

***INTERNATIONAL CYANIDE  
MANAGEMENT INSTITUTE***

***Summary Cyanide Production  
Audit Report  
Cyanide Plants 1 & 2***

***Sasol South Africa (Pty) Ltd  
Sasolburg, South Africa***

***16<sup>th</sup> – 18<sup>th</sup> November 2015***

***For The  
International Cyanide Management Code***

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Name of Cyanide Production Facility	:	Midlands site, Sasolburg Operations
Name of Facility Owner	:	Sasolburg Operations, Sasol South Africa (Pty) Ltd
Name of Facility Operator	:	Sasolburg Operations, Sasol South Africa (Pty) Ltd
Name of Responsible Manager	:	Mandla Lehloo
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**Location detail and description of operation:**

Sasolburg Operations is a division of Sasol South Africa (Pty) Ltd, formerly known as Sasol Chemical Industries (Pty) Ltd. Sasolburg Operations consists of a number of Functions and Operations of which Midland Chemicals Operations is one. The Cyanide plant is a department within Midland Chemicals Operations.

The Cyanide plant is a production facility consisting of two operating plants, namely Cyanide 1 & Cyanide 2, located in the North West corner of the Midlands Site. The facility specializes in the manufacture of liquid sodium cyanide solution for use in the South African gold mining industry. The production of the final product is accomplished by converting ammonia and natural gas to hydrogen cyanide gas in Shawinigan Reactors then absorbing it in caustic soda to form sodium cyanide. The main raw materials, ammonia, natural gas and caustic soda, are sourced from within Sasol business units.

Sasolburg Operations is responsible for the provision of plant utilities (instrument air, process water, etc.) and specialised services to the various Sasol entities operating or performing functions on the Sasol Sasolburg sites, including the Cyanide plant on the Sasol Midlands Site. The aforementioned services include the following:

- Emergency Services (security, fire station, HAZCHEM, medical centre etc.)
- Environmental Services
- Water and Waste
- Site Logistics (Sasol Transportation)
- AIA (Approved Inspection Authority) Inspection Services
- Occupational Health and Safety



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*Auditor's Finding*

This operation is


- X in full compliance
- in substantial compliance \*(see below)
- not in compliance

with the International Cyanide Management Code.

This operation has not experienced compliance problems during the previous three year audit cycle.

Audit Company: Eagle Environmental

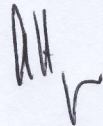
Audit Team Leader: Arend Hoogervorst E-mail: [arend@eagleenv.co.za](mailto:arend@eagleenv.co.za)

Name of Production Auditor	Signature of Auditor	Date
Arend Hoogervorst		22/3/2016

Date(s) of Audit: 16<sup>th</sup> – 18<sup>th</sup> November 2015


I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Institute for Code Verification Auditors.

I attest that this Summary Audit Report accurately describes the findings of the verification audit. I further attest that the verification audit was conducted in a professional manner in accordance with the International Cyanide Management Code Verification Protocol for Cyanide Production Operations and using standard and accepted practices for health, safety and environmental audits.

Name of Facility	Signature of Lead Auditor	Date
Sasol Cyanide Plants 1 & 2		22/3/2016

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Cyanide Plants 1 & 2

  
Signature Lead Auditor  
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22<sup>nd</sup> March 2016

**1. OPERATIONS: Design, construct and operate cyanide production facilities to prevent release of cyanide.**

*Production Practice 1.1: Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.*

**The operation is**  **X in full compliance with** **Production Practice 1.1**  
 in substantial compliance with  
 not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*

The original Quality Assurance/Quality Control plant documentation, in conjunction with the Engineer's Fit for Purpose report, was reviewed in the original Certification Report. Repairs recommended by the Professional Engineer have been implemented and signed off. Two additional cyanide storage tanks were constructed in 2013 including the pumps, pipes, valves, secondary containment and structures. The project was executed by a construction company, who were contractually required by Sasol to implement a quality assurance program and quality records were sighted and sampled. Subsequent annual fit-for-purpose engineering reports for all the production facilities were sampled and reviewed. The qualifications and competencies of the appropriately qualified persons were sighted. Documentation sighted showed that materials used for construction of cyanide production facilities was compatible with the reagents used and processes employed.

Pipelines are included in the Planned Maintenance System and form part of the operational inspections. PMS inspections and process inspections are used as preventative measure for spill prevention of the cyanide solution pipelines.

