ULVAC’s Growth Strategy in the coming Smart Society

Dec. 2019
ULVAC Inc.
Growth through overcoming violent ups and downs

Listed on the first section of the Tokyo Stock Exchange(04/4)

Established in 1952
Contributing to Industrial Development with Vacuum Technology

Asset bubble collapse (Japan)

Asian financial crisis (Korea)

Growth by Japanese electronic devices and semiconductor manufacturers

Growth by semiconductors and LCDs

V-shaped recovery

IT bubble collapse

Financial crisis

Growth by LCDs in Korea & Taiwan

Forecast

(Unit: ¥1 billion)
Sales by segments

Growth in
① FPD,
② Semiconductor, Electronic Devices related business
③ Component business

Structural reform


Other
Materials
General industrial equipment
Components
Semiconductor and electronic device production equipment
FPD and PV production equipment

(Unit: ¥1 billion)
Profit margin improved steadily

**Gross profit margin**

- Increase sales ⇒ Increase profit margin
- Increase in semiconductor electronics / component ratio (High level of profit margin)

**Operating margin**

- Visualization → Reduce product loss
- Suppressing subsequent costs
- Fixed cost control

Establish profit structure:

- Visualization → Reduce product loss
- Suppressing subsequent costs
- Fixed cost control

FY2022 16%
Enhancing Shareholders’ Equity and R&D Investment for the future

Shareholders’ Equity Ratio

(Unit: ¥1 billion)

Shareholders’ equity ratio:

- FY2010: 28.1%
- FY2011: 37%
- FY2012: 67%
- FY2013: 99%
- FY2014: 148
- FY2015: 151
- FY2016: 40.2%
- FY2017: 53.5%
- FY2018: 49.6%

Capital Expenditures (actual and forecast)

(Unit: ¥1 billion)

<table>
<thead>
<tr>
<th>Year</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2018</th>
<th>FY2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast</td>
<td>7.0</td>
<td>8.3</td>
<td>9.2</td>
<td>9.6</td>
<td></td>
</tr>
</tbody>
</table>

R&D Expenses (actual and forecast)

(Unit: ¥1 billion)

<table>
<thead>
<tr>
<th>Year</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2018</th>
<th>FY2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.3</td>
<td>6.9</td>
<td>8.3</td>
<td>9.2</td>
<td>9.6</td>
</tr>
</tbody>
</table>
Growth Strategy


Growth strategy

1. Semiconductor and electronics
   - Successful entry into the logic field related to EUV.
   ⇒ Future expansion (Entering two major companies)
   - Growth of new nonvolatile memory (PCRAM, etc.)
   - Growth in Memory.
   - Incorporating 5G-accelerated innovation into business opportunities.
     (MEMS sensor / communication device / power device / packaging / optical etc.)

2. FPD・PV
   Medium-Large OLED panel, Battery (RTR)

3. Growth of Stable business
   Components, Materials, Customer support
## Business Result for 1Q FY2019 and Order Trend

<table>
<thead>
<tr>
<th>FY2018</th>
<th>FY2019</th>
<th>Progress against 1H Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orders Received</td>
<td>218.5</td>
<td>98.6</td>
</tr>
<tr>
<td>Full Year Result</td>
<td>206.0</td>
<td>35.2</td>
</tr>
<tr>
<td>1H Forecast</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>Full Year Result</td>
<td>205.0</td>
<td>46.8</td>
</tr>
<tr>
<td>Order Trend</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Net Sales</td>
<td>220.7</td>
<td>97.5</td>
</tr>
<tr>
<td>Full Year Result</td>
<td>205.0</td>
<td>46.8</td>
</tr>
<tr>
<td>1H Forecast</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Full Year Result</td>
<td>205.0</td>
<td>46.8</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>23.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Full Year Result</td>
<td>22.5</td>
<td>4.9</td>
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<tr>
<td>1H Forecast</td>
<td>58%</td>
<td></td>
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<tr>
<td>Full Year Result</td>
<td>22.5</td>
<td>4.9</td>
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<tr>
<td>Net Income</td>
<td>18.7</td>
<td>6.0</td>
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<tr>
<td>Full Year Result</td>
<td>15.5</td>
<td>3.4</td>
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<tr>
<td>1H Forecast</td>
<td>57%</td>
<td></td>
</tr>
<tr>
<td>Full Year Result</td>
<td>15.5</td>
<td>3.4</td>
</tr>
<tr>
<td>1Q Result</td>
<td>3.4</td>
<td></td>
</tr>
</tbody>
</table>

### Quarterly change of Order received (Unit: ¥1 billion)

<table>
<thead>
<tr>
<th>FY2019</th>
<th>FY2018</th>
<th>FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Q</td>
<td>35.2</td>
<td>44.9</td>
</tr>
<tr>
<td>2Q</td>
<td>39.3</td>
<td>44.9</td>
</tr>
<tr>
<td>3Q</td>
<td>35.2</td>
<td>42.4</td>
</tr>
<tr>
<td>4Q</td>
<td>54.2</td>
<td>52.3</td>
</tr>
</tbody>
</table>

※The cancellation of contract for ¥3.4 billion due to the cancellation of FPD related contract (allowance for doubtful accounts booked in 4Q 2019/6).

