

PETER EVERS

Kok Sure

Ron Kok's deal with China to disrupt the lucrative LCD market is just the latest of his inventions to challenge the status quo.

It is mid-September and Ron Kok, a Dutch high school dropout turned millionaire inventor, is wandering the corridors of Beijing's China World Hotel. A bad cold, caught after working up a sweat while running to catch an overly air-conditioned airplane, causes beads of perspiration to form on his forehead.

But Mr. Kok (pronounced like "Coke"), arguably one of Europe's greatest tech entrepreneurs, can't wipe his brow because, as usual, all of his cloth handkerchiefs are wrapped around his latest inventions, stuffed in every available suit pocket.

Wrapped in one is a pair of eyeglasses that can correct vision problems with the turn of a knob. Once perfected, he plans to mass-produce them for the world's poor.

Wrapped in another is a light-emitting diode (LED) lightbulb designed to last 15 years.

Out of another pocket comes a low-cost organic light-emitting diode (OLED) display which Mr. Kok plans to produce in a joint venture with the Chinese government, a move that threatens to disrupt the \$70-billion global liquid crystal display (LCD) industry and put Europe back on the map.

Europe's big companies pulled out of LCDs early on. And Philips stopped all their display activities, OLEDs included. OLEDs herald a new approach to display technology that some argue is better than

LCDs for moving images because each pixel emits light and winks on and off as required, so the eye perceives a smooth flow of motion.

The 60-year-old Dutchman believes in OLED's potential. Last year Mr. Kok's company, OTB, which sits in Eindhoven, Philips' hometown, bought the OLED

unit from the electronics giant's PolyLED division. The move combined Philips' design team with some of his own OLED engineers. Then, he convinced John de Mol, the Dutch billionaire best known for his role in developing reality TV shows Big Brother and Fear Factor, to inject money into OTB to fund, among other things, its quest for a better, cheaper way to make OLED video displays for gizmos like MP3 and DVD players. (Mr. de Mol's investment company Talpa now owns 20 percent of OTB.)

Once some complicated technology problems were solved—including using thin transparent layers of film to protect OLEDs from moisture and oxygen rather than gluing a glass cover plate on top of the display—Mr. Kok and his team turned their attention to doing away with clean rooms.

Mr. Kok, who was named a Technology Pioneer by the World Economic Forum in 2003, prides himself on being what he calls a "clean room killer." He is already credited with changing the production process and thus the economics of making CDS, DVDs, contact lenses, and solar panels by doing just that.

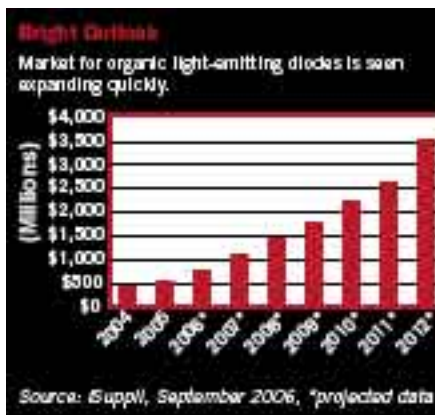


"Most people resist change, they don't like innovation."

RON KOK, PRESIDENT, OTB

Fighting the Status Quo

Each time he has met massive resistance from entrenched players. And the display industry is no different. Japanese, South Korean, and Taiwanese companies, which have sunk billions of dollars into clean rooms and huge factories that use a method called batch processing, have balked at adopting an entirely new approach,



Thus, OTB is in negotiations with the regional government of China's Jilin province about financing the world's first OLED manufacturing business using OTB's signature compact "in-line" machines. In-line machines can handle all the necessary processes in one place, significantly cutting costs.

"China missed out on LCD technology but that means it does not need to protect billions of dollars of LCD-related capex like South Korea, Taiwan, and Japan," Mr. Kok asserts.

If all goes well, production will begin in mid-2007. The exact location has not been determined yet, but there is talk of refurbishing an existing LCD plant in Jilin province, possibly in the city of Changchun.