There are systems in place to:- stop gas flows, stop pumps, release emergency nitrogen into the process, shut down reactors, and use back-up power to enable an orderly plant shutdown in case of power outages. The new tanks are mechanically linked, level measuring instrumentation and alarms are fitted, and interlocks in place will stop the filling of tanks if they reach 95%. Cyanide is managed on concrete surfaces to prevent seepage to subsurface. Secondary containments for process and storage tanks and containers are constructed of materials that provide a competent barrier to leakage and are sized to hold a volume greater than that of the largest tank or container within the containment and any piping draining back to the tank, and with additional capacity for the design storm event. The dam levels are shown on the SCADA (Supervisory Control and Data Acquisition) system and are equipped with high level alarms to ensure that the operating capacity remains available. Any overflow from the effluent dams is designed to flow down concreted trenches to the unlined environmental control dams.

*Production Practice 1.2: Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.*

**The operation is**  **X in full compliance with** **Production Practice 1.2**  
 in substantial compliance with  
 not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*

There are 387 procedural documents and 59 engineering procedures in place. All documents are quality controlled by a dedicated Quality Practitioner who has a specific document control

function. Documents are now broken down into subsections: - MR-PRC-AS – assessments; MR-PROC-CL – checklists, MR-PROC-LOG – Log sheets, MR-PROC-OTM – Operating Training Manuals; MR-PROC-PJO – Planned Job Observations; MR-PROC-PTW – Permit to Work; MR-PROC-WI – Works Instructions. A new, centralised and controlled electronic document repository system has been put into place to improve document access, and document review and update.

The liquid cyanide tanks are equipped with ventilation pipes to atmosphere as well as returning gas to the process. The solid cyanide store has centre roof ventilation openings which are waterproof. The store is designed to route water to the outside of the wall sheeting and bund and is equipped with a bund wall inside to prevent water from ingressing to the store floor. Doors are fitted to all entries and the building is locked. No water may be used for fire extinguishing and signage prohibiting the use of water in case of fires was observed (use of sodium bicarbonate fire extinguishers at store was verified during site inspection). No solid cyanide is produced or stored in the cyanide production plants. The solid storage facility is situated within the Sasol Midlands site. The plant's new installed additional liquid storage capacity eliminates the need for dry storage of emergency stocks of solid cyanide which are currently being worked down.

There is a procedure in place which covers contingencies relating to Level 1 emergencies (within the cyanide plants). A Sasolburg Operations procedure explains the Level 1, 2, 3 emergencies. (Level 1 – site based, Level 2 – area based (Midland complex), Level 3 – External to complex.) Cyanide 1 and 2 plants are located within a much larger Sasol chemical complex (Midland Complex) which includes Sasol Operations and other companies.

Sasol has a Management of Change (MOC) Procedure which is used for any changes to equipment, infrastructure or processes. Not undertaking an MOC assessment is a dismissible disciplinary offence. This procedure is audited by PSM (Process Safety Management - either SASOL or external contractors) and DQS (ISO Auditors) annually. Examples of MOCs were sighted and reviewed.

The Work Management Process, STAR (Sasolburg Total Asset Reliability), is a planning system that was introduced to manage work scheduling for maintenance and was used until June 2015. From July 2015, a new system, WMS (Work Management System) has been implemented. The SAP (multinational software development and consulting corporation) Work Management Process is used as the work and task capture system. Activities include planned inspections and generation of maintenance orders. This system contains full histories. The Electron PM system was demonstrated to the auditor and on-screen checks were made on PM schedules and histories, for tanks, pumps, pipes, valves and bunds.

Both Cyanide 1 and 2 are equipped with Delta V, updating the old Rosemount RS3 (both are Digital Control Systems). Certification of instruments is done using certified, calibrated instruments to check the operational instruments. Process calibration is done, based on works orders automatically generated in the SAP PMS schedules. External certification is done on the Druck (pressure equipment calibration equipment) and the Gammatrol (radiation based instrumentation calibration) units. Significant changes to process parameters are subject to a MOC process. Equipment is calibrated according to a documented schedule. Calibration certificates were sampled and found to be up to date.

