Raytek noncontact infrared thermometers are designed for use in glass industries where monitoring and controlling temperature is critical to productivity and product quality. Raytek infrared thermometers (or sensors) provide fast, accurate, noncontact temperature measurement. Realtime monitoring enables primary and secondary glass manufacturers to achieve the following benefits:

- Improved process control
- Increased product uniformity
- Higher product quality
- Less production downtime
- Increased throughput

Raytek infrared sensors are used with furnaces, bulk glass, melter, regenerator, refiner, fore-hearth, gob, molds, float lines, and annealing lehrs, as well as at the cooling and coating areas.

Efficient temperature measurement shows all aspects of the heating or cooling processes, such as whether a regenerator is too cool or too hot, or whether the tin bath and lehr zones are at their correct temperatures. Careful monitoring, from the molten state through the cooling process, ensures that the glass retains the desired properties as it travels through the manufacturing process.

Raytek infrared sensors take temperature measurement one step further. A wide range of optics, including the remote-controlled, motorized, variable focus in the Marathon MIM, covers an enormous variety of applications. The sensor can be aligned with the target by using the integrated through-the-lens sighting, plus either laser or video sighting for correct target location. Simultaneous analog and/or digital output allows temperature data to be integrated into a closed loop control system for remote temperature monitoring and analysis.

### Glass Industry

**Processing and Manufacturing**

**Noncontact Temperature Measurement Solutions**

**Major Applications**

- Melt Furnace
- Flat Glass
- Automobile Windows
- Bottles, Container & Specialty Glass
- Molds & Plungers
- Lamps, Bulbs & Tubes
- Glass Fiber
- Safety Glass
Melt Furnace
Melters can be either cross-fired (as shown in Figure 1) or end-fired. Regenerators improve fuel efficiency by heating incoming air and alternately firing the direction. The temperature of the brick packing in the regenerator columns increases as the heated air from the furnace escapes. When this packing reaches the appropriate temperature, the cycle is reversed and these columns are then used to heat air entering the furnace. To insure maximum operating efficiency, Raytek sensors are mounted at the top and bottom of each regenerator to trigger the air flow and firing direction at the optimum time. Using Raytek sensors to monitor the packing and refractory material for deterioration is crucial in planning the maintenance and rebuilding schedules, and eliminating emergency situations which could cause a costly, unscheduled shut down. The temperatures at the port arch and the bridgewall are measured to maximize the useful life of the refractory material. The precise aiming capability of Raytek sensors allows measurement of individual target bricks and avoidance of the furnace flame.

Flat Glass
Temperature monitoring is critical in each stage of flat glass production (Figure 2). Incorrect temperatures or rapid temperature changes cause uneven expansion and contraction, resulting in improper annealing. At the tin bath, sensors are mounted over each zone to ensure correct glass temperature. The annealing lehr also has several temperature control zones in the tin and bottom of each regenerator to trigger the air flow and firing direction at the optimum time. Using Raytek sensors to monitor the packing and refractory material for deterioration is crucial in planning the maintenance and rebuilding schedules, and eliminating emergency situations which could cause a costly, unscheduled shut down. The temperatures at the port arch and the bridgewall are measured to maximize the useful life of the refractory material. The precise aiming capability of Raytek sensors allows measurement of individual target bricks and avoidance of the furnace flame.

Bottles and Containers
From the furnace, the molten glass flows into one or more forehearth(s) (depending on the size of the operation), where the molten glass is kept at a uniform temperature. At the end of the forehearth, the gob is dropped into molds where initial forming is done by either a blowing process (compressed air) or pressing process using plungers and molds (Figure 3). Maintaining the proper temperature in the forehearth is critical to ensure that the molten glass is in the proper homogeneous condition when it reaches the exit. When the gob is forced out of the opening, it must have the proper viscosity (a 1°C change causes a 1% change in viscosity).

Infrared fiber optic sensors are placed along the forehearth to monitor the molten glass temperature and control the forehearth zone temperatures. The annealing lehr's temperature control zones must be properly monitored and controlled to keep product quality high. If the glass container(s) are too hot when they leave the lehr, they can mar at the next processing step or crack when they meet the cooler air outside the lehr. If they cool too fast inside the lehr, cracking or breaking can occur. Also, bottles and containers must be at the proper temperature if the glass receives a cold and surface treatment. Sensors mounted over each of the annealing lehr's temperature zones can accurately monitor and control the process and cooling process and cold end surface treatment. This allows better quality control and fewer rejected pieces.

Glass Fiber
There are two main processes for making glass fiber: crown wool and white wool. The crown wool process is shown in Figure 4. As shown in Figure 5, the glass fiber after curing, the fiber must be kept at a uniform temperature for the material to cure properly. If paper and/or foil is glued improperly, the glass “slugs” to enter the glass mat. Hot glass slugs can ignite the backing paper of insulation many days after production is complete.

Figure 1: Melt Furnace

Figure 2: Flat Glass Production

Figure 3: Container Glass Production

Figure 4: Glass Fiber Production (Crown Wool Process)