OTB is already facing competition inside China on OLEDs from a Chinese company called Beijing Visionox, which claims it will be the first to begin OLED production in China.

Both OTB's and Beijing Visionox' initiatives fit in with China's desire to embrace innovative technology and develop it into new products.

The significance of Mr. Kok's approach is that it should have major ripple effects if it lives up to its promise because it would change the economics of making displays, says David Barnes, the Hong Kong-based vice president of strategic analysis at Display Search, a market research and consulting arm of the NPD Group. "And those ripple effects could end up causing a tsunami."

OTB's in-line OLED process could, Mr. Barnes says, "potentially nullify the big scale advantages that the big Asians have, meaning the Chinese can get in the game but so could companies in Brazil or even in Spain. That is the big revolution," says

Mr. Barnes.

It is a revolution that "has everything to do with globalization and competitiveness," says Mr. Kok, who plans to sell his in-line machines not just to the Chinese but to anyone, including a new crop of display industry startups.

There is no need for factories to be expensive or complicated, argues Mr. Kok, who has been compared to Henry Ford, because his genius lies in the design of the assembly line.

In the future, Mr. Kok says, companies will no longer be able to use production equipment as their differentiator but will instead have to compete on quality and service. As he dispenses with clean rooms and foments change, industry by industry, he says, "I know I will have to fight every step of the way."

That is what makes Mr. Kok such a good entrepreneur, argues Frank Dings, the research manager who heads up the OTB division working on the long-lasting lightbulb.

"He is not afraid to go to war."

Turning Molds Into Millions

Born in Amsterdam and the second of seven children, Mr. Kok learned an important lesson early in life. His father owned a small engineering shop and invented new types of locks in his spare time. Although the elder Mr. Kok held 22 patents, he never made money from any of them and the family could barely make ends meet.

The lesson for Mr. Kok, who inherited his father's love for tinkering, was that the value of an invention was directly linked to how successfully it could be commercialized.

And once he gets an idea in his head, the feisty cigar-smoking Dutchman, an avid skier and mountain biker, just won't give up until he makes it work and sells it.

"Ron doesn't know 'it can't be done,' be-

cause he doesn't have that mentality," says Mr. Barnes, the market analyst. "Instead he thinks 'how could it work, how might it happen?' That is why he meshes so well with the 'can do' 'why not?' attitude in China."

Mr. Kok, who dropped out of school at 14, spent some time repairing tanks for the Dutch Army before landing a job in 1966 as a repairman in the Brussels branch of Krauss Maffei, a German company specializing in machines used for the injection molding of plastics.

He proved adept at fixing and improving injection molding machines used in factories so when Philips—one of Krauss Maffei's biggest customers—moved plastics production to developing countries, it asked for Mr. Kok's help. After years of extended stays in places like Brazil, Nigeria, and Iran, Mr. Kok took a job at Philips' plastic division in Holland.

While at Philips he came up with what he was convinced was a better way of making CDs, using some of the injection molding processes he had learned. When his bosses wouldn't listen he left and started his own company, Optical Disc & Memory Engineering (ODME). To prove his idea could work, Mr. Kok built an in-line machine capable of making compact discs without the customary multimillion-dollar clean room inside a warehouse in a gritty section of Eindhoven.

The invention made him a millionaire.

Until then, CD production required separate processes in different parts of a factory. Mr. Kok designed one machine, 20 feet by 10 feet, and equipped it with a small clear air unit, to handle all of those processes in one place, doing away with the need for a clean room and slicing the cost of producing a single CD from \$3.23 to \$0.18 (€3.5 to €0.2).

The first orders came from independent CD producers, followed by major record companies. Warner, for example, bought 15 machines at \$1.5 million each for use in America and another 25 for its European plant in Germany.












