



Programme to deal with environmental legacy issues at Obuasi

The Obuasi mine, which is located in an historic mining region in Ghana, is more than 100 years old. The history of the mine and its development over many decades is firmly interwoven with the fabric of the region. A large porportion of people in the Obuasi district depend on the mine for their livelihood, either directly or indirectly.

The mine has grown and developed over time, encroaching into what must have been rural farmlands, acquiring land as it needed to do so in line with Ghanaian law. This generally required the company to pay compensation to affected communities rather than having to resettle them. But the mining operations too have suffered from the encroachment of communities onto company-owned land as a consequence of a lack of active demarcation and land use planning in the past. The situation is further compounded by the presence of large numbers of artisanal and small-scale miners who often operate illegally on company-owned land while pursuing their subsistence activities.

This has given rise to an interdependent relationship between the mine and the community, but one which often gives rise to tensions.

Planning for rehabilitation and closure has been a more recent approach in line with international practice, increasing environmental legislation in Ghana and the operation of the mine by internationally listed companies – first Ashanti Goldfields and, since 2004, by AngloGold Ashanti.


Since the business combination between Ashanti and AngloGold, a great deal of time and effort has been spent on assessing the mine's environmental planning and impact, and a number of corporate reviews have been undertaken. But, also during this period, the operation has been under severe profitability constraints, having consistently reflected an operating loss. There has consequently been a great deal of pressure to return the operation to profitability and to maintain its viability. Thus, not all of the recommendations made from an environmental perspective have yet been put into effect.

Two specific environmental achievements have been recorded. First was the implementation of an ISO14001-aligned environmental management system (EMS) and the certification of the mine by an independent auditor against this standard in 2006. The second has been the implementation of monitoring systems that have been put in place on the basis that enhanced only what is measured can be managed. Included in this has been a comprehensive survey of the rehabilitation and decommissioning liabilities. Initial estimates indicate that these are more than double the \$31 million estimated at the end of 2006.

There are a number of issues of both environmental and social concern at Obuasi, (*see the Report to Society 2006*), but the issue of pollution is of primary concern. Corporate reviews of environmental performance at Obuasi undertaken in 2005 raised as a concern the levels of arsenic and cyanide in water that was being discharged into the environment. This issue was again raised during the ISO14001 audit. (The corporate review also highlighted the need for the safe disposal and rehabilitation of an area which contained 10,000 tonnes of arsenic trioxide that had been stockpiled at the Pompora Treatment Plant following the collapse of the arsenic market in the early 1990s. This was completed in 2006. (*See the case study in the Report to Society 2006.*))

EPA concerns

In spite of these efforts there remain significant environmental issues in Obuasi accrued through Ghana's colonial era to the present day. An issue of major concern has been the discharge of untreated process water into the environment which, among other things, recently compelled Ghana's Environmental Protection Agency (EPA) to stop operations at the mine's two metallurgical plants for 12 days. In an Enforcement Notice issued to the mine on 6 September 2007 by the EPA, the agency expressed concern about the mine's lack of corrective action following earlier visits and inspections. On 26 September 2007 the EPA lifted the enforcement notice following an Interim Environmental Report submitted by the mine in which it outlined a plan of corrective measures. The EPA gave Obuasi mine six months to implement corrective measures as per the commitments in the Interim Report.



Programme to deal with environmental legacy issues at Obuasi *continued*

The mine's response

Since September 2007, Obuasi has established a number of controls to reverse the pollution issues facing it: A 2km-long pipeline has been constructed to transport cyanide-containing supernatant water from the Pompora dam to the Pompora pump station. Active de-silting activities are being undertaken to create capacity in the Pompora coffer dam and the Duck Pond (located behind the mines BIOX plant in the south). A number of contaminated sites are also being mined as part of the clean up exercise.

Preparations are being made to install a process water treatment plant and an order is expected to be placed before the end of February 2008. Meanwhile a number of in-house water treatment units have been installed at various points on the mine. Construction of four (out of eight planned units) Rotating Biological Contactors (RBCs), a microbial water treatment technology which has been piloted on the mine, is expected to be commissioned by end of February 2008.

When completed the RBCs, which treat thiocyanates, will treat about 400m³ of cyanided water prior to discharge to the environment or recycling to the BIOX plant for use.

Parallel to this is an overall review of the mine's water balance with more emphasis on clean water-dirty water separation. Currently the south mine is operating on what can be considered as a closed water circuit, appart from a few issues which are receiving attention.

Two new tailings storage facilities (TSFs) are on the drawing board with construction expected to start in 2009. One of the TSFs will be dedicated to cyanide-containing tailings while the other will store float tailings that would be virtually devoid of cyanide and arsenic. The Environmental Impact Assessments for the projects, which have been contracted to an external consultant, are nearing completion.

An EPA-approved consultant is tracking progress of the EPA directives and has been reporting on a monthly basis to both the agency and the mine. A team of inspectors from the EPA recently visited the mine to confirm that the reports and recommendations of the independent consultant are receiving attention.

The mine has appointed a champion to manage the corrective action plan and provoke both daily and weekly reports to the newly established West Africa divisional office for review and input.

The BIOX process

The BIOX process pre-treats refractory sulphide gold ores such as pyrite, arsenopyrite and pyrrhotite, and was developed to increase gold recovery rates during the metallurgical extraction process. The gold in these sulphide ores is encapsulated in sulphide minerals which prevent the gold from being leached by cyanide.

The BIOX process destroys the sulphide minerals and exposes the gold for subsequent cyanidation, increasing recovery rates.

The process uses a combination of three bacteria that occur naturally, thiobacillus ferrooxidans, thiobacillus thiooxidans and leptospirillum ferrooxidans, to break down the sulphide mineral matrix in the ore being treated, thus freeing the occluded gold for subsequent cyanidation. The bacteria attach themselves to the metal sulphide surfaces in the ore, resulting in the accelerated oxidation of the sulphides.

The BIOX process involves the continuous feeding of the flotation concentrate slurry to a series of stirred reactors. Low pH levels and a high slurry temperature enhance the efficiency of the process and it is important that these parameters are controlled within narrow ranges so as to maintain the right balance of bacteria in order to achieve the optimum rate of oxidation.

During the bacterial oxidation process, elements like iron, sulphur and arsenic are dissolved. After oxidation, the BIOX product is washed in a counter-current decantation circuit and the solution is neutralised in a controlled two-stage process with limestone and/or lime. The precipitates formed meet environmental standards and can be safely deposited onto tailings dams.

The washed BIOX product is treated in a conventional cyanidation plant from which the gold is finally recovered.

The Sansu Biox plant at Obuasi is the largest in the world.