

# Shortages and Solutions in the Motherglass Market

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## Overview of the industry's concerns

Since their introduction in 1971, liquid crystal displays, or LCDs, have changed the way we have interacted with technology. LCD screens are found today in everything from flat-panel computer displays to cell phones. However, recently there have been concerns about a future shortage of motherglass, the base material for LCD screens. In turn, this has fueled predictions of imminent increases in the price of flat-panel LCD displays. A thorough understanding of supply and demand is necessary to answer the concerns about this shortage. Along the way we'll discuss the historical problem of shortage and oversupply in this industry, anticipation of demand as an answer to this problem, and the use of information systems as a means of achieving this solution.

## The roller coaster of shortage and oversupply

With the advent of flat-panel display technology, LCDs have made possible high-resolution computer monitors that take up very little desk space. Although flat-panel displays have been around for years, the prices were too high at first for most consumers. A low-end 14-inch flat-panel screen for a desktop computer, for example, cost around \$2000 in 1997. In the late 1990s, however, changes in consumers' tastes led to increased demand for notebook computers and handheld devices. Since these products rely on LCDs, the increased demand caused a shortage of motherglass, which then prompted glassmakers to invest in new factories in East Asia.

The market for motherglass is fairly competitive, so oligopolistic strategies such as collusion are not applicable. Consequently, the several major players did not coordinate their production schedules. Each made as much glass as possible, hoping to cash in on the excess profits in the market. However, more glass was produced than was needed, and supply outstripped demand. This caused the price of motherglass to plummet. The overabundant supply was reflected in the freely falling prices for LCD monitors through 2000 and 2001.

Eventually, however, consumers' rising demand caught up with the oversupply. Consumers' demand rose for several reasons. The most obvious reason was the low price of LCD monitors—15-inch flat panels were selling for as little as \$250. However, several underlying factors of demand also changed. Flat-panel monitors take up far less space than standard cathode-ray tube (CRT) monitors, are more aesthetically appealing, and cause less eyestrain. The energy crisis in California was also a major factor. Since LCDs require less electricity than do CRTs, corporations and government agencies were eager to switch to this more energy-efficient technology. These changes led to an increase in demand for motherglass, which continues to the present.

Currently, however, glassmakers are still focusing on the past oversupply. Many producers have a large stock of glass in inventory, forcing them to sell below cost. Most have cut back production. At the same time, demand for notebook computers and LCD monitors has continued to rise. One Samsung vice president predicted "50%-70% growth this year over last in flat panels." The average monitor size has also risen, which means that producers of motherglass are cutting their sheets of glass into fewer pieces, lowering their unit output. The implication of the rising demand and falling supply is that LCD prices are expected to rise dramatically over the next few years, until supply and demand

can come into balance. General motherglass shortages are expected to begin showing up during the third and fourth quarters of 2002 and possibly continue into 2003. The roller coaster is heading into a new period of shortage and high prices.

## Eliminating the four-year cycle

The executive vice president of LCD manufacturer LG Philips LCD, Bruce Berkoff, sees this roller coaster market as a cyclical phenomenon. He notes that historically the market has seen two-year periods of oversupply followed by two-year periods of shortage. Based on this analysis, he has been predicting a shortage for some time, and it appears that his prediction will be correct.

This four-year cycle is based on the fact that it requires about two years to build a new manufacturing plant and start producing glass. Since it takes two years to move from one long run to another, it is difficult for glassmakers to respond quickly to rapid changes in the market. Manufacturers cannot make large increases in output in the short run, because marginal cost soon becomes too great for the added output to be profitable. Increased output requires a change in the long run, and this requires time.

It is this cycle that causes the motherglass market to fluctuate so wildly. Ideally, motherglass suppliers would produce exactly enough glass to satisfy current demand, and prices would remain stable. This would require new manufacturing plants to come online at the beginning of periods of high demand rather than two years later. To accomplish this, glassmakers should begin building factories two years before the roller coaster begins to climb. Assuming that demand continues to exhibit its four-year fluctuations, this means that manufacturers will need to make these capital investments during periods of relatively low demand.

If the four-year cycle were guaranteed, this would not be a large problem—glassmakers could simply begin building new plants two years after increases in demand in preparation for the next cycle. Capital could easily be raised during these low-demand, low-profit periods with the promise of high profits two years down the road. Indeed, Philips and Samsung are both currently building new manufacturing facilities to handle expected demand. However, the industry is too new to be certain about the frequency of the business cycle, even if business cycles were easily predictable in the first place!

It appears that many motherglass suppliers are not currently planning for high demand in the next two years. Overall capital expenditures in the industry last year fell dramatically. Some analysts reported a 600% decline in the amount of spending. Corning Inc., the world's largest glass supplier with over 50% market share, reported in February 2002 that they were "evaluating the situation," but not establishing a strategy to address the motherglass shortage. It is true that throughout most of 2001, prices for motherglass and LCD screens were very low, and therefore not very profitable. By taking into consideration many factors of the market, however, we can look forward two years and expect high prices and corresponding high profits. Therefore, it would be to a manufacturer's benefit to spend money now building a new factory in order to have it finished and ready for production when it becomes necessary to increase output.

## Information systems as a solution

The need for information systems is immediately apparent, because manufacturers can use these systems to anticipate future demand. We have seen that glassmakers cannot depend on the roller coaster's four-year cycle. How then can a motherglass manufacturer look into the future to predict prices and profits? The task seems difficult, and this is where technology can come in.

The first step is to gather information. Information systems will require accurate data in order to produce accurate predictions. The necessary information will span a wide range of variables in the market. The emergence of new products based on LCD technology and their predicted demand will be important factors to consider. For example, the LCD television market is expected to reach seven million units annually by 2005, which will increase the demand for motherglass. Information about other producers will also affect predicted supply and demand. NH Techno Glass Corporation, a large LCD glassmaker in Japan, was forced to close late last year because of a boron gas spill. This decreased supply for several months, contributing to the rising prices of motherglass. Other important data to collect include shipment costs, computer sales, CRT prices, and new production techniques.

Once information has been collected, information systems can analyze it and compare the variables with past values. With a good algorithm, a computer system should be able to produce fairly accurate predictions. The accuracy of these predictions will increase as more historical data is accumulated, because there will be a broader foundation upon which to base assumptions. Certain factors will be found to be more influential to supply and demand than others, and these factors can therefore be weighted more heavily in the final analysis. Over time, producers will develop a very clear picture of what the market will be like throughout the next several years. With these forecasts as a guide, they will be able to make wise capital expenditure decisions now in order to be prepared for future increased demand. Information and the systems to analyze it will help glass producers to avoid the roller coaster of glut and shortage that the industry is currently riding by anticipating demand for years into the future. By correctly applying technology to the situation, the four-year cycle will disappear.

## Conclusions reached

LCDs are a great new technology, with many promising advantages to consumers. However, it has had a rough start. The lack of historical information and systems to analyze this data has been a disadvantage to glassmakers, giving them a foggy picture of the future of the motherglass industry. This has then plagued LCD manufacturers with wildly fluctuating costs, and consequently consumers have faced varying prices. The forces of demand and supply are evident in these fluctuations, so it is important to be able to predict the underlying factors of these forces. The four-year cycle that has been observed in the industry cannot be relied upon; instead, manufacturers must read current trends to predict future demand. To accomplish this, information systems will be needed to gather and interpret data about the factors of demand and supply and respond appropriately. With careful planning and well-informed strategies, glassmakers should be able to match supply with demand, keeping prices stable. Eliminating the four-year roller coaster ride by utilizing information systems will be to everyone's benefit.

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