Two procedures, "Management of Water and Waste Water on the Sasol 1 and Midland sites", and "Midlands Effluent Control SOP – High Cyanide from Cyanide Plant", are used in conjunction with a water balance model to prevent unauthorized/unregulated discharge to the environment of any cyanide solution or cyanide-contaminated water. Various scenarios were simulated which demonstrated the adequacy of dam capacity. Critical scenarios were identified and appropriate procedures have been developed to prevent discharge to the environment. The facility has environmentally sound procedures for the disposal of cyanide or cyanide-contaminated solids.



Sasol does not transport solid cyanide to end users, only liquid sodium cyanide solution. Bulk tankers are designed, labelled and operated as per South African legal standards for bulk tankers and hazardous substances transport. The tankers are operated by a Cyanide Code compliant third party transporter, Tanker Services.

*Production Practice 1.3: Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.*

The operation is  in full compliance with  
 in substantial compliance with  
 not in compliance with

Production Practice 1.3

*Summarize the basis for this Finding/Deficiencies Identified:*

Informal, on-going observations and inspections by shift staff are recorded by variance in the Shift Manager's Handover Logbook (Sampled and reviewed). The Tanker Loader Handover Log books, also in place, include checklists for shift handover covering operations, maintenance and personnel.

The facility uses the SAP (computerized) system to schedule and control inspection, monitoring, and maintenance of production facilities. Statutory Inspections (10 yearly) are undertaken by the Sasol, on-site, Statutory Inspection Authority (SIA). The current tank repair schedule covers 2013-2018. Weekly operational inspection checklists include looking for leaks and rust. There are 5 yearly visual external inspections and ten yearly full internal inspections (statutory) for all tanks.

All bunds are included on the SAP system and are inspected annually. Bund leak tests are carried out at the same time as the ten yearly inspections. Site inspection showed bunds were in good condition with evidence of on-going repairs and maintenance. Inspections are linked to a job card system to ensure effective response and follow-up of actions.

Pipelines are inspected according to an annual SAP inspection program. Weekly operational inspections by checklist include pipes, valves, and pumps and include looking for leaks, noise, and corrosion. Pumps are inspected on the SAP system on a daily basis for leakage, glands, mechanical seals, noise and general condition. Safety relief valves are included on the SAP system on a 2 yearly frequency. Tank and pipe thickness testing is carried out as per schedule and records were sampled accordingly.

All inspections are documented and include the date of the inspection, the name of the inspector, and any observed deficiencies. The nature and date of corrective actions are documented, and records are retained. The on-going failure mode analyses and legal checks are deemed adequate to ensure that inspection frequencies are sufficient to confirm that equipment is functioning within design parameters.

**2. WORKER SAFETY: Protect workers' health and safety from exposure to cyanide.**

*Production Practice 2.1: Develop and implement procedures to protect plant personnel from exposure to cyanide.*

The operation is  in full compliance with  
 in substantial compliance with  
 not in compliance with

Production Practice 2.1



*Summarize the basis for this Finding/Deficiencies Identified:*

The plant only produces liquid sodium cyanide, shipped in bulk tankers to the end users. The procedures include the required PPE and pre-work inspections for the work. The use of a standby (the “buddy”) is included in the specific procedures where a standby is required. Procedures sampled and reviewed included:- Sasol Regional South Africa Procedure for Work Permits, Management Of Change (MOC), Offloading of an overloaded tanker, Decontamination procedure for the cyanide plant, and the Maintenance Work Instruction for breaking into lines and swinging of Goggle plates. The Sasol Group Procedure for Work includes the requirement for a risk assessment, supported by a specific task risk assessment by the artisan before they carry out the job. The procedures routinely include normal, abnormal (non-routine) and emergency scenarios, required personal protective equipment (PPE), risks, emergency conditions and abnormal conditions, as well as protective measures, actions and responses.

Sasol has a Management of Change Procedure which is used for any changes to equipment, infrastructure or processes. Not undertaking an MOC assessment is a dismissible disciplinary offence. This procedure is audited by PSM (Process Safety management - either SASOL or external contractors) and DQS (ISO Auditors) annually.

New communication structures started on 1 July 2014. Mini business meetings have been held for two years and replaced previous structures, following the implementation of Project Phoenix (A Sasol Restructuring Programme). Project Phoenix resulted in changing communication to continue to include worker input in the form of the daily assurance meeting where safety forms a regular agenda item. Operators can raise issues relating to procedures at the daily shift meetings. Similarly, the daily maintenance meetings will include safety and procedures. A Quality practitioner has been appointed for the Cyanide Plant to manage document issues and procedure update and control. Procedures are updated and circulated electronically to all staff on the plants who have the opportunity to comment appropriately. All staff on the plant have access to email. Feedback on procedures is not common. Prior to the new structures implementation, worker input came via the BBS (Behaviour Based Safety) program. Steering committees (included worker representatives), and operators are included in risk assessments or represented through the SHE (Safety, Health & Environment) representatives in the Shift Circle meetings.

