950
Start of mass production

1957
Development of U106 cable-operated excavator

1965
Development of UH03 model, the first hydraulic excavator developed using Japanese technology

1970
Establishment of Hitachi Construction Machinery Co., Ltd.

1979
Development of UH801 ultra-large hydraulic excavator (for US market)

1987
Development of EX3500 ultra-large hydraulic excavator

* Separation from Construction Machinery Division of Hitachi, Ltd.
History of HCM (1989 and later)

1989
Listed in First Section of Tokyo Stock Exchange

1998
Acquisition of controlling interest in Euclid-Hitachi Heavy Equipment, Inc.

2004
Development of EX8000, one of the world's largest hydraulic excavators

2008
Completed construction of Hitachinaka-Rinko Works

2008
Development and launch of EH3500ACII rigid dump truck manufactured in Japan

2009
 Acquisition of Wenco International Mining Systems Ltd.

2013
Development of EH5000AC-3 rigid dump truck manufactured in Japan

2016-2017
Acquisition of Bradken and H-E Parts
Global Network of Mining Business

Development and production are concentrated in Japan, and sales and services are conducted from bases in each region around the world.

~ Development and production are performed concurrently to ensure quality and reliability of mining products ~
Integration of Hitachi Group Technology

- **AC drive control**
  - AC drive system
  - Trolley system

- **Information and communications**
  - GPS system
  - Wireless telecommunications

- **Fleet management**

- **Traffic management**

- **Remote operation/management**

- **Detection/image processing**
  - 3D modeling/mapping
  - Object detection
  - Image processing

**Ultra-large Hydraulic Excavators and rigid dump trucks**
Mining Business Sales Revenue
(Including Solution Business)

(Unit: billion yen)

- Solution Business (Bradken, H-E Parts)
  - Total: 127.5
  - 2012: 21%
  - 2013: 16%
  - 2014: 15%
  - 2015: 15%
  - 2016: 16%
  - 2017: 14%
  - 2018 (outlook): 17%

- Rigid dump truck
  - Total: 230.0
  - 2012: 17%
  - 2013: 15%
  - 2014: 15%
  - 2015: 16%
  - 2016: 14%
  - 2017: 17%
  - 2018 (outlook): 24%

- Excavator
  - Total: 256.8
  - 2012: 27%
  - 2013: 24%
  - 2014: 27%
  - 2015: 27%
  - 2016: 24%
  - 2017: 27%
  - 2018 (outlook): 27%

Total:
- 2012: 163.4
- 2013: 122.1
- 2014: 111.5
- 2015: 120.8
- 2016: 137.7
- 2017: 162.1
- 2018 (outlook): 194.7

FY12: 2012
FY13: 2013
FY14: 2014
FY15: 2015
FY16: 2016
FY17: 2017
FY18 (outlook): 2018
Mining Business Strategy

**Products**
- Strive to strengthen hydraulic excavators and utilize the collective power of Hitachi Group for rigid dump trucks
- Develop ultra-large hydraulic excavators
- Expand sales of AC rigid dump trucks
- Differentiate trolleys

**ICT application**
- Resolve customer issues
- Commercialize autonomous haulage system (AHS) technology
- Enhance FMS - Wenco -

**Value chain**
- Embrace challenge to enter new business areas
- Solution business - Bradken and H-E Parts -
- Strengthen the parts and services business
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Ultra-large hydraulic excavators that boast top-class share in world market

120 to 180 ton class
EX1200  EX1900  EX2600
EX3600  EX5600  EX8000

High operational performance
- Operation monitoring
- Workload monitoring

High operation rate
- Improved reliability/durability
- Improved maintenance ability
- Failure prediction

Optimal maintenance
- Thorough services and support
- Failure prediction
- Operation data sharing
Ultra-large Hydraulic Excavators (Efforts for EX7 Next-generation Model)

Maintaining the previously established high reliability while aiming for further evolution

