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**OPTIMIZATION OF GOLD RECOVERY
FROM FLUE DUST**

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(iii) **Abstract**

A gold bearing old flue dust dump at Roasting Plant was characterized for its base metal; gold; sulphur and arsenic trioxide content. Low values of arsenic trioxide were found, attributable to long exposure to weathering effects during the past many years. The base metal content was very low and was without any systematic distribution in the vertical and horizontal profiles of the dump heap, except for iron which increased down the vertical profile. Sulphur content was substantially high coupled with a mineralogy content of arsenopyrites; pyrites, pyrrhotite and magnetite. This prompted need to apply roasting as a pretreatment stage prior to cyanide leaching. Roasting reduced the concentration of sulphur; arsenic; the base metals were oxidized to their oxides and opened up the microstructure. The green dump which is material straight from the dumps and pre-roasted samples were pulverized to further reduce the particle size to less than 45 microns to enhance effective leaching by cyanide. Leaching in alkaline solutions of cyanide was performed on both green and roasted samples. In solution, roasted dump material gave a gradual loss in cyanide and base with significant gold dissolution rate. The green dump material registered rapid loss of cyanide and base with a low gold dissolution rate. Three bases, NaOH, CaO and NaHCO₃ were tested for their alkaline conditioning effects as individuals and as combinations. Lime and caustic soda proved to be more effective. High gold recoveries were achieved using a contact time of at least 16 hours, base combination of CaO and NaOH and a minimum of 0.02% free NaCN in solution. The test work showed that exploitation of old flue dust dumps is a viable project by achieving extraction efficiency of 51% from a gold content of at least 16g/t.