Induction heating for graphitizing process furnaces

Smart solution for multi-zone heating control

Ideal for complex heat treatment processes, unbalanced furnace loading
Power generator, with several outputs operated in PW mode
Power factor over 0.92, maintained on the power range
Detection of the current leakage in each zone
Induction heating for graphitizing process furnaces is used for «infiltration» process, a thermal process where parts made of carbon-carbon composite materials, are heated at very high-temperatures, under Vacuum or controlled atmosphere conditions.

The standard graphitization process entails heating up a carbon part (porous or nonporous) to between 1,000°C and 2,800°C and infusing it with a humidified gas. The parts undergo long treatments and pressure matrix cycles (vacuum and gas pressure). The treatment is done in a reducing atmosphere (nitrogen or argon atmosphere at atmospheric pressure, reduced pressure or in a vacuum).

Advantages of the Fives solution

The inductor and the susceptor are placed in a chamber where the required pressure cycle takes place. The startup powers for more modern systems exceed 1,000 kW.

- Controlled and fast raising of the temperature
- Continuous modulation of the temperature in each zone
- Leakage current continuous protection (maximum security)
- Power factor > 0.92 in the entire power range

Operating principle

PWM Mode: Modulation of the pulse width according to power
Unlike most circuit oscillating at the resonant frequency, PWM mode aims at changing the average value of the voltage at a given frequency, thus changing the signal’s duty cycle.

Example (graphitizing furnace)

- Inductor
- Susceptor
- Internal diameter
- Overall height
- Temperature process
- Payload
- Climb speed
- Generator
- Power characteristics
- Dimensions

- 3 heating zones
- pure graphite
- 630 mm
- 1600 mm
- 1000 °C
- ≈400 kg
- 10 °C/min
- Celes IS PWM 50/1.2
- 3x400 V 50/60 Hz
- 210 kVA
- 3200x800x2100 mm