~ Pursuing further "Customer Interest First" (CIF) through the EX7 model ~

**Fuel consumption reduction**
EX7 fuel consumption is at least 10% lower than that of EX6

**Engine selection** (2 types of engines)
- MTU
- Cummins
- Hitachi electric motor

**Safety improvements**
- Electric cut-off switch
- Inclinometer
- Escape chute

**Reliability**
- Slit-less electric wiring
- Dust entry prevention measures
- Stroke end control

**ConSite OIL is available for EX7**

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“One Hitachi” Approach in Development of AC Rigid Dump Trucks

Development of next-generation machines and progress of rigid dump truck autonomous haulage system (AHS)

Control cabinet
Hitachi, Ltd. Research & Development Group
Electrical Systems Division

Grid box
Hitachi, Ltd.
Electrical Systems Division

Alternator
Hitachi, Ltd.
Electrical Systems Division

Features
- Excellent operational performance, high-efficiency cycle time, and lower maintenance costs
- Class-leading retarder (electric brake) performance

Trolley compatibility
Hitachi Power Solutions Co., Ltd.
Advantages of AC Rigid Dump Trucks

**EH tuning package**
Reduce fuel consumption by tuning for each mine site

- Lower fuel consumption!
- Lower lifecycle costs!

**Vehicle stability control**
1. Slip/slide control
2. Pitch control
3. Side skid control

- Excellent control and stability!

**Aerial Angle**
1. Stationary mode
2. Forward mode

- Excellent safety!

**Trolley**
Industry-leading AC electric powered trolley equipped with IGBT inverter

- Higher productivity!
- Lower lifecycle costs!
Unique technology for tuning AC drive and alternator power generation

Meet customer demands for reduced lifecycle costs!

Aiming to reduce fuel consumption by optimizing the machine settings based on an understanding of the operating conditions at each site.

- Output characteristics of AC drive
  → Optimization of drive power, speed, etc.

- Output characteristics of alternator power generation
  → Optimization of engine speed and output

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Industry-leading AC electric powered trolley equipped with IGBT inverter

Meet customer demands for reduced lifecycle costs!

- Enables travel speeds that are approx. twice as fast as driving with engine and generator
- Hitachi’s unique pantograph features a high level of durability
- Completed series of AC-3 models with trolley system compatibility

Faster climbing and reduced fuel consumption contribute to higher productivity and lower CO₂ emissions
Trolley Video (Advantages of AC Rigid Dump Trucks)
[Overview of Wenco]

- 1987: Company established
- 2009: Restructured as subsidiary of HCM
- Track record of FMS implementation is in the top class of the industry
- Wenco FMS has been implemented at approximately 150 sites around the world, mainly in surface mining operations

Expanding the market focus on small- and medium-sized mining in addition to large-scale mining operations
[Products of Wenco]

**Wencomine**

*<Features>*
- System aimed at large-scale mining operations, designed to appropriately dispatch dump trucks on the scale of several tens of vehicles
- Facilities such as wireless network equipment must be installed at mining sites, so appropriate installation and maintenance costs are required

*<Key points>*
- Currently in operation at large-scale mines around the world (such as Australia, Canada, and South Africa)
- Ranked 2nd in world in terms of number of systems in operation (according to research by Wenco)

**Wencolite**

*<Features>*
- System developed for relatively small-scale mining operations, with limited functions such as vehicle asset management
- Provides capabilities such as operational support for vehicle operators, transmission of information from vehicles to the control room, and communication between vehicles
- Installation and maintenance costs are lower than those of Wencomine

*<Key points>*
- Currently in operation at small- and medium-sized mines, construction sites, etc. around the world (such as in Australia, USA, and Russia)
Rigid Dump Truck Autonomous Haulage System

System that contributes to safety, productivity, and cost optimization by enabling **rigid dump trucks** to perform **autonomous haulage** at mining sites according to specified plan.

