Factors to consider before buying a tempering machine

Value is paramount

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For the purposes of this article, let's assume that the prospective purchaser has already decided that purchase of equipment is the most desirable option compared with purchasing tempered glass from an outside source, partnering with a glass tempering company or leasing the equipment.

There are many pitfalls to be avoided when buying a piece of equipment that has to fulfill a product requirement and provide years of trouble-free service. Throughout history, the buyer has been at risk. The Romans coined the expression “caveat emptor,” which translates to “let the buyer beware.” In the recent past, the American investor, businessman and philanthropist, Warren Buffett, observed: “Price is what you pay. Value is what you get.”

A purchase decision for capital equipment should take account of both the initial cost and the lifetime costs of the investment, i.e., the capital cost and the ongoing operating costs. So, the paramount objective in buying any commodity or piece of equipment should be to make sure that value is obtained and the optimal result is achieved for the right price and cost.

Glass product requirements

Just as it is vital for a company to properly identify its business mission, it is essential to correctly specify the type, quantity and quality of product that the company wishes to produce. The specification of glass product becomes the basis for supplier quotations.

To avoid omissions and errors, gather a team of commercial, marketing/sales, technical, quality management and production personnel to create the product specification.

The essential details required by suppliers for requests for quotation or tenders are:

- Glass type, e.g., clear float, low-E coated, low-iron
- Glass tempering standard to be met, e.g., ANSI-Z97, ECE R43, EN 12150
- Maximum glass piece size
- Minimum glass piece size
- Glass thickness range
- Distribution of thicknesses, i.e., percentage of each required in the product mix
- Total output required, e.g., tons or square meters per week, year
- Number of planned working hours.

Subsidiary questions are:
- Altitude of the production site above sea level
- Maximum and minimum ambient temperatures at site location
- Available electrical power, voltage, phases, frequency
- Availability of gas supply
- Space restrictions at the proposed site, e.g., available floor area, headroom and position of walls and columns.

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After gathering the information above, the supplier can provide a quotation or tender for a system that is a best fit to all the requirements.

New or used equipment

Unless the budget is severely limited, the safer option is to buy new equipment which will embody the latest technology and will be covered by a manufacturer’s warranty.

Purchase of used equipment usually turns out to be more expensive than anticipated, due to the need to replace worn or obsolete components, and the lack of warranty from the seller or the original manufacturer. Buy nearly new, i.e., equipment less than about 3 years old, to reduce the risk.

Ask the original manufacturer for assistance in moving, installing and re-commissioning used equipment and to add a contingency sum to budgeted costs to avoid overstating return on investment.

Continuous or oscillating system

There are basically two types of flat glass tempering systems: continuous or oscillating. In continuous systems, (see figure 1), the glass load proceeds in a single direction through the heater until it reaches tempering temperature, and then is conveyed to the quench for cooling at the desired rate to induce the stresses, which meet the given standard, and finally to permit it to be handled. In oscillating systems, (see figure 2), the load oscillates back and forward in the heater until it reaches tempering temperature and then transfers to the quench where it usually oscillates back and forward until tempered and cooled for handling.

The heating time for float glass is typically 40 seconds per millimeter of thickness in a radiation heater and 30 seconds per millimeter in a convection heater. So, 4 mm thick glass takes typically 160 seconds or 120 seconds, respectively, to heat to tempering temperature. A continuous system conveying 4 mm glass at a speed of 150 mm per second requires a radiation heater 24 meters (about 80 feet) long, whereas an oscillator only needs to be 5.5 meters long if the glass goes through three full oscillations (forward and backward) in the heater.

Oscillators are the most common systems because they are relatively inexpensive, can process 3 mm to 25 mm glass economically, are very versatile, and are available in widths up to 3.3 meters. Continuous systems are typically more expensive than oscillators and are generally applied to high volume repetitive production of thinner (3 mm to 6 mm) glass of limited size, for example appliance glass, standard window glass and shower doors.

In the past, continuous systems tended to be narrower than oscillators with typical widths of 1,200 mm and 1,500 mm. The solar cell industry is changing that situation due to the ever-increasing size of photovoltaic panels and the huge volumes required, so continuous systems of 2,000 mm to 3,000 mm width are being requested.