There is a procedure for monitoring of the stacks at Cyanide 1 and 2 Plants. It requires monitoring of gaseous emissions to demonstrate compliance with the permit conditions and specifies monitoring of Hydrogen cyanide gas, amongst others. Hydrogen cyanide (HCN) gas emissions are limited to 15ppm derived from the National Environmental Management (NEM) : Air Quality Act (with a trigger warning at 6ppm). Data from 1/01/ 2012 to 17/11/2015 was sampled with all results being at or below limits of detection (less than 4 ppm hydrogen cyanide gas) for both stacks at Cyanide 1 and 2. In addition, six IBRID portable gas monitors are used to ensure that workers are not exposed to hydrogen cyanide during the course of any operations that may cause the release of hydrogen cyanide as defined by the risk assessment for the job. No fixed monitors are used. The portable monitors are sent for calibration weekly but the manufacturer’s recommendation is six monthly calibrations. Sighted records confirming regular calibration.

Worker exposures are governed by risk assessments and health risk surveys which influence the writing of procedures and work instructions which include relevant PPE and mitigation controls. Any “hot spots” are activity driven, rather than area based.

The site wide radio system was upgraded to a digital trunked mobile radio system from an open channel system. This improves communication with the control room in case of emergencies.

The use of the standby (the “Buddy”) is included in the specific procedures where a standby is required.



Employees receive annual medicals, pre-employment medicals, and exit medicals, and routine surveillance medicals are also undertaken. Staff are blocked from entering the site at the security gate if it is not recorded that they have had an up to date medical.

The site has a cyanide specific laundry. Cyanide plant personnel are issued with overalls and work clothing which is returned at the end of the shift to be rinsed (pre-laundered) on the plant from where it is sent to an outsourced contractor for final washing. Laundering of work clothes forms a part of the decontamination procedure. Employees are required to change overalls after all spills or splashes. If visitors or contractors have clothing contaminated, they will be washed in the cyanide laundry. The effluent from the laundry is returned to the plant for processing.

There is a procedure for symbolic safety signs, colour coding and emergency showers in place. Sasol uses SANS (South African National Standards) standards for PPE signage. "Use of Goggles" areas are delimited by yellow painting on handrails. The use of appropriate signage including MSDS display boards and the use of signage prohibiting smoking, eating, and drinking and open flames in the appropriate areas was verified during the site inspection.

*Production Practice 2.2: Develop and implement plans and procedures for rapid and effective response to cyanide exposure.*

The operation is  in full compliance with  
 in substantial compliance with      Production Practice 2.2  
 not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*

The 'Procedure for level 1 emergency, level 2 emergency, or level 3 emergency conditions on the cyanide plants' was sighted and details the actions to be undertaken in the event of an emergency on site to ensure there is a rapid and effective response to a potential cyanide exposure. (Level 1 is within the plant, level 2 is site wide and level 3 is outside the site boundary.) The Works Emergency Action Plan (site procedure) is referenced in the plant procedure for Level 2 and 3 emergencies and the Area Emergency Action Plan is referred to in the plant procedure. The cyanide treatment protocol is in place at the clinic and the external hospital is familiar with the protocol.

Fire Extinguishers were observed to be located strategically on the plants. Operational shift inspections are undertaken which include fire extinguishers, eye wash bottles, first aid boxes, fire hydrants, utility points and safety showers. Safety showers also form part of the monthly visual inspections. Showers are repaired when found to be defective. Monthly inspection sheet records which include fire extinguishers, safety showers, and eye wash boxes and bottles, were sampled in 2013 and 2015. The Sasol Midland Complex Fire station inspects fire extinguishers annually. A Fire Protection Survey (including maintenance, pressure testing and servicing) is conducted every 2½ years.

Oxygen and resuscitators were observed at the control room for use in an emergency. The antidote is held in a dedicated refrigerator in the Control Room. In addition, a cyanide medical treatment kit is also held in the Control Room. Both of these are only administered by the doctor attending the emergency. Potable water is readily available. Cyanide poisoning alarm points are located on Cyanide 1 and 2 Plants. Poison alarms are tested monthly on the 1st Wednesday of each month. A radio communication system is in place for plant based communications.

