

LED Production Equipment Market: Key Research Findings 2009

➤ Research Outline

Yano Research Institute has conducted a study on the world LED production equipment market as described below.

1. Research period: May to July 2009
2. Research targets: LED production equipment manufacturers and trading companies (18 firms in total)
3. Research methodologies: Face-to-face interviews with relevant personnel, supplemented by interviews via telephone and e-mail, and literature researches.

<What is LED production equipment market?>

LED chip (element) production is consisting of thin-film deposition on the wafer by epitaxial growth (MOCVD equipment), electrode formation (photolithography and related equipment), chip dicing (scribing, breaking equipment). Then, LED chip will be bonded on a circuit board such as PCB (die bonder) and sealed with plastic (molding equipment). In this research, the world market for the major LED chip (element) production equipment, including MOCVD equipment, laser scribing equipment and molding equipment which is noteworthy for the future packaging process is reviewed and analyzed by each type of equipment.

➤ Key Findings

◆ World MOCVD equipment market in fiscal 2008 was 38.8 billion yen, and expected to be 45.3 billion yen in fiscal 2009.

In fiscal 2008, since LED manufacturers centered in Taiwan, a major LED production region, have enhanced their production facilities, the world MOCVD equipment market is estimated to be 38.8 billion yen, increased by 44% compared to the previous year. In fiscal 2009, although there is a concern for negative impacts of the world economic recession, demand increase can be expected for liquid crystal display backlight and lighting applications in Korea and Taiwan, and the manufacturers are planning to install additional MOCVD equipment in the second half. As full-scale recovery of capital investment will be realized, the market is expected to grow by 17% compared to the preceding year, and reach to 45.3 billion yen.

◆ World laser scribing equipment market is estimated to be 3.0 billion yen in fiscal 2008, and 4.0 billion yen in fiscal 2009.

The installation and use of laser scribing equipment is spreading centered in Taiwan due to its high productivity (high throughput). The market size in fiscal 2008 is estimated to be 3.9 billion yen, increased by 30% compared to the previous year. The market size in fiscal 2009 is estimated to increase by 3% from the preceding year to 4.0 billion yen, as the growth will continue in and after 2009 as well.

◆ World molding equipment market is estimated to be 2.2 billion yen in fiscal 2008, and 4.1 billion yen in fiscal 2009.

The market of molding equipment which is expected to be an efficient production system for LED high-intensity packaging has started its full-scale growth in 2007-2008. As the installation and use of the equipment has been spreading among the US, European and Taiwan manufacturers, the world market size in fiscal 2008 has been estimated to be 2.2 billion yen, increased by 52% compared to the previous year. In fiscal 2009, the introduction to Japanese manufacturers will further progress, and the market will grow to 4.1 billion yen, by 82% compared to the preceding year.

◆ The future market growth depends on the development of a "standard" system, and preparation of business models which combine "integrated production process", and "materials and elements" together.

In order to achieve the production cost reduction required for the further spread of LED in the future, it will be necessary to develop special purpose machines designed and optimized for LED production. Further, it will be important to address the advantage of production stability which could be achieved by an integrated production system which includes pre and post processes together, or to establish business models, not only to sell the equipment, but to combine the related materials and elements.

➤ Report format:

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➔ Research Summary

1. MOCVD equipment market

1) Market overview

In Taiwan, LED chip production capacity in fiscal 2008 has increased by 37.9% compared to the previous year to 13.31 billion pieces per month, as a result of positive M&A in recent years in view of improving cost competitiveness, production volume increase for each processes, and total production capacity enhancement. Also in Korea, the LED chip production capacity in fiscal 2008 has increased to 780 million pieces per month, doubled compared to the fiscal 2005 (216.6%), in response to the increased demand of LED for the backlight of LCD (its main application) used in mobile phones and LCD televisions, as Korean manufacturers have made remarkable progress in the global market.

Based on the positive production capacity enhancement mainly among Taiwan and Korean LED manufacturers, the market of MOCVD equipment which is used in the first process of LED chip manufacture has been growing steadily, and its world market size in fiscal 2008 has been estimated to be 38.8 billion yen (increased by 44% compared to the previous year).

