

# Primary Aluminum Production

## Baking Carbon Anodes in an Open Ring Furnace



# Q

Question

How do you measure the temperature of the flue walls within a carbon anode bake furnace?

# A

Answer

### Situation Analysis

Carbon anodes are a key consumable of the aluminum smelting process. The anodes deliver high voltage to the powdered alumina, bauxite and cryolite, reducing the mixture into molten aluminum. The carbon anodes are slowly consumed as part of this process. Anodes with poor conduction or poor mechanical properties greatly increase the energy consumed and decrease throughput of the smelting process. Carbon anodes must be properly baked in order to have the correct electrical conduction properties, proper mechanical strength characteristics and allow volatile pitch matter to be burned off. Twelve green carbon anodes are loaded into 7 to 9 open pits in each section of a carbon bake furnace. Flues immediately adjacent to the green anodes are then heated by combustion. The flue refractory bricks slowly heat the anodes and burn off impurities.

- Critical temperature measurement = 1050 to 1300°C (1922 to 2372°F)
- Target Size = 1 m x 1 m (39 x 39 in.)
- Distance to measurement object = 2.5 to 5 m (98 to 197 in.)





## Solution and Improvements

The Raytek CABFR1 provides accurate temperature measurements of the refractory deep within the flue. The temperature at this location is most indicative of the saturated furnace temperature. Raytek's unique signal filter prevents interference from the burner flames. The rugged installation hardware protects the fiber-optic cable and allows for quick and easy removal of either the fiber-optic head for cleaning or the entire assembly when the bridge is to be moved to the next fire location. The negative pressure of the furnace creates a natural air purge keeping the fiber cable cool and the sensor window clean. The sensor also features a hard sapphire protective window. The complete system provides a rugged solution to measuring flue temperatures, thus optimizing carbon anode baking.

Two-color thermometry is preferred for monitoring and controlling the flue refractory brick for the following reasons:

1. Process measurement is unaffected by the cloudy atmosphere inside the flue.
2. Process measurement is unaffected by deposition of process materials on the protective window.
3. The sensor tends to read the hottest target within the field-of-view.

### Raytek Product

#### CABFR1ACF1

Temperature range: 600 to 1300°C

#### CABFR1BCF1

Temperature range: 700 to 1550°C

### Accessories

- CABINSTALL Hardware

### Benefits

- Increased Safety
- Reduced Maintenance
- Increased Productivity
- Increased Fuel Efficiency
- Reduced Environmental Impact

For customized solutions to your process, please contact:

[www.flukeprocessinstruments.com](http://www.flukeprocessinstruments.com)

