Ferrotec Holdings Corporation

Medium- to Long-term Growth Strategy /Progress Reports

November 27, 2017
The semiconductor market is booming

- In particular, **China's growth rate will rise to the top level in 2018**
  - The effects of the 'China Production 2025' national policy
  - There is also the possibility that **China will take over second place in the world share**, outstripping Taiwan

![Chart showing changes in China's semiconductor manufacturing equipment market from 2014 to 2018 (E) with projected figures for 2017 and 2018 (E).](chart.png)

*Prepared by Ferrotec Holdings based on the Market statistics report by SEMI*
Due to technological trends, **semiconductor demand is sure to continue** into the long term

<table>
<thead>
<tr>
<th>Technological trends</th>
<th>Influence to semiconductor market</th>
</tr>
</thead>
</table>
| IoT                          | Lots of different devices are being newly connected to the network  
⇒ Increase in semiconductor demand (discrete, power system) in new fields |
| 3D-NAND                      | Demand for miniaturization, and for the replacement of high-speed large-capacity devices is emerging  
⇒ Increase in demand for consumable supplies due to complicated process stages               |
| Big data                     | Demand for semiconductor memory increasing for enormous data analysis applications                 |
| AI                           | Increase in integrated data volume due to utilization of big data  
⇒ Increased demand for memory, sensors, etc.                                                   |
| Automatic driving            | Increase in demand for parts accompanying the addition of new functions                            |
| Mobile communications system (5G) | High speed and large capacity, increased number of terminal connections  
⇒ Increase in demand for memory for use in edge servers and for sensors                       |
| Power semiconductor          | Trend toward worldwide power saving  
⇒ Expansion of demand deriving from increased adoption of inverters                            |
Continuing capital investment in order to capture demand

1. **OEM production for semiconductor manufacturing equipment**
   - Contract production in special fields

2. **Increase production of semiconductor material products**
   - Establish new factories in highly profitable fields

3. **Establishment of a new company in Hangzhou, China**
   - To increase production of 8-inch wafers

4. **Capturing market for the utilization of EV vehicles and industrial power semiconductors**
   - Demand for semiconductors accompanying shift towards adoption of EV
Toward achieving the sales target

Continuing capital investment in order to capture demand

1. OEM production for semiconductor manufacturing equipment
   • contract production in special fields
2. Increase production of semiconductor material products

   - Establish new factories in highly profitable fields

   ➢ Won the "Best Supplier Award" from a major US equipment manufacturer

Our semiconductor-related products

- CVD-SiC
- Contract processing
- Quartz
- Ceramics
- Vacuum feedthroughs
- Silicon parts
- Equipment cleaning
- Power semiconductors

Next generation technologies

- IoT
- 3D-NAND
- Big data
- Communications
- Power semiconductors
- etc...
2. Increase production of semiconductor material products

◆ Establish new production base
  ➢ Expand production capacity by establishing new production line
2. Increase production of semiconductor material products

- Increase productivity with smart factory utilizing the IoT

Robotization and automation

The smart factory project is underway (DCB production line)
2. Increase production of semiconductor material products (cleaning business)

- Demands from customers’ factories for increased production of semiconductors, FPDs, and organic EL
  - Factories located in regions in which semiconductor makers tend to gather
  - Fourth factory in Dalian completed
Expansion of peripheral services which we aim to develop as new business

Future development of cleaning business

Cleaning factory

Shanghai
Tianjin
Neijiang, Sichuan
Dalian, Liaoning

Plan
Jinjiang, Fujian
Tongling, Anhui

Customer factory
 Expansion of production capacity – semiconductor material

◆ Started operations at 8-inch wafer factory in China

- Construction of Yinchuan plant and Shanghai plant completed in July, in accordance with the business alliance concluded with GWC Co., Ltd., the third largest manufacturer of wafers in Taiwan

- Started mass production targeting monthly volumes of 50,000 units in October, 80,000 units in November, and 100,000 units in December

- Aiming for monthly production of 150,000 units by the beginning of the new year
3. **Establishment of a new company in Hangzhou, China, for the production of 8-inch wafers**