Money from the sales of ODME's first in-line machines for CDs was used to buy Philips' optical disc mastering division. Mr. Kok and his then partner, Lambert Dielissen, disagreed on how the expanding business should be managed, and parted ways. As part of a settlement, Mr. Kok walked away from ODME with \$6 million after taxes, agreeing not to work

**Ron Kok is not
afraid to go to war.**

FRANK DINGS, RESEARCH
MANAGER, OTB

Diary of a Mad Scientist

Ron Kok's history of innovation stretches 20 years from 1986 to 2006.

Product		What it Does
CD machine		Sliced the cost of producing a single CD from €3.5 (\$TK) to €0.2 (\$TK).
Mastering equipment		Used as first step in the in-line production of CDs and DVDs
Molding technology		Breakthrough technology developed for reproducing CDS and DVDs.
In-line lens machine		Makes the manufacturing of contact lens more efficient.
In-line solar wafer machine		Improves the transformation of solar wafers into photovoltaic cells.
Film deposition process		The ultrafast process improves the manufacturing of organic light-emitting diodes (OLEDs).
In-line bulb machine		Enhances the manufacturing of long-lasting light-emitting diode (LED) lightbulbs.
In-line machine for OLED displays		WHAT'S IT DO?
MicroElectro-Mechanic Systems (MEMs)-based inkjet printer		Uses industrial applications, such as printing colors in an LED display.
In-line "FocusSpec" machine		Produces self-adjusting "FocusSpec" eyeglasses for the world's poor.
WHAT'S THE ACTUAL		Improvements in solar panels, wind power, and stocking hydrogen energy to create a self-sustainable house.

Source: Red Herring research

in the optical media field for four years. He then took on a new partner, Leo van Doorne, a venture capitalist who had acted as an adviser to Mr. Kok on the negotiations. (Mr. van Doorne is now OTB's executive vice president; Mr. Kok is president.)

As part of the deal, Mr. Kok held on to the engineering arm of ODME, the company now called OTB. This came in handy when he was approached a short time later by Johnson & Johnson about applying a variation of the technology used in CD production to the mass production of its Vistakon line of disposable contact lenses.

At the time, Johnson & Johnson was manufacturing contact lenses using a batch process, which requires that every step in the process be done by a different machine, not directly linked to the previous or next process, requiring many human operators.

An in-line machine that Mr. Kok drew on the back of an airline napkin after visiting J&J's Florida plant did the same job using only one machine that took up far less space and needed only one operator. To further cut costs, Mr. Kok and his engineering team also developed a new way of quickly changing the many molds needed to cover the range of contact lens prescriptions.

Next, Mr. Kok was approached by Royal Dutch Shell. Mr. Kok's company developed a way for Shell to more efficiently turn raw silicon wafers into photovoltaic (PV) solar cells, again using a specially designed in-line machine.

OTB has since parlayed its work with Shell into a separate solar subsidiary which sells in-line machines that do away with clean rooms. OTB's in-line machines allow all production processes to take place in one fully automated dust-free unit that measures 7 meters by 60 meters. Customers include South Korean solar cell manufacturing company KPE, a subsidiary of Changwon-based Kyungdong. Chris Boomaars, OTB Solar's CEO, says the division has five other customers globally but declines to name them.

Mr. Kok claims the company has slashed the cost of transforming solar wafers into PV cells through the use of the in-line machine. The machine takes up less space, requires fewer operators, and the process involves only one quality control flow. "This business is boom-



Bore dunt

ing,” says Mr. Kok. “We entered the right market at the right moment.”

OTB's New Focus

Ophthalmics is a new line of business for OTB, though this effort is philanthropic rather than a profit center. Frederick van Asbeck, a student, came to Mr. Kok in 2004 with a business plan he wrote while at the University of Delft's School of Industrial Design & Engineering, on how to modernize and mass-produce self-adjustable glasses, which were invented by American physicist Luis Walter Alvarez in the 1960s. The variable lens—which Mr. van Asbeck calls Focusspec—is based on a principle that consists of two lenses with a special determined form. Its corrective (cylindrical) power changes when the lenses are moved in opposite directions. Until recently, however, the eyeglasses had to be handmade, an expensive, time-consuming process. Mr. van Asbeck, who founded an organization called Focus on Vision, asked OTB to design the right production tool to make mass-market production possible at the lowest possible price. Mr.