"Overchoice"

According to Alvin Toffler, author of "Future Shock" (1971), "overchoice occurs when the advantages of diversity and individualization are canceled by the complexity of the buyer’s decision-making process".

Today, there are many glass tempering systems available from suppliers based in the U.S., Finland, Italy, India, China and other countries, and there are typically several suppliers in each of those countries. Back in the 1970s, there were only two or three suppliers with a global reputation offering dependable equipment. So, purchase options were limited.

The proliferation of suppliers, capabilities and pricing makes the buyer’s task more difficult today. The choice of supplier can obviously determine the quality of the purchase, the longevity of the investment and its profitability.

It is important to select suppliers with credibility and the capability of fulfilling the buyer’s needs.

The fulfillment of needs extends to the quantitative and qualitative performance of the equipment, and to the factors that depend on the financial strength of the supplier, such as ability to see the project through on time, provide meaningful after-sales service and take care of any warranty issues.
Selection of the suppliers who will be asked to quote should be done with the help of experienced or informed advisers, drawn from within or outside the buyer's company, comprising technical, production, maintenance and financial members.

The optimum number of suppliers for consideration, to avoid overloading the buyer's organization with investigation and analysis, is three.

**Evaluation of quotations**

When the buyer receives a quote, he or she must ensure that the stated equipment capabilities match the product specification in every sense. That means not only the type, quantity and quality of the product, but the reliability of the process and the total cost of production.

Unless the buyer has previous experience of the quoting company's equipment, it is important to obtain an independent opinion on the suitability and reliability of the equipment plus the supplier's performance in supplying, installing and commissioning it on time. This is best achieved by visiting an existing installation and discussing all aspects of the system's performance with the owner of the equipment.

The buyer should carry out a rigorous comparison of quotations received, inspect the relevant type of equipment and examine glass produced by it. Figures 3 and 4 show the difference in reflective quality, or roller wave, that two different systems could produce. This could become a critical factor in determining the acceptability of a particular system.

Other factors would be the overall flatness of the glass (see figure 5), and the freedom from surface marking.

Then, the buyer needs to discuss with each supplier and confirm exactly what is included in the price, discuss options, confirm delivery and installation schedule. It is important to make sure that "apples are being compared with apples" from one quotation to another.

**Productivity, energy consumption, operating and maintenance costs**

While the initial cost of the equipment is an important consideration, the lifetime or total operating costs are probably more important for equipment that will operate over a life of five years or more. Too often, the uninformed buyer purchases the lowest-priced equipment and subsequently finds that excessive costs are incurred in keeping the equipment running.

Clearly, the lowest unit cost of production, which is derived from high productivity, will lead to the highest profitability. Energy costs, other operating costs, maintenance costs and reliability (uptime) all become part of the calculation.

It is neither the lowest price nor the highest capacity that should be the deciding factor. It should be the lowest unit cost of production for a given quality and output or the highest productivity.
After sales service
The efficiency of after sales service from the supplier can greatly influence the uptime of the equipment if downtime occurs as a result of a breakdown and the buyer needs the assistance of the supplier to restore production.

So, the supplier's service capability should be carefully considered. This is particularly important if the location of the equipment is in a different country from that of the supplier.

The contract
The purchase agreement or contract will vary in appearance and format dependent on the supplier and buyer, but the terms and conditions content will be similar. When the buyer has selected a supplier and requested to submit a contract, he or she should require financial and legal opinions before signing it.

Financial considerations will focus on the price, the schedule of payments, how the payments are made and any payment guarantee requirements such as letters of credit. Legal concerns will focus on clauses relating to confidentiality of information, warranties, patents, technology licenses, transfer restrictions and penalty clauses.

At the end of the day, the best contract is the one that gathers dust on a shelf, because neither the buyer nor the seller has to resort to claims against the other.

Conclusion
A glass tempering system could be one of largest investments made by a company and one which involves high operating costs but can generate good profitability. Purchase of the wrong equipment could ruin a company, whereas purchase of the right equipment could assure growth and success.

So we are back to where we started in seeking the best value rather than the lowest price. Let John Ruskin, British art critic, author and social thinker (1819 to 1900) have the last word: "It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money—that is all. When you pay too little, you sometimes lose everything, because the thing that you bought is incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better."

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