Early Developments in Treating Pyritic Gold Ores: The Australian Perspective

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After quartz, pyrite is the mineral most commonly associated with gold. In many pyritic gold ores significant gold occurs as small intergrowths and inclusions in the pyrite and extracting this fine-grained gold presented a major challenge to early metallurgists. In the late nineteenth century new techniques were developed to treat these refractory gold ores. In Australia experiments and developments were made at key gold deposits in central Victoria, in New South Wales at Harden and Majors Creek, at Mount Morgan and Kalgoorlie. In the 1860s the first attempts were successfully pioneered by the Port Phillip and Colonial Gold Mining Company at Clunes in Victoria. These involved gravity separation of pyrite, roasting of the concentrate followed by grinding in Chilean mills and amalgamation. Into the 1880s various modifications and patent techniques were tested for different pyritic ores. Chlorination of gold (and silver) was an ancient technique successfully applied in the 1840s in Silesia. The Plattner process used in Europe was tried on Australian pyritic ores before 1881, but was largely unsuccessful until replaced by improved versions including the locally developed Newberry-Vautin process. Generally chlorination was expensive and susceptible to chemical variability in different ore types. It was most successful at the famous Mount Morgan gold mine in Queensland from 1887 to 1912. A breakthrough came with introduction of cyanide processes, first developed by MacArthur and Forest in the UK in 1887. This highly effective dissolution technique applied to roasted pyrite concentrates, combined with improved methods of finer grinding allowed effective recovery of gold from most pyritic ores. Major improvements, including the use of tube mills, were made at Kalgoorlie in the late 1890s. None of these techniques were developed in isolation, rather there was a vigorous transfer of ideas and information between mining centres in Australia and around the world. Custom processing plants were also set up across Australia to service mines too small to have their own plant or with particularly difficult ores. These plants also played an important role in developing new techniques.