# Research and development

AngloGold Ashanti's research and development includes a range of initiatives in geology, mining, processing, engineering, safety, environment, marketing and knowledge management. A combination of collaborative and in-house research is adopted. Collaborative partners include research organisations, universities, mining companies, mining service providers and contractors.

In addition, AngloGold Ashanti's wholly owned subsidiary, ISS International Ltd, (ISSI), is a global company specialising in seismic monitoring of mines, engineering structures and earthquakes. The company initiates and undertakes both broad-based and focused research and development to enhance the safety of those working in mining by developing effective monitoring and warning technology systems. ISSI functions on the international stage and its involvement in seismic matters extends well beyond the mining environment.

AngloGold Ashanti is a signatory of the International Cyanide Management Institute (ICMI) and is committed to reaching compliance with the International Cyanide Management Code. All processing operations group-wide were audited by an in-house audit team, areas of improvement were identified at the operations and a schedule is in place for the operations to undergo ICMI external audits to demonstrate compliance with the International Cyanide Management Code. Extensive cyanide speciation studies have been conducted in collaboration with Mintek at the various plants in the South Africa region to determine, on both a macro and a micro-scale, the environmental impacts of cyanide in residue material. A project evaluating the impacts of hypersaline water and cyanide on wildlife and the environment is under way in Australia in collaboration with ACMER. Continuing projects cover cyanide measurement and control, cyanide recovery and cyanide destruction. These projects have enabled a clearer understanding of the environmental impacts of cyanide and have led to the implementation of strategies to ensure compliance with the requirements of the International Cyanide Management Code.

The AuTEK project to develop new industrial uses for gold is based at Mintek in Johannesburg. AngloGold Ashanti continues to support the catalysis initiative within the programme. This involves gold catalyst development for carbon monoxide oxidation, for use in fuel cells and in photocatalysis. Current efforts are aimed at improving scale-up and commercialisation of gold catalysts.

Geology initiatives include:

- the development of a pneumatic sampler for underground use;
- a digital terrain modelling system for proper representation of 3D data on underground plans, particularly in steeply dipping areas;
- geometallurgical mapping and mine modelling to systematically produce metallurgical ore body domains; and
- a hydrothermal project to understand chemical characteristics of ores and their potential impacts on processing and recovery.

Mining initiatives include:

- improving short-term seismic hazard assessment through improved numerical modelling capability;
- improving tunnel support systems in deep, seismically active mines through a destructive proof-testing approach;
- development of an oscillating disc cutter to be mounted on a four wheel drive vehicle for underground face sampling;
- development and testing of an underground water cannon system for stope cleaning;
- a large open-pit research project to develop a new toolbox for geotechnical design and risk management;

- development of an alternative radar system for radar monitoring of pit slopes;
- development of micro-seismic monitoring for pit wall stability as a backup monitoring system;
- risk-based mine planning using conditional simulation techniques; and
- Integration of software used for geological mapping and modelling.

Processing initiatives include:

- Thiosulphate leaching of gold as a development of a non-cyanide gold extraction process;
- use of digital camera technology to measure mill feed size, using this information to improve mill process control;
- establishing uranium leaching conditions for maximum extraction of uranium from the Vaal River operations;
- Amira P9N comminution technology project on milling efficiency, steel ball and liner wear;
- Amira P420 gold processing project looking at refractory ore treatment, thiosulphate leaching, cyanide and the environment;
- Amira P266 thickening project, improving thickener performance using discrete element analysis and modelling;
- evaluation of optical sorting as a method for upgrading ore streams or waste rock dumps; and
- thickened tailings beach slope angle modelling to improve tailings facility operation.

Other initiatives include:

- monitoring real-time corrosion rates in uranium plant elution columns;
- void-filling using aerated cement walls for improved management of heat, radiation and ventilation; and
- Automated in-stope water-blast to reduce silica dust exposure in stopes.