

III. Intellectual Property and R&D in Main Target Businesses

Hitachi is strengthening advanced technology further and giving full play to collective Group strengths for creating products that can maintain the No. 1 or No. 2 market share in their respective segments. These efforts have contributed to solutions in the “Social Innovation Business” and “Infrastructure Technology / Products” (See in previous section) for both Japanese and overseas markets. Below are three examples of excellent product solutions.

1. Industry-leading disaster response system and improved durability elevators

The earthquake that struck northwestern Chiba Prefecture on July 23, 2005 registered a seismic intensity of five on the Japanese scale and caused about 64,000 elevators to temporarily stop operating in the Tokyo metropolitan area. In addition, there were 78 incidents of people trapped inside elevators and it took over 20 hours to restore all operations to normal. This earthquake immediately brought to the fore the question of elevator safety during a disaster. Related issues were also exposed such as (a) how to reduce the number of elevators that come to a stop during an earthquake, (b) how to prevent people from becoming trapped, (c) how to rescue people quickly, and (d) how to quickly restore elevator operations to normal.

In addition to these issues, as Japan becomes an aging society, people want elevators to be both safer and more convenient to use. To respond to all these needs, Hitachi has developed an elevator that has enhanced durability and incorporates a new wide-area disaster response system. The new elevator features a number of innovative improvements. The first improvement is an “automatic diagnostic and recovery system” that enables quick rescue and restoration to normal operations. The second improvement is a “wide-area disaster response and restoration support system” that uses remote monitoring to accurately assess on-site damage conditions. Remote monitoring avoids the use of phone lines that may become congested during an emergency, and enables instructions to be given over a network. The third improvement is an “earthquake control operation device” that automatically verifies safety and recovery conditions before restarting the elevator and sending occupants to safety to the nearest floor. This feature is designed to reduce the number of people who become trapped if the elevator stops between floors during an earthquake. The fourth improvement is an “earthquake control operation system with a long-period seismic sensor.” The sensor is the first of its kind that can detect long-period seismic activity inside skyscrapers. The development of this industry-leading elevator with advanced emergency response and improved toughness together with Hitachi’s support system will enable the time to total recovery to be reduced from 20 to within six hours.

Intellectual property activity related to these earthquake response technologies is based on a unified strategy of preservation and product development to promote patent creation and incubation. IP activities in this area have thus far resulted in 29 patent registrations and another 105 patent applications under examination.

Going forward, Hitachi will promote the security, safety, comfort, and convenience of the new elevator system and the benefits to society in disaster recovery and reduction of elevator entrapment. At the same time, these promotional activities will enhance the value of the Hitachi brand.

