programmable mylar film is placed in the palm-size lens-making device on top of a ring whose shape is adjustable. The shape of this ring is important because it determines what type of eye problem (nearsightedness, farsightedness, or astigmatism) the resulting lens will correct for. Griffith notes that more complex ring shapes can yield progressive or bifocal lenses.

The lens gets its shape—which determines the degree of correction—from the curvature of the film's surface. To produce a concave surface, baby oil that fills the cavity under the ring is drawn out, pulling the film against the ring. For convex lenses, the ring sits on top of the mylar membrane and baby oil is injected into the cavity. When the proper curvature is reached, a containment ring that represents the proper shape of the lens's outer rim is placed on the mold. The procedure saves on time spent shaping the edges of the lenses and on wasted materials.

To form the actual lens, the same type of UV-curable acrylic/monomer lens that is used in 95 percent of the world's eyeglasses is poured into the ring. Then the technician shines a device comprising four ultraviolet LED arrays on the monomer, providing enough energy to polymerize (and solidify) it. The UV cures the polymer in 3 to 5 minutes. When the polymer is pulled away from the mylar membrane and popped out of its containment ring, it is a finished lens that is ready to be fitted into a frame and worn right away. **–WILLIE D. JONES**

Canon and Toshiba Go Their Own Way In Flat Panels

New technology plus competition spawn another Asian alliance

Well-heeled consumers around the globe are eagerly installing digital home theaters consisting of DVD players, jumbo TVs, and booming sound systems to match. To meet the soaring demand, Japanese manufacturers of large flat-panel screens are scrambling to form joint ventures around differing technologies. The link-ups allow allies to share technologies, production facilities, and investment costs. This consolidation makes it easier to compete with rivals both at home and in South Korea and Taiwan for a market forecast to be worth over US $6 billion in 2004, and to climb to $30 billion in 2007, according to market researcher iSupply/Stanford Resources in El Segundo, Calif.

The latest of these industry alliances involves Canon Inc. and CONTINUES ON PAGE 28

NEW ENTRANT: Executives of Toshiba and Canon unveil a prototype flat-panel display based on surface-conduction electron-emitter display technology, a derivative of what once was known as field-emission technology.

YOSHIKAZU TSUNO/AFP/GETTY IMAGES

NEWS

CONTINUED FROM PAGE 24

Toshiba Corp., both in Tokyo. The companies announced in mid-September a joint venture to produce and market large flat-panel screens for TVs based on surface-conduction electron-emitter display (SED) technology [see photo, "New Entrant"]. This technology is a newcomer to the big-screen wars, which have been dominated by liquid-crystal displays (LCDs), followed by plasma displays and projection TVs using cathode ray tube (CRTs).

SED technology evolved out of research done on the now-defunct field-emission display (FED) technology. Like FED technology, SED is similar in principle to the CRT. However, where a CRT uses a single electron gun to fire, focus, and scan an electron beam across a screenful of phosphors—exciting the material to create millions of colors—an SED makes use of an array of tiny electron emitters measuring just several nanometers wide, each producing an individual pixel.

This setup, which Canon and Toshiba have been exploring together since 1999, makes for a relatively simple design. The 31-inch (79-centimeter) diagonal SED prototype described by the companies in their announcement measures just 7 millimeters deep, including the "box" holding everything in place. Essentially, the display contains a phosphor-coated glass plate separated by a small gap from the electron emitters mounted on a second glass plate, with the air evacuated.

SEDs provide a picture as bright as a CRT's, but in much wider sizes and without a CRT's bulk and weight, say Canon and Toshiba. Compared to LCD and plasma displays, SEDs have a faster video response time, as well as superior color reproduction and darkness contrast. Power consumption is also lower, with the SED prototype consuming 160 watts at an average picture level, compared to 200 W for a similar-sized LCD and 350 W for a plasma display, the companies claim.

Canon is taking a 50.002 percent stake in the new venture, named SED Inc. and headquartered in Hiratsuka, just south of Tokyo, with Toshiba accounting for the remainder. Initial investment is ¥20 billion ($183 million), with a further ¥180 billion ($1.6 billion) to be used for setting up a mass production line for the panels. Canon is supplying its proprietary electron-emission and microfabrication technologies to the venture, while Toshiba is bringing the mass production know-how it gained from manufacturing CRTs.

Production of the SED panels for TVs is due to begin in August 2005, with a targeted 3000 units monthly, rising to 15 000 panels at the beginning of 2007. Production capacity will reach 70 000 units monthly by the end of 2007. That will be just about the same time that Seiko Epson, the Japanese manufacturer in Suwa City best known for its inkjet printers, expects to be taking on entrenched LCD and plasma makers with its large organic light-emitting diode (OLED) displays.

Seiko Epson, using inkjet printing, unveiled a 35-inch (88-cm) prototype full-color OLED display in May—the industry's largest OLED screen. Seiko Epson says it will be able to produce large OLED TV panels using this technology after improving its OLED materials and extending their lifetime.

Just a couple of weeks before the SED announcement, Toshiba, Hitachi, and Matsushita Electric Industrial said they would establish an alliance in January of next year to produce and market large LCD panels for TVs. And in late July, the consumer-electronics giants Sony Corp. and South Korea's Samsung Electronics Co. celebrated the completion of their advanced seventh-generation joint venture production facility in South Korea for manufacturing large LCD panels. Meanwhile, Fujitsu and Hitachi have been producing plasma TVs together through their Fujitsu Hitachi Display Ltd. linkup since 1999.

Other Japanese flat-panel producers continue to go it alone or get out of the market. Ahead of the pack is market pioneer Sharp Corp., Osaka, which launched the first LCD TV in 1987. Sharp maintains the largest global LCD-TV market share with its Aquos line, according to market researcher DisplaySearch in Austin, Texas. Pioneer Corp., Tokyo, a manufacturer of plasma panels, boosted its panel output when it took over NEC Corp.'s plasma panel business last February.

—JOHN BOYD

Danish Wind Turbines Take Unfortunate Turn

Problems at showcase Horns Rev project provide wind energy critics with ammunition

The world's largest producer of wind turbines, and the whole idea of large-scale wind energy itself, suffered a setback this summer with news that all the turbines at Denmark's Horns Rev (Reef)—the biggest offshore wind farm built to date—would be moved to shore for repair and replacement of defective transformers and generators. Vestas Wind System A/S in Ringkøbing blamed harsh sea conditions for the substandard performance of equipment supplied by ABB Ltd., the Swedish-Swiss energy conglomerate headquartered in Zurich. The generator and transformer problems made it necessary to retrofit all 81 of the 2-megawatt turbines, at considerable expense.

Vestas, the world's leading wind technology supplier, installed the Horns Rev turbines in 2002, under contract with Denmark's biggest power producer, Elsam A/S in Fredericia [see photo, "Let It Blow"]. The mishap at Horns Rev is especially embarrassing because similar problems arose at the first big wind farm Vestas installed, near Copenhagen. The company had expressed confidence when erecting the Horns Rev turbines that this time things would go more smoothly. CONTINUES ON PAGE 34

ELSAM A/S

LET IT BLOW: A wind turbine was installed on a wind farm at Horns Rev, in the North Sea just off Denmark's southwestern coast. Now, all turbines have had to be removed for repairs.