

Woodbury's Research Frontiers heralds 'smart' glass

BY EMILY PICKRELL

emily.pickrell@newsday.com

July 31, 2007

Robert Saxe, founder of Research Frontiers Inc., hopes that a recent commercial deal will prove he's a genius, not a fool.

Saxe, the 72-year-old inventor and chief executive of Research Frontiers Inc. in Woodbury, will get to see his company's innovative "smart glass" being mass-produced by one of the world's leading glass manufacturers after he spent 42 years to invent, develop and refine it for commercial use.

Hitachi Chemical recently announced that it has completed factories specifically tailored for Research Frontiers' smart-glass film and is gearing up for production. Hitachi is the first licensee to reach capacity for mass production.

"It's a thrill," Saxe said. "If you spend 40 years of your life building something and it does not work out, people will say you're a stubborn fool. If it does work out, then they say you're a persistent genius. But the difference between the two is a millimeter."

Saxe's company has been working since 1965 to develop technology that can automatically or manually change the tint of window glass. The company's smart glass uses suspended particle device, or SPD, technology, which involves a thin film containing millions of microscopic particles.

When no voltage is applied, the particles are scattered, blocking the light. When electrical wires supply voltage, the particles align to allow light to pass. By adjusting the voltage, a user can regulate the desired level of light. RFI does not manufacture the chemicals or film itself, but develops and refines the product and licenses production to other companies. The company has secured more than 450 patents to protect the SPD technology and has licensed 33 companies around the world to produce the chemicals, create the film and produce the glass with the film integrated into it.

Steve Abadi, owner of Innovative Glass in Plainview, which specializes in integrating smart-glass technologies into a finished product and is licensed to sell the SPD glass, said he believes that the technology will revolutionize the use of glass in buildings, airplanes and cars.

"SPD glass is the holy grail of glass that architects have been clamoring for for years," Abadi said. "Imagine having a variable tinted glass that you could dial up or dial down depending on the sun's position without any mechanical blinds. There's nothing like it."

SPD technology achieves results that have eluded other types of electronic glass: Liquid crystal glass scatters light when electricity is applied, turning the glass hazy to provide privacy but also obscuring any view. And electrochromic glass turns opaque, but requires time to darken or lighten the glass and is useful only for small windows.

The ability to control the tint, Abadi said, allows users not only to darken or lighten large rooms but also to control the amount of heat coming into a room through windows. The Department of Energy has estimated that the new technology could reduce cooling and lighting energy use by

up to 60 percent in rooms with windows.

"It's a green technology," Abadi said. " ... You could harvest the daylight and control the heat coming into the room."

The technology won the 2002 Best of What's New award from Popular Science magazine for home technology.

"Our model is a lot like a biotech company," said Joseph Harary, president of Research Frontiers. "We focus on research and development and we rely on our licensees to do the heavy lifting."

The inspiration for the technology came when Saxe worked at Corning, where light-sensitive eyeglasses were being developed. The technology relied on sunlight, but Saxe decided to pursue the use of low levels of electricity to control the tinting. Saxe, armed with a degree in physics and a master's in business, both from Harvard, used savings from an earlier position as an investment banker to establish Research Frontiers in 1965.

The company, once housed in a garage, has grown to a staff of 11 and has annual operating expenses of approximately \$3 million. It went public in 1986, and the current business model allows it to maintain negligible debt.

Although RFI has used investment to fund the operating losses of roughly \$4 million per year over the past five years, lack of sales until recently means the company is still waiting to see a profit.

Saxe calculates that if SPD glass were used for even 1 percent of world glass sales, the four-decade research and development cycle will have paid off.

Sales to date have been modest, but there are encouraging signs. Raytheon announced in February that it would offer SPD glass for its Beechcraft King Air aircraft. Abadi says requests for the smart glass are now coming from museums, houses of worship, libraries and stadiums, as well as private residences.

Harary said that Hitachi's recent announcement is the most tangible evidence to date that the product is close to reaching a worldwide market. Other licensees also will soon begin production, Harary said, and potential customers, such as architects, are beginning to integrate it into their design plans. Research Frontier's stock prices have increased with the Hitachi announcement, rising from its 52-week low in September of \$4.06 to \$15.24 this month. The stock closed yesterday at \$14.27.

The chatter on financial Web sites is mixed at best. According to Motley Fool's Web site, a significant majority of its "all-star" rated anonymous investors have rated Research Frontier's stock negatively, predicting that it will underperform compared to the general market. The criticism centers on Research Frontier's delay in getting its product out into the public.

Stock owner Dennis DeJose of Garden City disagrees. "I feel that the prospects are enormous; they are revolutionizing the glass industry," said DeJose, who has owned the stock for several years. "I wish I had more money to buy more stock."

Saxe recognizes that his smart glass will have to deliver on its promises in order for potential

customers to spend roughly 10 times as much as they would for ordinary glass.

"The whole system has to be dramatic," Saxe said. "The change between very dark and very clear has to be striking."

Saxe acknowledges that he never imagined that the roll-out process would span 40 years, but he says he has no regrets. He still makes the daily trip from Manhattan to Woodbury on the 6:45 a.m. train and typically does not return until evening, determined to see his product gain recognition.

"The difference between a good idea and a product is a very long distance," Saxe said of the 42-year odyssey. "It's very, very exciting."

Smarter glass

A new technology pioneered by Woodbury's Robert Saxe could revolutionize the glassmaking industry. Suspended particle device (SPD) technology would allow users to regulate the tint in window glass, doors, skylights and more.

1. Layer of SPD film is placed between panes of glass. Electrical leads link window pane to an AC voltage source.
2. SPD film contains millions of microscopic particles that randomly align themselves when no voltage is present, blocking light.
3. As voltage is introduced, particles align themselves in an ordered fashion, allowing light to pass through.

Adjusting voltage allows users to regulate the window glazing to any state between light and dark.