2) Market perspectives

In fiscal 2009, the demand of LED is expected to increase for the backlight of LCD used in note PCs and LCD televisions. In Korea, considerable investment is scheduled for the reinforcement of MOCVD equipment. The LED production in Korea is expected to be vertically integrated, focusing on supplying LED for their own products within their group. Although the production capacity in Korea will be enhanced, the outstanding shortage of LED will be resolved by increasing the import from Taiwan and China. In Taiwan, the LED chip production factories have been in full operation since the beginning of 2009, and the capital investment is expected to start increasing in the latter half. Although many people appear to be cautious about the capital investment in Japan, the investment in Taiwan and Korea is expected to offset this trend. Some MOCVD equipment manufacturers are receiving purchase orders which occupy all of their production capacity until the end of the year.

As a result, the market in fiscal 2009 is expected to increase by 17% compared to the previous year to 45.3 billion yen, and the demand to continue increasing steadily in fiscal 2010 as well, expanding the market to 58.9 billion yen, increased by 30% compared to the preceding year. The positive capital investments implemented from now on, in view of the expected demand for backlight applications, however, will be peaked out, and the demand in 2011 will be flattened as a reaction. As a result, the market in fiscal 2011 will shrink slightly to 55.9 billion yen, decreased by 5% compared to the preceding year.

2. Laser scribing equipment market

1) Market overview

Blade dicing machines for silicon semiconductor production have been used for the chip dicing of LED based on GaAs and InP substrates. However, in case of GaN based LED (sapphire substrate), for which the demand is rapidly increasing for white LED applications, the cost of replacement blades has been an issue as the blade is easily worn out due to working on the extremely hard sapphire substrate and need to be replaced frequently. Another issue was the scribing line width. In order to reduce the LED chip cost, increase of the number of LED chips from one substrate has been explored by reducing the scribing line width (down to 10 μ m, while 15 μ m was the narrowest with blade). In order to resolve those issues, laser scribing equipment has been introduced and become popular for dicing the sapphire substrate LED.

Although there was a concern on the negative influence of laser scribing equipment on the brightness (about a few percent), the spread of laser scribing equipment has started in the first half of 2000, starting among the manufacturers in Taiwan who valued its high productivity. Presently, in 2009, it is estimated that more than 90% of the scribing processes in Taiwan are processed on the laser scribing equipment. Although there are mechanical scribing machines (with diamond tool) as well, it is expected that laser scribing equipment with higher productivity will become popular in the world market. Based on these conditions, the market size in fiscal 2008 has been estimated to be 3.9 billion yen, increased by 30% compared to the previous year.

2) Market perspectives

Although full-scale recovery of capital investment is expected in the second half of fiscal 2009 in Taiwan, the majority of investment will be focused on the MOCVD equipment used in the pre-process of LED production, and substantial investment on laser scribing equipment used in the post-processing is expected to start in or after 2010. However, as "Stealth Dicing" equipment which has overcome the negative impact of laser scribing on the brightness, announced in 2008 has been attracting attentions, the laser scribing equipment market is in a growing trend in the long term.

In fiscal 2009, the LED production will increase with increased shipment of MOCVD equipment, which in turn will increase the needs for laser scribing equipment. Taking these situations into consideration, the market size in fiscal 2009 is estimated to be 4.0 billion yen, by 3% increase compared to the previous year. The market size in fiscal 2010 to be 5.2 billion yen, increased by 29%, and in fiscal 2011 to be 6.8 billion yen, increased by 30% compared to the preceding year respectively.

3. Molding equipment market

1) Market overview

In the past, plastic sealing (potting) was commonly applied after bonding the LED chip to a package, leaving the formation of lens for high-brightness LED for another process. Lately, however, the molding equipment which can achieve resin sealing and lens formation in one process is attracting attentions as a technology to realize brightness improvement and cost reduction at the same time.

