A Trip to the Penjom Gold Mine

OIL, GAS AND MINING TECHNICAL DIVISION

by Engr. Rudisham Marjohan

BACKGROUND OF THE PENJOM GOLD MINE

Through the organising effort of Ir. Azwira Azmi, the Oil, Gas and Mining Technical Division (OGMTD) had successfully carried out a one-day technical visit to the Penjom Gold Mine on 28 April 2012, as part of its planned activities for the year. The delegation was made up of 11 members which included the members of the OGMTD committee, secretariat and other members of IEM from various engineering disciplines. A bigger number had earlier registered for the visit. However, as a large public rally had been scheduled on the same day, some participants had withdrawn their participation at the very last minute due to safety concerns.

The Penjom Gold Mine (coordinates N 4º 07' 58.10" and E 101º 59' 39.11") is located approximately 170km North East of Kuala Lumpur, in the district of Kuala Lipis, Pahang. It is accessible through the Federal Route 8 connecting the town of Bentong to Gua Musang with the turn-off to the mine just 8km short before the town of Kuala Lipis itself. The largest gold producer in the country, the site has had a long history of mining which first began in the 19th century. However, in recent times, production re-commenced in the now called Penjom Gold Mine in December 1996 under the previous ownership. It is currently owned by an Indonesian-based company, J Resources Nusantara, while the operation of the mine is carried out through a locally registered company called Specific Resources Sdn. Bhd.

The production method utilised at this mine is open-pit mining with blasting being the main method of rock-breaking. Mineral processing makes use of the Resin-In-Leach (RIL) process and gravity separation to recover the gold. The mine is expected to operate until 2017 based on the current reserve estimates. Current gross reserve is estimated at 586,000 oz of gold while gross resources stand at 1,051,000 oz of gold at a cut-off grade at 0.5 g/t. Year 2011 production (before auditing) was reported to be at 54,108 oz.

THE JOURNEY TO PENJOM GOLD MINE

The bus departed at 7.15 a.m. from Wisma IEM, Petaling Jaya. Other than a slight detour due to some road closures, the entourage proceeded uneventfully across town towards the Karak highway. After a short stop for a quick breakfast at a petrol station before the Bentong toll plaza, the bus continued its journey non-stop at the proper posted speed limit all the way to the planned destination. There was no problem with directions as some members of the group were quite familiar with the area, apart from being aided by signboards along the road. Upon reaching the entrance to the mine site, arrangements were made with the security personnel to secure all necessary PPE for the delegates before proceeding to the main building.

BRIEFING AND PRESENTATION

On arrival at the main building, the visitors were greeted by En. Mohd. Zakaria Endut, who is the mining geologist and who would act as our guide for the day. The delegates were ushered into a training hall where some refreshments were served. A brief introduction was made, followed by a safety briefing and a welcoming speech given by En. Mohd. Zakaria. This was reciprocated by a short appreciation speech by Engr. Rudisham on behalf of the IEM's OGMTD and the group. En. Mohd. Zakaria then proceeded with a very interesting presentation on the mine site that was well-received, before the group adjourned to the mine for a guided tour.

Reaching the main entrance to the mine site

Delegates were treated to a very informative presentation on the mine by En. Mohd. Zakaria

TOURING THE MINE SITE

After the presentation, delegates boarded the bus again for the mine tour. The gravel road network within the mine site was well-constructed and properly-maintained, and with the prevailing good weather on that day, it did not necessitate the use of a four-wheel drive vehicle to get around.

The first order of the day was to get to the mining pit which was located towards the other end of the property limit. As the bus progressed, the delegates had the opportunity to observe the daily activities at a mine site while passing by the workshop and vehicle maintenance areas, the storage areas and the core handling yards. The delegates also had a chance to witness the hustle and bustle of miners working with the tools of their trade. As the vast pit came into view, it became the most commanding sight as the bus travelled along the side of it.

The entourage was brought to the northern section of the pit wall where an observation post was located. From here, viewing the mining pit which was currently more than 200m deep was a magnificent sight. Delegates had the chance to note down salient points and observe some geological features as described earlier by En. Mohd. Zakaria during his presentation. He also took the time to explain the different parts of the pit, geology and the activities that were taking place at the pit. The abundance of pyrite or commonly called "fool's gold" amongst the debris surrounding the observation post piqued the interest of almost everyone as the mineral was often mistaken as gold.

As the delegates were admiring the view of the pit, it was learnt that a section of the pit has already been prepared for blasting which was scheduled to take place later in the afternoon. It was an opportunity not to be missed and the delegates voted to wait a little longer to witness this rare occasion. The presence of a committee member, Ir. Look Keman, who is a well-known blasting expert and a group of engineers from the mine, whose task was to record and monitor the blast, among the delegates at the observation post made the wait a tolerable one as lively discussions on the topic of blasting filled up their time.

