

5.0 HEALTH AND SAFETY

5.1 Overcoming Barriers to Safety Performance

Instilling a culture of responsible safety behavior has become inevitable in the daily operation of the mine. However, a number of measures and techniques have proven to be successful in encouraging diverse workers with varying degrees of commitment to safety, to adopt uniform safety behaviour.

Monitoring performance, identifying emerging issues, addressing problems, reporting and evaluating incidents and accidents are key elements of any safety program. Operating a just culture where people are recognized and rewarded for their safe practices as well as holding them personally accountable, bring management systems to life and bring the mine closer to a workplace free from harm.

See Plate 16: Award presentation to Mr Richard Mensah, Health and Safety Officer and Plate 17: The triumphant team below.



Plate 16: Award presentation to Mr Richard Mensah, Health and Safety Officer



Plate 17: The triumphant Health and Safety Team

5.1.2 2012 First Aid and Safety Zonal Competition

A tremendous performance was exhibited by G.M.C during the 2012 first aid and safety zonal competition organized by the Ghana Chamber of Mines at Bogoso on the 18th of August this year, under the theme “Safe Mining, Our Core Business”.

The event involved teams from five (5) mining companies in the area namely, Golden Star, Goldfields, AngloGold, Endeavour and G.M.C to compete in the oral and practical first aid and

safety competition. Not only did the occasion attract mining companies' representatives, but also the chief and elders of Bogoso as well as people from the various catchment communities. The competition begun with an oral exam for all the five (5) teams followed by practical performance. With an outstanding determination and hard work, GMC team stood above the rest, placing 1st at the end of the competition. The GMC team thus qualified and participated in the finals of the National first aid and safety competition together with Golden Star Resources (Wassa Mine) the host mine and Newmont (Gh) Ltd Ahafo Mine. The GMC team emerged runners up in the 2nd position at the end of the competition that was won by Golden Star Resources (Wassa Mine).

5.2 Staff Development Programme

The Training and Development Policy of GMC states that, the company is committed to excellence in people's development with the view to maintaining and enhancing its position as a world class Manganese producer in Ghana. The Company therefore recognizes the need to develop its people so that they become fully equipped with the necessary skills and technology to deliver the Company's business objectives. Convinced by benefits that could be derived from its Training and Development Policy, GMC committed a substantial amount (US\$131,221) into training for its workforce during the 2012 calendar year. Below are the specific details of the various training programs that were carried out across the various departments in the year under review. Basically, all the training programs that were carried out across all departments could be categorized into two (2) broad themes as follows:

5.2.1 Technical Trainings

- Best Practice Statistical Method Validation and Uncertainty of Measurement for Laboratories. Two (2) supervisors from the Assay/Met Lab were sponsored to participate in a 5-day residential training that was organized by CDM Trainings from South Africa. The purpose was to increase the knowledge base of the Assay/Met Department in managing quality control issues at the Laboratory. The training was organized from March 26 to 29, 2012 in Accra.
- Protection of Mines, Oil & Gas Installations against Lightening & Power Surges. Two supervisors from the IT/Electrical Department were sponsored to participate in this training program. The purpose of the training was to help the IT/Electrical manage the company's electrical and electronic installations properly such that, power surges and thunder lightening should not damage company property. The program was organized by Messrs. Thundersafe Engineering from April 11 -12, 2012 at the Miklin Hotel, Accra
- Complying with VAT obligations. The 1-day training program was on how to meet VAT obligations by individual companies. AA & K Consulting Services in Accra organized it on April 18, 2012. One (1) person from the Finance Department was sponsored to participate in this training program.
- SURPAC TCL Training. The company sponsored two (2) people from the Geology unit of the Mining Department to participate in this program. SURPAC is a mining software package that is used by Geologists, Surveyors and Mining Engineers to make their work

easier and with precision. The program was organized by GEMCOM from South. The training took place at the Hilda Hotel, Tarkwa from April 30 to May 8, 2012.