The full-scale development of molding equipment market has started in 2007-2008 period as silicon resin was beginning to be used for high-brightness packaging. As the installation of bonding equipment has been spreading among the Taiwan and US/European manufacturers, the market size in fiscal 2008 is estimated to be 2.2 billion yen (increased by 52% compared to the previous year).

2) Market perspectives

As it is expected that the installation will progress among Japanese manufacturers as well in fiscal 2009, the market is expected to grow to 4.1 billion yen, increased by 82% from the preceding year. Although the growth rate will decrease in 2010 and after, the market is expected to continue growing by an average of 50% compared to the preceding year, based on the market environment that highly productive molding machines will become popular and readily available as manufacturers will introduce high-productive models into the market. As a result, the market is expected to grow by 50% to 6.2 billion yen in fiscal 2010 and by 52% to 9.5 billion yen in fiscal 2011 respectively.

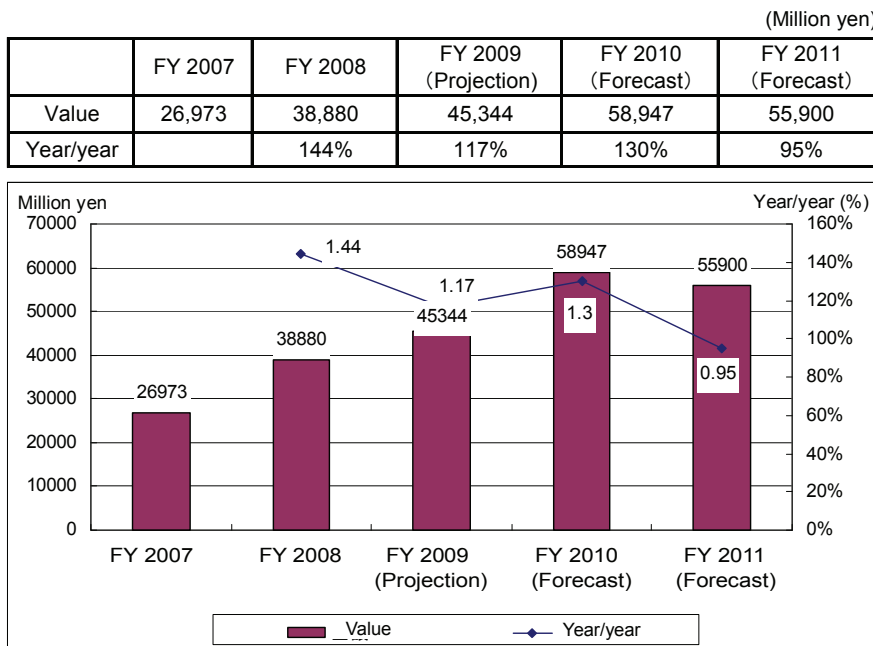
4. Perspectives of the LED production equipment market

The adoption of LED for lighting application is expected to increase the use of LED drastically, with the world market of white LED for lighting applications, about 40 billion yen in 2008 to 413 billion yen in 2013. It is expected, therefore, that the demand of LED production equipment will continue to increase from now on, especially for the production of white LED.

In the meantime, cost reduction is indispensable for the full-fledged popularization of LED for lighting applications, which in turn, will drive the shifting of production facilities from Taiwan and Korea to China.

Currently, the equipment manufacturers are proposing and emphasizing throughput improvement and high-brightness LED production capability of their products to the clients. From now on, however, it would become necessary to offer production cost reduction as well, and to develop production systems to reduce the initial investment cost. This would require the development of special purpose machines focused on LED production and integrated production processes which combine pre and post processes together. Further, it would be effective to address a business model for combining materials and elements together with the manufacturing systems. Through these activities, it would be necessary to contribute to reducing the production cost for achieving the growth of LED market.