The view of the mining pit from the observation post looking south. Exploration drilling activities using an inclined drilling rig can be seen on one of the eastern benches as seen in the bottom left hand corner of the photo

Approximately 550,000 bench cubic metres of ore per month is mined this way with a strip ratio of ore to waste at about 1:25. The mine operates with a total of 810 personnel where 99% of them are Malaysians. It deploys quite an arsenal of mining equipment with a fleet of forty-nine 30t haulage and dump trucks, nine 65t excavators and five units of blast-hole drilling machines being the main machineries. All in all, about 500 holes can be blasted on any given day if required. To date, 1,270,462 oz (39,516kg) of gold from 9,384,373 tonnes of ore has been mined under the current management.

Final preparation of the bench being carried out for blasting and the blast holes can be clearly seen

Moments after blasting

VISIT TO THE PROCESSING PLANT

After this exciting event, the delegates assembled and boarded the bus again to return to the main building for the next stop, namely the processing plant. The processing plant was a mere walking distance from the main building passing through another set of security filter.

The plant has the capacity of processing 740,000 tonnes per annum of ore, out of which about 60,000 oz of gold can be produced yearly. It is equipped with a jaw crusher, three units of ball mills, two concentrators,

eight leaching tanks, six batches of leaking tanks and shaking tables, amongst its main processing equipment. There are two main processing methods deployed here; namely the gravity methods to handle the coarse particles and the chemical methods to treat fines.

Broken ore from the pit is dumped into the ore bin which feeds into the jaw crusher. From here, by conveyors the crushed ore is fed into the ball mill and grounded. The mill's discharges then goes through a cyclone where the heavies or underflow will be routed to the scalping screen and from there on to the concentrator. Concentrates produced from the concentrator are then fed to the shaking table where gold nuggets are recovered.

The overflow or fines from the cyclone is treated chemically with a method called Resin-In-Leach (RIL) gold recovery process. The cyclone overflow goes through a screen and then into blanking cells where it is conditioned with lime. These are then transferred into the RIL tanks where cyanide is added. From here, resins loaded or pregnated with gold from the RIL tank is screened and then sent to the resin stripping column while the barren solution is discharged to the plant tailings. Gold from the pregnant solution that comes out of the resin stripping column is then recovered by electro-winning method. The gold nuggets that were recovered earlier through the gravity method are then smelted together with the gold recovered by electro-winning. This molten mix is then poured into a mould that produces 10 to 15kg of gold bullion with 99.99% Au content.

The mine has also been implementing a progressive mine rehabilitation method and has often been cited by the mining authorities in the country as a model of a successful progressive mine rehabilitation programme.

Towards the end of the tour at the processing plant, delegates paid a visit to the Gold Room. This is where the nuggets are recovered and smelting is done. Unfortunately, there was no smelting done at the time of the visit, and therefore, no gold bullion was in sight. However, the delegates were delighted to see some tiny gold nuggets recovered from the shaking tables.

Part of the processing plant site showing the crusher, conveyor and milling sections

The shaking table used to collect gold nuggets or coarse gold particles

VISITING THE LABORATORY AREA

From the Gold Room, delegates proceeded back to the training hall where lunch was served. During lunch, members of the group took the opportunity to inquire more information and seek further clarification from En. Mohd. Zakaria on the mining and processing of gold. In the air-conditioned comfort of the training hall, a short appreciation ceremony was also held with Ir. Look Keman presenting an IEM memento to En. Mohd. Zakaria and J Resources Nusantara.

After lunch, delegates were brought to the laboratory area which sits in the main complex. Delegates then had the chance to witness some of the tests carried out and how assaying was done to the samples collected from the mine or exploration sites. This included the Fire Assay process and the Aqua Regia technique to determine the weight and amount of gold including its quality from the samples taken. Part of the Fire Assay procedures involved heating the material in a furnace. The more than 1,200°C of heat generated from the furnace could be felt by all the delegates even though they were standing some distance away.

RETURNING TO WISMA IEM

Ir. Look Keman on behalf of the IEM OGMTD presenting a token of appreciation to En. Mohd. Zakaria

IEM delegates with En. Mohd. Zakaria taking a group photo to commemorate the occasion

At the end of the tour, En. Mohd. Zakaria took the delegates to the Mine Planning unit to have a feel of how the whole mining activities were planned to meet the desired objectives and to achieve efficiency. The group then assembled again in the front yard of the main building to take a group photo before boarding the bus to head for home. The bus left the mine site at 4.30 p.m. and safely reached Wisma IEM just before 8.00 p.m. It had been a successful outing despite the small number of participants. ■

Engr. Rudisham Marjohan, a mining engineer from Technical University of Nova Scotia, Canada, had served many years in the exploration and mining of gold and iron in Malaysia and Indonesia. He is now involved with subsea/deepwater processing technologies within the oil and gas industry.

The author wishes to express his gratitude on behalf of the participating delegates to Ir. Azwira Azmi and the secretariat for organising this trip, to J Resources Nusantara and to En. Mohd. Zakaria Endut in particular, for his willingness to spend the day with the delegates on his day off.