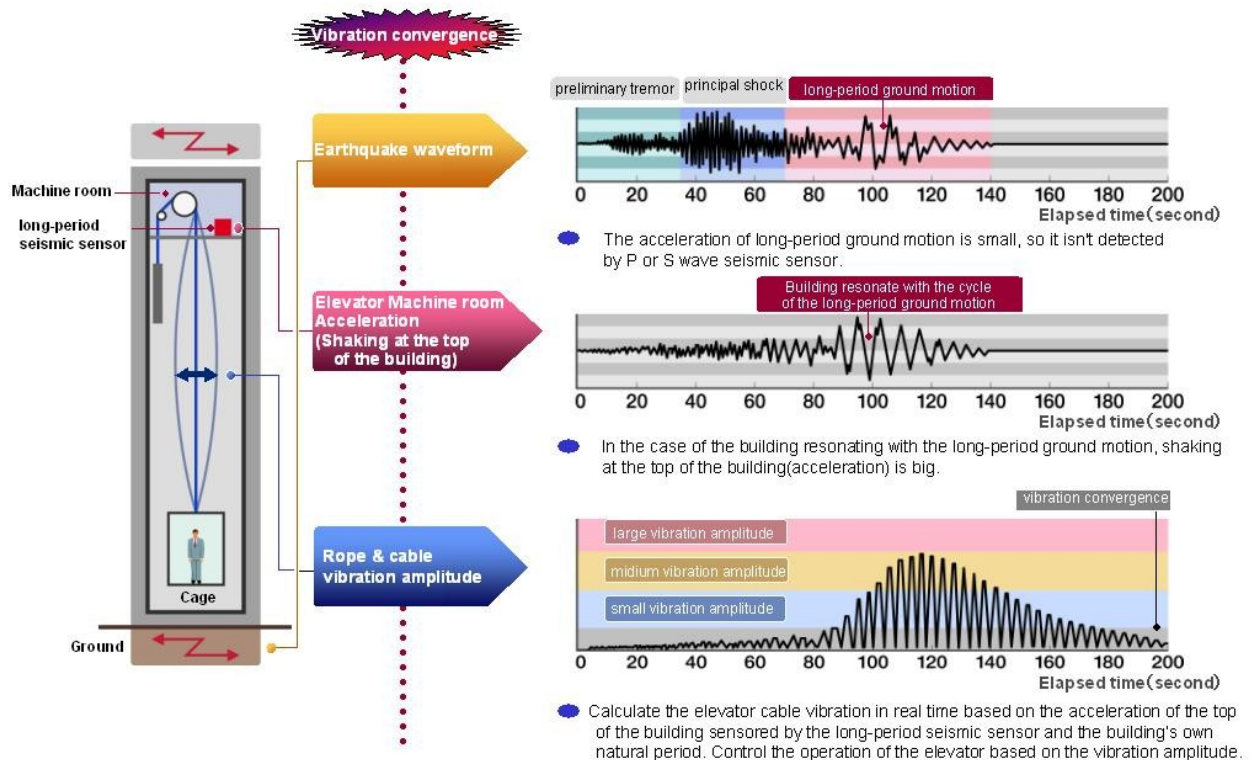


Figure 3.1 Earthquake Control Operation System with Long-Period Seismic Sensor

2. High-density 2.5-inch hard disk drive based on perpendicular magnetic recording

Last year marked the 50th anniversary of the commercialization of the first hard disk drives, which were initially applied as information storage peripherals for mainframe computers. Over the decades, manufacturers have consistently increased the capacity of hard disk drives while reducing their size. Drives today enjoy 10,000 times the capacity and 10 million times the recording density of their ancestors. In addition to use in computers, hard disk drives can now be found in TV recorders, car navigation systems, mobile audio players, and a host of other consumer electronics. The market for drives is expected to nearly double by the year 2010 with sales approaching 700 million units.

The rapid growth of the hard disk drive market can be attributed, along with the increase in digital data, to extremely high capacity coupled with relatively low price per bit. Hard disk drives command superior price competitiveness even compared with flash memory, whose price has been dropping dramatically.

Through the years, Hitachi has developed various innovative technologies to support ever greater disk capacities. These technologies include thin film magnetic heads in the 1980's and magnetic resistance type reading sensors in the 1990's. Over the past few years, however, developers have begun to see the physical limit in refinements to the longitudinal recording method used since the birth of the hard disk drive. Working under this limitation has thus made it increasingly difficult from a technological standpoint to expand capacity horizons further.

To overcome this physical barrier, Hitachi adopted a perpendicular magnetic recording (PMR) method. The PMR method was invented by Professor Shunichi Iwasaki of Tohoku University

(currently President, Tohoku Institute of Technology) in Japan in 1977. At the time it was an extraordinary landmark in the development of data recording technology. Now, after some 30 years of industry-academia-government cooperation, the method is being implemented in data storage products by several manufacturers. In May 2006, Hitachi began mass production of a 2.5-inch PMR hard disk drive. The most important factor on the road to commercialization has been to ensure product reliability. So Hitachi has worked closely with Hitachi Global Storage Technologies (Hitachi GST) to develop and introduce new technologies for components, devices, and manufacturing processes. The final product is the Travelstar 5K160, which has received high marks in reliability from PC manufacturers. In addition, this product has received the 49th Best Ten New Products Award (Nikkan Kogyo Shimbun Ltd.) and the 53rd Okochi Memorial Production Prize.