- With Hangzhou City as a partner, aiming at **monthly production of 300,000 wafers for 8-inch wafers**
- Capital investment requirements to be funded by cash on hand, borrowings, and a subsidy from the city of Hangzhou
Strengthen customer relationship with Global Wafers

- Top runner in China with 8-inch wafer
- The construction of the new 8-inch factory is scheduled to start within the year
- 8-inch market potential of 5.8 million units/month
- Cost competitive advantage with the in-house production of pulling apparatus and crucibles

- Towards a monthly production volume of 850,000 wafers including small diameter wafers
Our products are used in almost all semiconductor manufacturing processes

~ General semiconductor manufacturing process (partly omitted) ~

<table>
<thead>
<tr>
<th>Start</th>
<th>Wafer manufacturing process</th>
<th>(From) Front-end (testing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single crystal ingot pulling</td>
<td>Heat treatment · oxidation · CVD</td>
</tr>
<tr>
<td></td>
<td>Silicon wafer generation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pattern formation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resist processing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Etching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wafer cleaning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inspection</td>
<td></td>
</tr>
</tbody>
</table>

**Coverages of our products**

- Quartz
- CVD SiC
- Ceramics
- Silicon parts
- Vacuum Feedthroughs
- Cleaning
- Contracted processing

Support provided as a follow-up service at all stages

Support provided as a service at all stages

For deposition, etching equipment applications, etc.

For cleaning, oxidation, diffusion devices

For heat treatment equipment

Wafer inspection (probe card)
Structural reform of photovoltaic-related business

- Demand in emerging countries is steady. Improve profitability with higher value-added products.
- Implement structural reforms for the current fiscal year to the next fiscal year.
- Pulling device is in operation for our own 8-inch semiconductor.
- About 50% of crucibles was shifted to semiconductor applications.

Shifted the photovoltaic applications into the semiconductor applications.
Transition to 5G standard for communications in Japan ongoing - with 2020 as target

Anticipate an increase in demand for semiconductors for optical communications

The mobile industry market predicts market size to be twice as large in 2020 (460 trillion yen) *1

Source: *1 Quoted from the Ministry of Public Management, Home Affairs, Posts and Telecommunications’ report ‘5G as a Revitalization Strategy for Japan’

Strengthen communications equipment sector

Thermo-electric Module

Constant temperatures in communications laser diodes, repeaters, antennas etc.
Strengthen core business products

4. Capturing market for the utilization of EV vehicles and industrial power semiconductors

- Anticipate a growth rate in excess of 30% and 3 trillion yen of market size by 2025
- Demand also increases in the automotive field due to the development of Electric Vehicles (EV)
- Continue to increase production Toward 1.8 times of production capacity

The world market for power semiconductors

- Bullet trains
- Electric Vehicle
- Welding robots
- Temperature controlled seats for automobiles
- Air conditioners

<table>
<thead>
<tr>
<th>Year</th>
<th>In 100 millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>24,239</td>
</tr>
<tr>
<td>2025 (Forecast)</td>
<td>31,799</td>
</tr>
</tbody>
</table>

*Prepared by Ferrotic Holdings based on the data by FUJI KEIZAI CO.,
Increase in automobile products in response to the spread of EV

- Including combined electric and gasoline PHV vehicles, the market for EV will exceed 10 million units in 2035*
- In addition to Britain and France, China is also going to restrict gasoline-powered vehicles
- Demand is surely set to rise in response to the increase in assemblies

*Prepared by Ferrotec Holdings based on the data by Fujitsu SEMI
Enhance automobile-related field – expansion of automobile products

• Start automobile-related project with the development of EV

Target 20 billion of sales for 3 years

Potential products

- Related products of current sensor for EV
- Battery cooling system for EV
- Head-up display
- Magnetorheological suspension
- Sub air conditioner for EV
- Rider communication chip
With continuing its capital investments, we target **net sales at 100 billion yen** and **operating margin at 10% level** for FY3/19.

### Sales target

**In 100 millions**

- **Semiconductor and other equipment-related**: 43~46 billion yen
- **Electronic device**: 19~22 billion yen
- **Photovoltaic-related**: 18~20 billion yen
- **General industrial equipment (Others)**: 14~16 billion yen