- Tax Education Training: Four (4) officers from the Finance Department benefitted from these training packages. It was organized by PWC at the Regent Hotel, Accra between May 23 and November 20, 2012. The programs were organized on five (5) different occasions.
- Advanced Wireless Network Security: The Company sponsored a staff of the IT/Electrical Department to participate in this training. It was organized by the Ghana Telecom University, Accra from July 23 to 27, 2012.
- Surface Design & Block Modeling Reporting Using SURPAC. Two (2) people from the Mining Department were sponsored to benefit from this training. The training was organized by GEMCOM from South Africa at the Hilda Hotel, Tarkwa. The training took place from August 13 to 17, 2012.
- Machine Operator Training: The Company engaged the services of SOP Consult to train machine operators in areas such as Excavator, Dozer, Dump Truck, Wheel Dozer, Grader, etc. operating techniques. In all, fifty nine (59) operators benefitted from this training. The training took place from July 14 to August 26, 2012.
- SURPAC TCL Training fresh graduates: Three (3) fresh graduates were sponsored to participate in a 5-day SURPAC TCL block modeling training program at the Hilda Hotel, Tarkwa. The training was organized by GEMCOM, South Africa, from October 22-26, 2012. The three (3) graduates were drawn from the Mining Department under Mining Engineering Unit, Survey Unit and Geology Unit. The purpose of the training was to build a pool of critical skillful talents for the Mining Department.
- Overhead Crane Training: Nineteen (19) technicians drawn from HD/EME, Light Vehicle, Carbonate Plant and Electrical/IT departments were sponsored by the company to benefit from this particular training. Again, the services of SOP Consult was sought to conduct this training. It was a 2-day training program where the first day was committed to theoretical work while the second day was used for practical work. Participants were thought how to calculate weights before lifting, how to prepare the environment before lifting, how to position the crane, how to travel with the load, how to observe safety precautions etc. Participants were really happy and grateful to GMC for the opportunity offered them. The training was organized between October 6 and November 27, 2012.
- Belt Splicing Awareness Training: The training was conducted by an expert from Plant & Processing Company from November 19 to 21, 2012 at the Senior Staff Club House of the GMC. Participants were taken through both theoretical and practical ways of splicing plant belts. In all, eleven (11) workers were drawn from both the Takoradi Port Plant and Carbonate Plant at Nsuta to undergo this training. It was very successful.
- Use of Drilling Fluids: Six (6) workers from the Geology section of the Mining Department participated in this training program. It was organized at the Hilda Hotel on November 16, 2012. Participants were Diamond Drillers who were trained on how to use the hydraulic fluid to maintain its quality and to prolong the life span of equipment.

5.2.2 Professional Development Trainings

- Training programs were designed and carried out with the aim of among other things, developing the workforce along their career path in order to gain increased expert knowledge in their field of operation. The following are the specific training programs that took place in course of the year:
- **Microsoft Certification IT Professional Training:** One (1) of the workers of the IT/Electrical Department was sponsored to undergo this training. The program took place from February to August 2012 in Takoradi.
- **Research Methods and Report Writing Training.** The Community/Public Relations Officer of the HR/Administration Department benefitted from this Training. The training was organized by the Institute for Statistical and Social Research of the University of Ghana Legon for different shades of professionals. The training was conducted from May 28 to June 8, 2012.
- **Mining Training for Non-Mining Professionals.** This training was organized by the University of Mines and Technology, Tarkwa in collaboration with the Ghana Chamber of Mines. The first phase of this training was carried from June 11 to August 31, 2012. Two (2) mining workers were sponsored by GMC to benefit from this training. The purpose of this training is to prepare non-mining professionals in the industry to become certificated mining professionals.
- **Physician Assistants Annual Conference for Professionals.** The company sponsored one health worker from the GMC hospital to partake in this professional development conference. The Conference was organized by the Ghana Medical Association in collaboration with the Ghana Health Service for Physician Assistants in the country to development their profession and to be abreast with current medical practices and appropriate medication to be administered in a particular situation. The program took place at the EREDEC Hotel, Koforidua from October 8-12, 2012.
- **Pharmacy Technologists Association Annual Conference for Professionals.** This program was organized by the Pharmacy Technologists Association under the auspices of the Ghana Pharmaceutical Council at Tamale, Northern Region from October 17–21, 2012. The purpose was to create a professional development platform for Pharmacy Technologists in the country to share experiences, learn about new developments in the field of practice and to renew their membership with the regulatory body. The company sponsored one (1) of the Pharmacy Technologists of the GMC Hospital to benefit from this program.
- **Preparation of Shift Bosses for Mine Captain Certification.** Three (3) Shift Bosses were prepared by GMC to write the Mine Captain certification examination organized by the Minerals Commission of Ghana. A consultant was engaged to prepare the three (3) candidates for the said exams. In the face of the skill flight challenge that the mining industry is facing, GMC believes that there is the need for building a pool of skilled personnel for its mining operations. The company believes that, the availability of such

pool of skill will ensure continuity of its business operations even if the unexpected happens. The candidates required at least six (6) months preparation before taking the exams.