Kok liked the idea so much he hired Mr. van Asbeck and gave him funds.

“Now that we have computerized grinding and polishing machines it is easy to make the mold,” says Mr. Kok. “Designing things simple and cheap is what OTB does well.”

At the suggestion of the World Health Organization, the first target group for the self-adjustable glasses will be myopic children, who will be able to adjust the glasses from minus one to minus six.

There are some 500 million children in the world who will never learn to read because they can't see well and their parents can't afford to buy them glasses, says Mr. Kok. With Focusspec, children can adjust the power by themselves and don't need the intermediate help of an ophthalmologist, says Mr. Kok. He figures he can produce the glasses for \$0.70 or less each and is hoping to convince a big corporation, such as Google or Dell, to fund their production and then give them away for free to poor children.

OTB has always been a hotbed of innovation, so it isn't surprising that lightbulbs are now part of the picture.

A Dutch inventor named John Rooijmans came up with the LED bulb and went to the Philips family for financing, but needed help in solving some technical problems involving the electronics and heat management before the bulb could be mass-produced.

So, Mr. Rooijmans turned to Mr. Kok, ironic considering that Philips remains a huge player in the lighting business and is itself in the LED business.

OTB says it has licked all the problems and the first batch of the long-lasting lightbulbs will begin rolling off its assembly lines by the end of the year. It will have the ability to produce millions within the next few years.

The company is not ready to put a price tag on its LED bulb, but Mr. Dings hints it will be priced to sell. “I would buy it and I am pretty conservative.”

Mr. Dings and his team are charged with innovating not just with lightbulbs but a whole variety of things, including designing a house equipped with solar panels, a windmill, and gizmos that would produce all of its own energy needs, including fueling the family car.

Although Mr. Kok eventually reentered the optical media sector, designing inline machines for the mass production of all

types of DVDs, OTB has since pulled out again, selling its patents in 2004 for undisclosed sums to Singulus, a German competitor, and the Netherlands' VDL Group.

“We only go after double-digit growth in sectors where there is room for innovation,” says executive vice president Mr. van Doorne.

OLED technology fits that bill, but the battle to develop this new display technology and change the way it is manufactured has been by far the toughest to date, says Mr. Kok.

OTB has spent two years knocking on the doors of every big LCD manufacturer in Asia—including the big three that dominate the LCD business, LG Philips and Samsung in South Korea and Taiwan's AU Optronics, which just bought Quanta Display—to no avail.

And the nascent OLED market is tumultuous and cutthroat, acknowledges OTB Display CEO Bas van Rens, with companies starting up and going bankrupt every week.

That is where OTB comes in, because its approach to OLED manufacture lowers the amount of investment and risk for startups, says Mr. van Rens.

OTB has so far invested \$25 million on its approach to manufacturing OLEDs—a big bet for a mid-sized company. In 2005 OTB Group, which has some 200 patents, had revenues of about €5 million.

Mr. van Doorne expects OTB to have revenues of €30 million this year; based on existing contracts, he expects the company to pull in €70 million to €80 million in 2007.

The pending contract with the Chinese government is key, Mr. van Doorne acknowledges. “The Chinese will be a very big launching customer for OTB, a huge new customer,” he says. “If this deal goes through, it will put us on the map and on the forefront of this new technology.”

If the Chinese sign up, others will follow. That is the way it has always worked and Mr. Kok says he has every reason to believe it will work that way again. It is getting the first contract that is toughest.

“I know we have to go all the way, make it work, show we have the technology, show we are cheaper,” says Mr. Kok, shaking his head. “Most people resist change, they don't like innovation.”

Luckily for Europe's technology sector, Mr. Kok has spent 20 years proving he does. **RH**