Excluding the cancellation contract, orders received would be ¥6.1 billion for FPD and PV and ¥38.6 billion on consolidated basis.
• LCD production facilities for large-sized TVs (G10.5 in China) are scheduled to begin production gradually from 2019 through 2021
• Investment in OLED for smart phones is expected to continue ⇒ FPD-related investment is expected to be sluggish for 1 or 2 years
• Expansion of the medium/large-sized OLED market by anticipated increase in applications ⇒ Collaboration in development for mass production with top manufacturers (Contribution to our Sales is expected to be 1 or 2 years later)
Expanding business opportunities by shifting to OLEDs

Characteristics of OLEDs

- Flexibility
- Enable to be made thin and lightweight
- Possibility of cost reduction

Expansion of applications for OLED displays

- Foldable smart phones
- Wall-hung large-screen displays
- In-vehicle flexible displays
- Rollable displays
- Transparent displays

Technological challenges

- Development of equipment for large substrates
- Structural change (Evaporation process ⇒ Sputtering)
- Development for mass production

ULVAC’s strengths

- Sputtering on large substrates and transport technology
- Expertise in sputtering equipment
- Collaboration in development for mass production with top manufacturers

Aim for top share in medium/large-sized OLED market
Smart society: Shift to electronics in every industry

Global social problems: population expansion, aging population, concentration in cities

- Shortage of medical care
- Shortage of food and water
- Shortage of energy
- Traffic congestion
- Changes in the natural environment

Technological solutions

Smart society

Anytime | Anywhere | Wireless | High-speed | Prediction | Low power consumption | Autonomous

Medical and healthcare | Agriculture | IT | Electric power | Transportation and distribution
Technology for enabling a smart society = Growth market

Applications

- Automobile (autonomous-driving)
- Finance (blockchain)
- Drones (unmanned delivery)
- Food (smart agriculture)
- Smart phones (healthcare)
- Medicine (remote medicine)

Smart systems

- IoT
- AR/VR
- Big data
- AI

Growth markets (key technologies)

- Semiconductors (memory & logic), new non-volatile memory, MEMS, Sensors, Communication devices, Power devices, Li-ion batteries (LIB), Advanced packaging, OLED displays, Solar panels

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Big opportunity occurred only once every few decades

5G accelerates the development of a smart society
- Ultra fast x100
- Ultra low latency x1/10
- Massive connectivity x100

Increase in multiple connection data

Cloud computing

Edge computing

Sensors, communication devices, batteries

Technical innovations required for a smart society

Higher capacity servers, high-speed processing,

lower energy consumption

Devices that are multi-functional, environmentally tolerant, small, low-cost, self-powered, and use new energy

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ULVAC’s technical advantage: Integration of core technologies (semiconductors, electronic device, energy, packaging)

Thin-film processing technology and new materials are needed to support these technologies!!
ULVAC’s strategic collaborations in PiezoMEMS

Europe
- Advanced technology development
- Collaboration with major leading manufacturing foundries

China
- Next giant MEMS market
- Entry into China’s ecosystem

SEA
- New growth market
- Collaboration with leading research institutes and foundries

US (Silicon Valley)
- Technical collaboration with startup companies
- New business model with system owner companies

Australia
- New Application (Biomedical, Digital agriculture)
- Technical collaboration with leading research institutes

Acquire top position in both technology development and business development
Local production systems, supply chains, and networks built in individual expanding markets and regions
Realizing new value: SaaB (Service as a Business)

Attract new customers by using ULVAC’s wide technical coverage, strengthen marketing

♦ Use ULVAC technology platform
  • Using ULVAC equipment for prototyping and testing as a business expansion tool.
  • Capture new potential customers

♦ Provide One-Stop Service
  • Achieve mass production in a short time through one-stop service from prototyping to mass production stage

Market expansion, New business creation
Semiconductor Market Environment: Memory

Memory market

- Active investment by memory manufacturers in 2017 to 2018 ⇒ Oversupply and significant price declines
- Postponement of investment by memory manufacturers from the end of 2018 ⇒ Investment is not expected to fully resume until 2020 or later due to high-tech trade friction between the US and China (Investment in 2019 to 2020 is forecast by SEMI to be lower than in 2018)
- Growth in DRAM and NAND demand (memory capacity) ⇒ After realization of the smart society, the current forecast may be exceeded

Semiconductor Manufacturing Equipment Market Outlook (SEMI) 2016 = 100

Source: Gartner

DRAM demand (shipment volume) forecast

Source: Gartner

NAND demand (shipment volume) forecast

Source: Gartner
Semiconductor Market Environment: Logic

**Logic market**
- Investment on par with that for memory (DRAM and NAND)
- Logic-related investment is stable (¥4.4-4.7 trillion)
- Future growth is expected for advanced miniaturized products ⇒ Focus on capital expenditures (Advanced miniaturized products will not be fully developed until 2020 or later)

