The Minfurn™ carbon-regeneration furnace

WITH EVERY ADSORPTION CYCLE IN THE CIP/CIL PROCESS, activated carbon loses some of its ability to adsorb gold, owing to contamination by organic materials. Thermal regeneration decomposes these materials and restores the original activity of the carbon, thus maintaining adsorption efficiency and minimising the loss of soluble gold.

The Minfurn™ is a novel apparatus for the regeneration of activated carbon, which uses direct resistive heating. It has several major advantages over conventional carbon-regeneration equipment:

- Continuous operation.
- Smaller size than equivalent kilns and batch-operated furnaces.
- Fewer moving parts, and thus lower maintenance costs.
- More efficient energy utilisation.
- Refractory walls that resist high temperatures and corrosion.
- A unique control strategy that does not rely on thermocouples to maintain the temperature.
- Owing to its small size, simplicity, and high efficiency, the Minfurn is more economical to construct and operate than conventional units.

**Principle of operation**

In the Minfurn, the temperature required for regeneration is generated within the carbon, by means of an electrical current passed through the carbon bed, rather than externally. The optimum temperature is maintained by regulating the temperature of the bed itself, rather than using thermocouples to control the temperature of a chamber surrounding the heating elements.

Since the electrical resistance of carbon bears an inverse relationship to its temperature, the current through the furnace can be used as an indication of the temperature. On cold start-up, a fixed voltage is applied along the axis of the carbon bed. The resulting current causes the bed temperature to rise - the resistance falls and the current increases. The current (temperature) is allowed to increase up to a pre-determined setpoint, at which the discharger switches on, removing hot regenerated carbon from the bottom of the furnace and allowing cool feed carbon to gravitate into the top of the furnace. This counters the temperature increase - the resistance increases, and the current decreases.

The discharge rate is regulated so as to keep the current (temperature) constant. This ensures a constant and instantaneous match between the carbon throughput and the power required for maintaining a constant temperature profile.

**Benefits of the Minfurn**

Lower energy consumption
- Without drier - about 0.6 kWh/kg.
- With drier - about 1.0 kWh/kg.
- Heat is generated and highest temperature reached within the carbon bed.
- More efficient energy utilisation - virtually 100 per cent transfer into carbon.

Lower maintenance costs
- Fewer moving parts - less wear. No heater elements that require frequent replacement.
- Refractory lining more suited to high temperatures - longer furnace life.
- Can be stripped and rebuilt in a single shift.

Fewer carbon losses
- No tumbling action - minimal attrition of carbon.

High quality product
- Activity 90 - 100 per cent of virgin (from contaminated carbon initially at 40 per cent).

Minfurns can be manufactured with capacities of 3, 25, 42, 75, 125, and 200 kg/h (dry regenerated carbon). Units can be customised to suit clients’ requirements.

**Installations world-wide**

Minfurns are operating in South Africa, Peru, Zimbabwe, Chile, Russia, Brazil, Côte d’Ivoire, Sudan, and Texas (USA).

Specialist

Hylton Gidish – Head: Electrical and Instrumentation