6.0 OIL MANAGEMENT

During the year under review a total of 183,040 liters of used oil was retrieved from the routine maintenance and servicing of equipment in the workshops and from periodic cleaning of the oil/water separator.

6.1 Oil Management Training

The Environmental Department ensures that hydrocarbons including petrol, diesel, grease and lubricants are properly managed in order to prevent health and safety hazards in the mine. In view of this, a presentation on the environmental topics “Hydrocarbon Management” was carried out during the year under review with the entire workforce. For effective participation, it was organized for the various departments on a rotational basis with the respective HOD’s in attendance as indicated in plates 18 and 19 below.

Oil Storage and Handling was organized. This training program was organized by Total Ghana for workers from the Engineering Department and those from Stores. The main object of this training was to help the participants to appreciate the causes of oil contamination and its effect on machine efficiency as well as what to do to prevent from becoming contaminated through proper storage and handling practices. The training was organized in three (3) sessions. The first batch was on April 31, the second batch July 16 and the last on July 17, 2012. The training was at no cost to GMC apart from meals.



Plate 18: Hydrocarbon awareness training



Plate 19: A cross-section of participants

6.2 New Oil Management Systems

During the year under review, New Oil Pumping Systems with engine, gear- hydraulic and grease suspenders were installed to help dispense accurate Levels of lubricants into equipment

and trucks and also to help in the effective management and the minimization of spillages. The system is also an improvement on the dispensing of the correct lubricants into equipment for the avoidance of possible contamination of the various lubricants.

6.3 Waste Segregation and Disposal

Education on the importance of waste segregation and colour codes has been intensified at the various departments. Dust bins depicting the appropriate colours have been placed at vantage points. The environmental department intends to paste pictures of various wastes on the bins.

7.0 INFRASTRUCTURE IMPROVEMENTS 2012

7.1 Takoradi Port

The Tippler is the device used to empty the railway wagons onto GMCs belt infrastructure. A complete rebuild of the 60yrs old infrastructure was carried out, utilizing modern PLC controls and a state-of-the-art hydraulic power pack. All instrumentation and control circuits were developed in-house GMC and used to train and re-educate on Siemens PLC and general Instrumentation. A total modification of the old tippler unit with new tippler drives on a hydraulic system gave rise to an increase in its cargo lifting capacity.

An automatic sampling system was designed and built at the shipping location, enabling GMC having representative samples. Plates 22 and 23 show new conveyor structure for conveyor and new transfer house between No. 2 and No. 3 points respectively.



Plate 22: New conveyor structure for Conveyor Plate 23: New transfer house between Nos .2

7.2 Nsuta Infrastructure

During the year under review, several infrastructural projects were undertaken. A new building infrastructure is currently established for the CAT workshop, consisting of 4 Offices, 1 Meeting Room, 1 Tools room and a new change room for the wellbeing of our staff. Chance was taken to utilize part of the facility for housing a server and switchboard at no additional cost. Plates 24 and 25 below show the New CAT workshop structure.



Plate 24: CAT workshop new office infrastructure.

7.2.1 JNR Staff Residences

As introduced in 2011, the JNR staff housings were brought to new standard by designing a 2-in-1 plan. Designs were carried out by GMCs Civil Engineering Team, works and implementations successfully created by closely supervised contractors. Concurrently, Bio Gas chambers were introduced in order to provide cheap source of energy and reduce the electrical consumption of all units. Plates 26 and 27 show Junior Staff houses under construction and completed Junior Staff housing units.



Plate 26: Junior Staff houses under construction. Plate 27: Biomas Chamber inspection

During the year under review, renovation works aimed at improving hygiene of the facilities and tiling works were carried out. Converting the “former” junior staff club house into a fully equipped sporting and gymnasium facility including an open air basketball/tennis court was also undertaken in 2012 and will be completed in 2013.

8.0 ENVIRONMENTAL IMPROVEMENT PROGRAMMES DURING YEAR 2012

8.1 Environmental Program and Workshops

The environmental policy statement was discussed with workers in the various departments during the HSE morning meetings on a rotational basis. This is to make them aware of the company’s commitment to environmental issues and the role of employees in achieving the company’s goal.

Presentation on oil management was made as part of training for workers at the filling station organized to sensitize them on Standard Operating Procedures and safety precautions during their work.

The company’s waste classification colors were regularly discussed at the HSE morning meetings. This is to make the workforce familiar with the colors so as to enhance proper segregation of waste on the mine.