**Success in entering the logic field**
- Two major manufacturers rated us higher than the competitors in the sputtering process required for miniaturization in EUV process ⇒ Certified as standard equipment
- Grow by expanding business to logic foundry manufacturers who are pursuing miniaturization

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**Semiconductor capital expenditure amount (2018)**
- NAND 3.5
- DRAM 1.8
- Logic 4.5
- Other 1.0

(Exchange rate: $1=¥110)

- Source: Gartner

**Logic capital expenditures**
- (Unit: ¥1 billion)
- 2018: ¥3,000, 2019: ¥4,000, 2020: ¥5,000

**Demand forecast**
- CAGR 46.5%*
- 5/7 Nano logic:
  - 2018: ¥1,000, 2019: ¥2,000, 2020: ¥3,000
- General logic:
  - 2018: ¥2,000, 2019: ¥3,000, 2020: ¥4,000

*Source: Gartner
Semiconductor Market Environment: New non-volatile memory (PCRAM)

**New non-volatile memory market**

- Memory positioned between NAND and DRAM in that it 1) has a faster processing speed than NAND, and 2) unlike DRAM, it is non-volatile (memory is preserved even if power supply is cut)
  ⇒ Contributes to high-speed processing of big data and energy conservation
- PCRAM can be used to replace DRAM-based DIMMs on servers. Other applications will also be developed.

**ULVAC’s strengths**

- ULVAC is the only equipment supplier to enable mass-produced film deposition system for PCRAM
- Providing equipments to several major leading manufacturers at mass production level
- Supporting the development for next-generation products of manufacturers as a partner

**Note:** Emerging Memory includes MRAM, ReRAM, PCRAM, etc.

Source: Gartner 2018
MEMS sensors

**Demand forecast**

- **CAGR 16.9%**
- **Demand forecast graph showing** years 2018 to 2022 with peak at 300 billion yen in 2022.

**Characteristics and market growth**

- Expansion of market for VR/AR, microphones, LIDAR, and other sensors to support 5G/smart society.
- Anticipated expansion of applications and markets by raising the performance and lowering the cost of MEMS devices used in sensors.

**ULVAC’s strengths**

- Achieved low-temperature process using PZT sputtering equipment.
  - Enable PZT thin-films on CMOS.
  - Enable development and production of high-performance MEMS devices.

**Growth strategy**

- Leverage our PZT-MEMS sputtering equipment technology, which we launched ahead of our competitors.
- Capture market share by using the advantage being the first development, mass production supplier working with major research institutes and manufacturers in Europe and Asia.
- Support next-generation process development.
Power Devices

Demand forecast

(Unit: ¥1 billion)

CAGR 12.1%

2018 2019 2020 2021 2022

Source: Yole 2017

Characteristics and market growth

• Increase in Si-IGBT production expected mainly for Japanese automobiles

• Increase in market entries by Taiwanese, Chinese, and South Korean manufacturers (China particularly is moving in the direction of domestic-made products: currently around 5%)

• In China and Europe, demand for SiC for replacements in electric vehicles is expected starting around 2023

ULVAC’s strengths

• Si-IGBT experience in Japan (more than 100 units for sputtering of 200 mm mass production line (backside))

• Maintain a share of nearly 50% in stable high-temperature injection technology for SiC implants

Growth strategy

• In addition to the existing 200 mm sputtering equipment, we will add 300 mm to the development lineup to maintain and increase our share

• Ion injection increases incoming orders by promoting equipment that is cost-effective due to in-house sourcing of ions, 300 mm-compatible equipment, and by installing Si-IGBT mass production lines
Next-generation Li-ion Battery

Characteristics and market growth
- In-vehicle LIB demand: 40 GWh in 2018 ⇒ 177 GWh in 2022
- The challenge is to increase the running distance of electric vehicles (EV) ⇒ Need to increase in-vehicle LIB capacity, reduce size and weight, develop quick recharging capability, etc.
- Solution: Focus on lithium metal thin film (vacuum evaporation using RTR*) as a negative electrode material for next-generation LIBs

ULVAC’s strengths
- Collaboration with leading companies, universities, and research institutes ⇒ Establish RTR*-type metal lithium evaporation technology
- Developing and testing mass production manufacturing with leading companies (use experience in two-sided deposition for LIBs)
* RTR (Roll to roll: ULVAC’s market share is over 90% in RTR evaporation equipment for in-vehicle high-capacity capacitors)

Growth strategy
- Support the advancement of mass production for leading global battery manufacturers using technology experience of RTR evaporation and RTR metal lithium evaporation (two-sided deposition equipment)

LIB capacity forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (GWh)</th>
<th>CAGR 45.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>160</td>
<td></td>
</tr>
</tbody>
</table>

Source: Interviews by ULVAC

RTR Li-ion battery production equipment
ULVAC vacuum technology contributes to many industries and applications

- Automobile
- Semiconductor
- Flat Panel Display
- Photovoltaic
- Food Processing
- Aircraft
- Bio
- Smart Phone
- Magnetic Device
- Home Appliance
- Aerospace
- Pharmaceutical
- Wearable/VR
- Power Device
- MEMS Device
- Architectural Glass
- Optical
- Flexible
- Packaging Materials
- Next Generation Light