**AHS = Autonomous Haulage System**
Advanced Wenco FMS functions serve as the basis for Hitachi AHS

Fleet management system/Dispatch system

- Rigid dump truck dispatch system
- Automatic and manual dispatch enables maximization of productivity

Traffic control system

- Link to FMS
- Specify travel intervals for rigid dump trucks
- Manage multiple loading & dumping points

Rigid dump truck autonomous haulage system

- Use traffic control system instructions
  - Perform autonomous position detection
- Recognize surrounding environment
- Travel autonomously within intervals, even if wireless communications are interrupted
Rigid Dump Truck Autonomous Haulage System

Hitachi AHS development concept

**Scalability**
Hitachi’s railway traffic management system keeps data traffic per unit under control and can handle about a hundred fleets.

**Flexibility**
Rigid dump trucks equipped with Hitachi’s automobile electric control technology and AC motor control technology can be converted into AHS model after delivery.

**Agility**
Realized fast system improvement meeting customers’ needs due to state-of-the-art model-based development and simulation technology.
Progress toward commercialization of Hitachi AHS

2017
  Testing of completely driverless operations at Australia test site

↓

June 2018
  Conclusion of agreement between Whitehaven Coal (WHC) and HCM regarding AHS collaboration and implementation

↓

During FY2018
  Start of WHC testing operations (planned)

↓

FY2019
  Start of WHC commercial operations (planned)

<Topic>
AHS project room opened at WHC-Maules Creek Mine (May 2018)

* HCM site staff began operations on same floor as WHC-AHS project, to strengthen the partnership
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Acquisition of Two Solution Business Companies

Aiming to deepen the value chain of the mining business

**Bradken**
- 1922: Company established
- March 2017: Restructured as subsidiary of HCM
- Expanded to Australia, USA, Africa, Europe, Asia, China, and other areas
- **Main strength: Technical capabilities in molding and casting**

**H-E Parts**
- 2006: Company established
- December 2016: Restructured as subsidiary of HCM
- Expanded to Australia, USA, Chile, Canada, and other areas
- **Main strength: Comprehensive after-market solutions**

<table>
<thead>
<tr>
<th>Bradken Products</th>
<th>H-E Parts Products</th>
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<tbody>
<tr>
<td>GET*, etc.</td>
<td>Comprehensive solutions for mobile mining equipment</td>
</tr>
<tr>
<td>Liners for crushers and mills, etc.</td>
<td>Services &amp; parts for crushing equipment as well as on-site and off-site services &amp; repairs</td>
</tr>
<tr>
<td>Castings for fixed plant mining equipment, etc.</td>
<td>Comprehensive, high-horsepower diesel engine remanufacturing solutions (including rebuilding)</td>
</tr>
<tr>
<td>Specialty castings, etc.</td>
<td>Comprehensive undercarriage parts and GET for mobile construction equipment</td>
</tr>
</tbody>
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*Ground Engaging Tools*
Coverage expanded to include consumable parts for excavators and rigid dump trucks in general, as well as mills and crushers.
Cooperation with Bradken and H-E Parts

Expansion of solution business

- Incorporation of parts and services businesses to cover all machinery at customer sites
- Expansion of procurement system

- Expand sales channels by utilizing each other’s networks
  - Expand sales of Bradken’s undercarriage parts and GETs* for mining equipment (consumables)
  - Utilizing GETs for wheel loaders procured by Bradken

- Newly promote parts remanufacturing business of H-E Parts by collaborating with HCM Zambia

- Establish an operating base of parts remanufacturing business of H-E Parts in Chile

*Ground Engaging Tools
Expansion of Parts and Services System

- Using machine information from each vehicle to determine optimal replacement periods and select items for recommendation
- Building upon the results achieved in Australia to expand to other regions and provide parts and services
- System of setting up parts remanufacturing plants near customer sites to provide support
- Utilizing bases established by H-E Parts and Bradken

Expansion of parts and services system to reduce customer lifecycle costs
Aiming for further evolution of the mining business, 10 years after the full-scale launch of rigid dump truck sales

- Quick and agile development and production
- Striving toward new heights in the pursuit of greater reliability for hydraulic excavators
- Taking the next step forward with implementation of AHS in rigid dump trucks

Aiming for further customer penetration through the expansion of new business areas

- Working toward the establishment of a value chain that provides optimal solutions to customer issues
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