The following were also undertaken during the year:

- Induction of newly employed workers and employees resuming from annual leave was also conducted.
- Staff of the Environmental Department attended all the ENSOC meetings held during the year 2012.
- A training session was organized on the theme “General House Keeping,” to encourage the workers to practice good housekeeping at all times. The workers were also informed about the next Akoben Audit requirements and the need to follow oil spillage management procedures by cleaning up oil spills immediately with either saw-dust or sand/rag which, should thereafter be put into the contaminated material/waste bins.

8.2 Summary of Environmental Activities during Year 2012

- The oil/water separator was thoroughly cleaned; the four (4) siltation chambers connected to the oil/ water separator were de-silted and regularly checked to ensure only water free of oil was discharged into surrounding streams.
- Various drains on the mine were regularly de-silted to improve drainage and surroundings regularly weeded to maintain a clean environment.
- The metal pipes on the piezometric points at the tailings dam were painted to prevent rusting of the pipes.

- More dustbins were placed in banded areas in the Nsuta village. This was to improve the sanitation situation in the village so far as waste management is concerned. The various workshops were regularly inspected; oil spillage, waste segregation, littering and general housekeeping were closely monitored to ensure good housekeeping was practiced in the workshops.
- The dustbins/room for disposal of wastes from the canteen were thoroughly scrubbed and disinfected to remove stench and kept the place hygienic.
- Expired drugs at the pharmacy of the Nsuta hospital were properly disposed of by burying.
- Various drains on the mine including “Essuabena”, Kawere and Tarkwa Banso were de-silted to improve drainage and to maintain a clean environment.
- The contaminated soil containers at the workshops were repainted black in accordance with GMC color code.
- Various measures such as cutting of trench, planting of more trees and filling of gulleys with waste rocks were carried out on benches to ensure stability.
- Plastic dustbins with lids were provided to some departments and residences to aid in improving sanitation.
- Overgrown branches of trees in the residential areas, hospital and on the mine were pruned to improve their aesthetic value.
- Trees in close proximity to overhead lines were trimmed to reduce the risk of fire.
- The water storage chambers of the oil/water separator used for washing dump trucks were de-silted and thoroughly cleaned. The regular de-silting and cleaning of the separating chambers also continued within the year to ensure that only oil-free water is released into the external environment. Silt-trap constructed at the Golf course to reduce the amount of silt carried by storm water into the Kawere stream was regularly de-silted.

8.3 Visiting Groups

- The mining department of EPA visited the mine on their yearly Akoben audit of various mines on the 10th of May 2012.
- As part of the quarterly inspection by the Minerals Commission, officials of the Inspectorate Division of the commission visited the mine within the year.
- The Inspectorate division of the Minerals Commission visited the mine on their annual Safety audit.
- Consultants on Aquaculture visited the mine and assessed the suitability of water in Pit A, B, and C for fish farming during/after closure of the mine
- As part of the Mine Safety Day Celebration, the Inspectorate Division of Minerals Commission visited the mine to conduct Mine Safety audit.
- The Ankobra Basin Officer of the Water Resources Commission visited the mine for inspection of water bodies and their management.
- Engineering students from the Cape Coast Polytechnic paid an industrial visit to familiarize themselves with the operations of the mine.

- The Municipal EPA director was invited to the mine to hold discussions on projects to be undertaken this year.

9.0 ENVIRONMENTAL MONITORING PROGRAMMES

The environmental monitoring program at GMC is designed to evaluate the potential impacts of the operation on the surrounding environment and, to validate predictions made in the Environmental Impact Assessment and the Environmental Management Plan. Monitoring results are compared to the Environmental Protection Agency (EPA) guidelines and standards. In the absence of the applicable guidelines and standards, the results are compared to the World Health Organization (WHO) international standard.

9.1 Environmental Quality Monitoring

Environmental quality monitoring is one of the key tasks carried out by the environmental department throughout the year. For this purpose the Electrical department designed a fully networked system, coupled over encrypted radio connections from most of the required locations to the corporate network. Local meteorological conditions were monitored throughout the year. Places monitored include tailings dam, Pit C, and Tarkwa Banso. The meteorological conditions monitored included rainfall, temperature, wind speed, wind direction, rate of evaporation.

Periodic water monitoring was carried out to measure the depth and level of water in the tailings. This was carried out by the use of a piezometer gauge. At the tailings dam the ground water level measurement took place at six (6) different points. The values secured from the water level measurement were recorded and analyzed.

