Strategy of HDD Heads Business and Magnetic Sensors Business

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HDD: Maturity stage to declining stage

1) PC market will be decline and HDD for PC will be decline.
2) HDD will shift to High capacity market.

⇒ HDD volume will decrease. **Head volume will be flat.**
Change and technology innovation of HDD industry

- Marge business unit and efficiency up
- It still needs R&D activities / R&D investment in HDD and HDD Head.
  - Needs multi disk technology and becomes longer testing time for reliability for high capacity HDD
  - Thermal assist Head (TAMR)
  - Two dimension MR (TDMR)
  - Micro dual stage actuator (Micro DSA)
- HDD maker did big investment into NAND industry
Business Strategy of Magnetic Head & Sensor

- Taking strategy to develop HDD technology continuously with keeping enough profitability.
- Together with another clear strategy for growing market.

- Strategy for HDD Head
  - Recent breakthroughs will enable TAMR products.
  - Precedence of micro DSA for narrow track technology
  - Efficiency up for supply chain in HDD industry and supporting backend process
    ➤ Advanced technology, High productivity & Low cost will contribute HDD industry.

- Strategy for Magnetic sensor
  - Applying magnetic technology and process to Magnetic Sensor business.
HDD Suspension Business

◆ Background of acquiring HTI & Supply chain of HDD ~ Suspension

- Supply Chain
- Circuit
- Etching & Mount plate
- HDD Suspension
- HDD Head
- HDD

Technology Innovation
- TAMR needs more narrow pitch for Circuit
- DSA technology needs Innovation for TPI up
- Technology break through for TAMR & Multi disks technology

Vertical Integration for Suspension

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<tr>
<th>Components (○ Internal Components)</th>
<th>Suspension Assemble</th>
<th>HDD Head</th>
<th>HDD</th>
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<td>TDK/MPT</td>
<td>TDK/SAE</td>
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<td>HTI</td>
<td>Company B</td>
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<tr>
<td>Mount Plate</td>
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Synergy for All TDK
- Making suspension components internally & efficiency up for SG&A,R&D.
- More automation for Suspension assemble
- Getting circuit technology for TAMR generation

Advanced technology & Low cost solution by Vertical integration in HDD suspension components will enable us to contribute to the HDD industry.
Business Strategy of Magnetic Head & Sensor

As for "Magnetic sensor company" TDK becomes.

1) Establish business basis first.
   - More capability for products design, development, ASIC design and getting production capacity.
   - Expand products line up.
   - Expand customer basis. (More than 40 Customers.)

2) Becoming general magnetic sensor company.
   - Add many type of sensor on MR.
   - More downstream, like module / system.
   - Combination with other TDK products, like magnet and electric components.

 Expansion for magnetic sensor for automobile / industrials / consumer market.
Magnetic Sensor in Automobile market

**Accelerating**
- Electric throttle valve system
- Engine Management:
  - Cam timing
  - Crank timing
- Drive by wire
  - Accelerator

**Braking**
- Wheel Speed Measurement:
  - ABS
- Indirect TPMS with ABS
- Brake by wire

**Steering**
- Hydraulic
- Electric (EPS)
  - Torque sensor
  - Angle sensor
- Steer by wire
  - EPS

**Autonomous Driving**
1) TMR sensor and adding various types of sensor
2) Growing toward to overall magnetic sensor company
   ➔ Applying High Accuracy & High Output for Linear scale in industrial market
   ➔ Encoder for Single-lens reflex camera
   ➔ Focusing for Smartphone application
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