Table/Graph 1: MOCVD for LED World Market Size Transition & Forecast



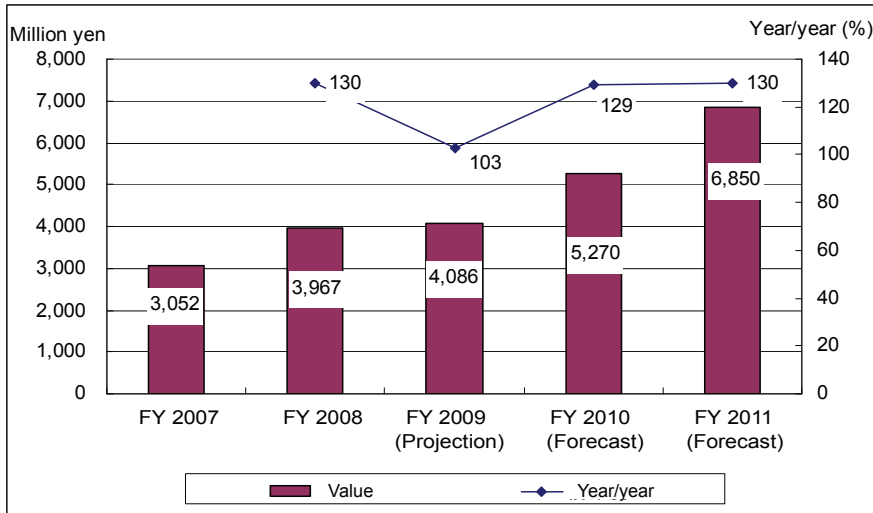
Note 1: Based on the shipment value

Note 2: (Projection) indicates that the value is a projection, and (Forecast) indicates the value is forecasted.

Table/Graph 2: Laser Scribing equipment for LED World Market Size Transition & Forecast

(Million yen)

	FY 2007	FY 2008	FY 2009 (Projection)	FY 2010 (Forecast)	FY 2011 (Forecast)
Value	3,052	3,967	4,086	5,270	6,850
Year/year		130	103	129	130



Estimated by Yano Research Institute

Note 3: Laser scribing equipment (Abrasion process, etc.), stealth dicing, and laser lift-off equipment are included.

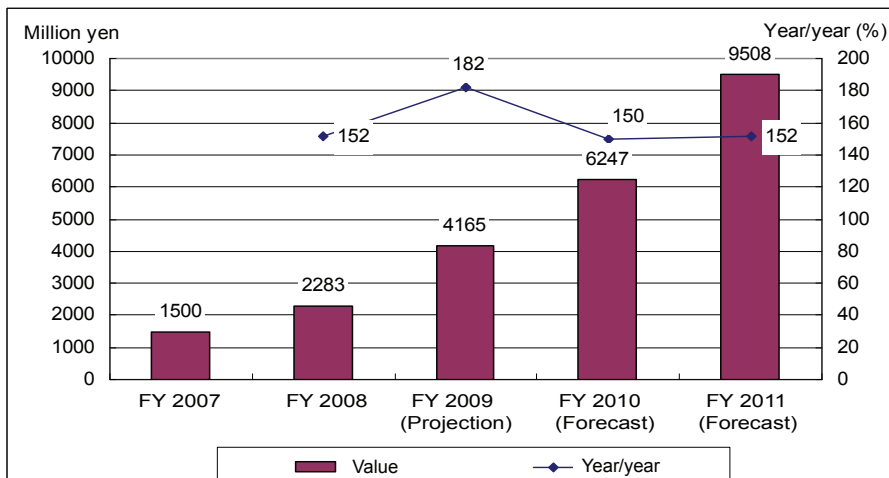
Note 4: Based on the shipment value

Note 5: (Projection) indicates that the value is a projection, and (Forecast) indicates the value is forecasted.

Table/Graph 3: Molding equipment for LED World Market Size Transition & Forecast

(Million yen)

	FY 2007	FY 2008	FY 2009 (Projection)	FY 2010 (Forecast)	FY 2011 (Forecast)
Value	1,500	2,283	4,165	6,247	9,508
Year/year		152	182	150	152



Estimated by Yano Research Institute

Note 6: Based on the shipment value

Note 7: (Projection) indicates that the value is a projection, and (Forecast) indicates the value is forecasted.