In-Processing Plant Recovery of Gold from Waste Activated Carbon Using a Designed Novel Reactor

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Abstract

Waste Activated Carbon (WAC) refers to the fine, brittle particles of activated carbon generated during gold recovery processes, such as carbon-in-leach (CIL) and carbon-in-pulp (CIP) methods. These particles, although highly active and gold-laden, are typically lost to tailings due to their inability to be retained by inter-tank screens, resulting in significant gold losses and an economic impact on gold processing plants. This study presents the development and evaluation of a novel reactor designed for the on-site treatment of WAC at gold processing plants. Representative WAC samples were characterized and subjected to optimized combustion in the reactor, resulting in the production of ash with a concentrated gold content. Results show that combustion of the carbon fraction of WAC achieves a gold enrichment ratio of 8.5–9.6 (over 730%) compared to the feed, with gold recoveries of up to 96% using cyanidation at 1000 ppm. Economic analysis indicates that the process can generate approximately US$57,000 per tonne of ashed WAC with reasonable operational and fabrication costs. By providing an efficient, plant-integrated method for recovering gold from WAC, this research offers a practical solution to minimize gold losses, enhance operational profitability, and improve resource utilization and sustainability of gold mining operations.