Intellectual property activity related to PMR technologies is based on a unified strategy of business and development to promote patent creation and incubation within a global R&D environment. As of the end of FY 2006, IP activities in this area have resulted in 112 Japanese and 100 overseas patent registrations, 275 Japanese and 240 overseas patent applications under examination (after laying open), and 50 Japanese and 50 overseas patent applications under examination (before laying open). Going forward, Hitachi will spare no effort to further strengthen patent-related activity in this area.



Figure 3.2
Travelstar 5K160: 160 GB 2.5" Hard
Disk Drive using PMR Technology

3. IPS liquid crystal display (LCD)

LCD panels are used in a wide range of products from large, flat panel televisions to mobile communication devices. In 2002, all departments related to the display business of Hitachi, Ltd. (such as planning, development, design, manufacturing, and sales) were spun off to form a separate company called Hitachi Displays, Ltd., a specialist in the manufacture of LCD panels. Hitachi Displays cooperates closely with IPS Alpha Technology, Ltd. (a specialist in large LCDs for flat-panel TVs) and other domestic and overseas affiliates to form a core of partners in charge of the LCD display business for the Hitachi Group.

LCD displays were originally used in watches, calculators, and other small electronic appliances. In the beginning, they were only used to display extremely simple alphanumeric characters. In the years that followed, innovation in LCD technology advanced to the point that LCD panels started to attract a lot of attention as a replacement for the age-old cathode-ray tube found in standard television sets. Today LCD panels are used in a wide variety of products.

In 1995, LCD panels received a big boost in usability with the development of in-plane switching (IPS) technology. IPS was a landmark innovation that swept away the notion that LCD panels only had a narrow viewing angle. IPS technology introduces a horizontal electric field in which liquid crystal molecule revolve in a plane parallel with the TFT substrate. The simple movement of these molecules achieves superior performance in terms of viewing angle, color reproduction, and response speed to halftones.

In 1996, Super TFT debuted as the first product by Hitachi to use IPS technology. The technology has since evolved into Super-IPS and Advanced-Super-IPS, each with even wider viewing angle.

In 2006, the technology reached new heights with the release of IPS-Pro, which combines a wide-viewing angle and a high-aperture ratio. IPS-Pro technology has a broad range of applications, from large LCD TV panels to mobile communication handsets. The excellent high-aperture ratio of IPS-Pro coupled with new image processing technology has led to the commercialization of many new products. One example is a thin IPS LCD module that is half the width (1.29 mm) of existing products. This is achieved by combining an extremely energy efficient and mobile IPS LCD panel, a thin backlight, and 0.2-mm thick glass. In response to the planned launch of new services for mobile phones (such as full browser view, map search, picture view, and 1Seg) in December 2006, Hitachi made possible released of a 2.9-inch wide, high definition (WVGA) IPS LCD.

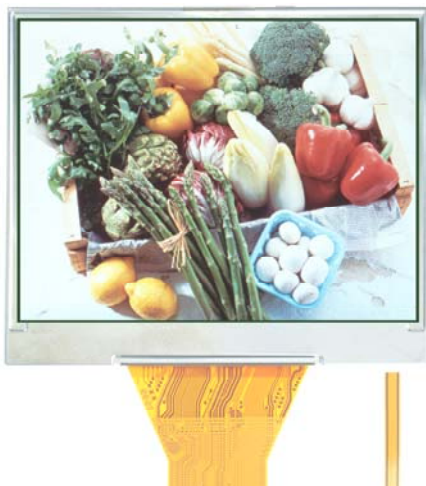


Figure 3.3 2.9-Inch Wide IPS LCD

The objective of intellectual property activity related to IPS is to keep in sync with how the technology evolves and thereby be in a position to create and incubate strategic patents. As of the end of FY 2006, IP activity in this area has resulted in over 400 patent registrations (Japan and overseas) related to IPS technologies, and over 2,100 patent registrations (Japan and overseas) related to liquid crystal technologies. Going forward, Hitachi aims to increase the number of patent registrations even further and strengthen cooperation between R&D activities and patent activities.

Click on the link below to read more details about IPS technology.

http://www.hitachi-displays.com/technology/2060974_17271.html

* IPS is a registered trademark of Hitachi Displays, Ltd.