9.2 Daily Drinking Water Analysis

Drinking water is also analyzed for microbiological parameters such as total coli-form, faecal coliform, E coli, Yeast and Mold. Two samples of water were taken daily to determine quality of the presence of some water constituent. The parameters analyzed under investigation were mainly physiochemical parameters. Below is the detail of the qualitative analysis. A conductivity meter was used to measure the specific conductance, and total dissolved solid (TDS).

Chlorine and pH were analyzed qualitatively using Brometymol and O-T iodine as reagents respectively. Lovibond 1000 comparator was used to carry out the qualitative analysis. The water samples were taken from two different places namely Gallaway and Golf course. The Gallaway pump station supplies portable water to the Nsuta community and the company's operational areas while the Golf course pump station supplies water to the bungalows. Plates 29 show Laboratory technician autoclaving and technician analyzing water quality



Plate 29: technician analyzing water quality

9.6 Surface Water Quality Monitoring

The mine has an effective monitoring system designed to evaluate the potential operational impacts on the surrounding environment. Water sampling was carried out every month. Water was sampled from surface water and boreholes in the surrounding communities for quality assurance. See plates 32 and 33 below. Samples of all water sources within and outside mine were taken on monthly basis and are reported to the EPA, Mineral Commission and other stakeholders in the mining industry. These water sources include pits, bore holes, rivers and streams. Samples are then sent to SGS for analysis.

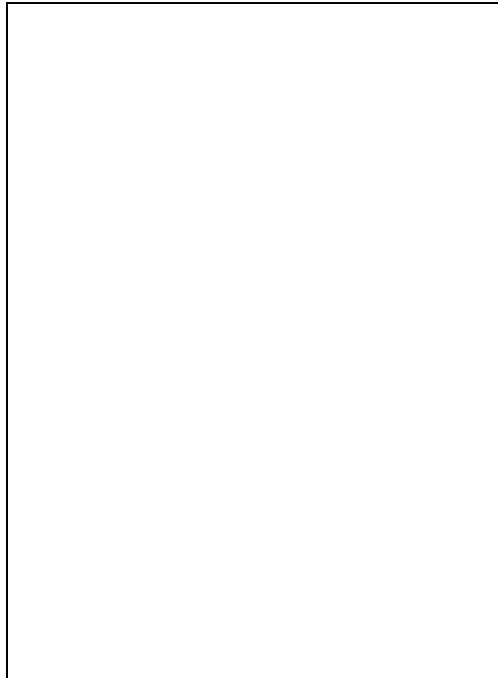


9.7 Dust Monitoring

The company carries out monitoring of the ambient air quality on its premises as well as the nearby communities to ensure that its activities do not have much adverse effects on its workers and inhabitants of nearby communities. Dust monitoring was conducted throughout the year using the Turnkey Osiris Dust Air sampler to determine TSP and PM₁₀ concentrations respectively at the carbonate processing plant, workers canteen, Takoradi Port, Nsuta village and the Tarkwa Banso community.

The OSIRIS environmental monitor is supplied with AirQ32 Windows software which enables results to be stored in the OSIRIS memory and uploaded into PC when sampling is completed. This phenomenon helps the mine to control and collect results from the OSIRIS sensor in real time for modelling and predicting ambient dust concentration in the operational areas. AirQ is designed to collect, manage and display data from a range of environment sensors, either as individual sensors or in real-time when connected to a sensor network. The sensors can be used to measure a whole range of environmental quantities such as PM10 particles, airborne fibres, VOCs and pollutant gases. Meteorological signals are constantly recorded as an aid to determining the source of the pollution as well as GMC's possible contribution.

Averagely most of the measured results were below EPA threshold values due to rains and effective dust suppression systems. Values higher than the EPA thresholds were due to wind storm during monitoring, heavy traffic and the harmattan season. Further measurements will need to be conducted to determine baseline data for reference. Table 9/Fig 16, Table 10/Fig 17 and Table 11/Fig 18 below show dust monitoring analysis for 2012.



9.8 Blast Monitoring

GMC conscious of environmental variations, designed a suitable blasting procedure in consultation with the Minerals Commission and EPA, giving due considerations to climatic condition.

The ground vibration measured was observed to be well within accepted limits, which is assisted by geological structures such as faults and fractures of the rocks in the area. The mine ensures correct relationships between burden, spacing and hole diameter. Correct delay sequence and interval time is of maximum importance. Further measures taken to minimize the “nuisance value” of blasting upon our communities include:

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