The Clinic Emergency Room is fitted with defibrillators, oxygen points, beds, standby oxygen cylinders, and points on a portable oxygen distributor. It was reported that two sets of Tripack antidotes are available in the fridge in the Clinic pharmacy. If the plant cyanide alarm is set off, an alarm is automatically triggered in the Clinic. The ambulance from the Fire Department is then directed to a safe location for receipt of any affected personnel once it reaches the plant.



Communication between the clinic and plant is via telephone. Trained staff at the Clinic include registered nurses and doctors on dayshift and 1 nurse and 1 doctor on standby after hours. The clinic can treat 16 patients in beds and 42 on oxygen points.

Cyanide first aid equipment consists of first aid boxes, SCBA sets, and emergency escape chairs. First aid boxes are maintained and replenished by the Complex's medical station. Operational shiftly inspections cover cyanide antidote, oxygen, emergency BA sets, first aid boxes, cyanide antidote fridge, and the poisoning alarms. Equipment is inspected shiftly and monthly.

The revised cyanide first aid protocol is available in the clinic emergency room and the cyanide emergency treatment kit is in the control room. The business language of the plant is English and all procedures and information materials are in English. MSDSs are available in plant files (2) and displayed on notice boards in the appropriate sections on the plant as well as available on the intranet. The site is moving to electronic SDSs (Safety Data Sheets) which are available to all on the Intranet Bubbles Portal. All employees are computer literate and have access to computers.

Tanks and pipes are clearly marked using a stencil signage format. Cyanide is identified with flow direction indicated on pipes, all tanks (including new tanks and associated pipelines) are labelled.

A procedure is in place for transporting patients during day clinic hours to the on-site clinic and after clinic hours to the Vaal Park hospital off site. Patients can also be transported to Metsimaholo Provincial Hospital. There is an open ended mutual aid agreement with ER24 ambulance services for rendering additional ambulance services in place.

Mock drills are undertaken on a regular basis at all levels and records of these were sampled. The reports detail observations, recommended actions, responsible people and comments with the target date for corrective actions, where necessary. There is a procedure in place covering incident investigation and documentation relating to reporting, investigation and corrective actions which was reviewed.

### ***3. MONITORING: Ensure that process controls are protective of the environment.***

*Production Practice 3.1: Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.*

The operation is  in full compliance with  in substantial compliance with  not in compliance with Production Practice 3.1

#### *Summarize the basis for this Finding/Deficiencies Identified:*

It is possible for the facility to have a direct discharge to surface water. This does not normally occur, as effluent water and storm water within the cyanide plant is captured in the lined, concrete containment pits (A, B, C, D) prior to being returned to the plant to be used in the process. If Pit D is full, overflow will pass to the CAP Dams. Water from the CAP Dams is passed to the discharge from the site via the South Channel.

A comprehensive probabilistic water balance (updated three yearly) is used to simulate and manage rainfall scenarios to prevent direct discharges (The two new cyanide storage tanks were included in the probabilistic water balance to test the risk of discharges - sighted demonstration of water balance. The output indicates that the system can handle a rainfall event of 600mm. This exceeds the potential storm events significantly). The overflow of the dams would only result in an unrestricted discharge to surface water in the event of a 600mm rainfall event and simultaneously for the largest tank to rupture.

The facility has a target which is not to exceed 0.022mg/l total cyanide (this is less than the 0.5 mg/l WAD cyanide) in the discharge. The Effluent Control Department takes samples of the CAP and South dams prior to release of any water from these dams. A flow model is used to determine that the mixture of water from the different dams does not lead to any exceedance. In addition, samples are taken every 4 hrs and tested for Cyanide, conductivity, sodium and pH by the Effluent Control Department. A daily sample is sent to the Sasol laboratory for analyses with results uploaded into the LIMS (Laboratory Information Management System). There is also an on-line continuous monitor at the discharge point with readings fed through to the Effluent Control Department. There is no numerical standard established by the applicable jurisdiction for WAD cyanide or any other species of cyanide in groundwater, therefore there are no compliance points below or down gradient of the facility. There are no identified beneficial uses of the groundwater in the area, i.e. No boreholes that are extracting water for drinking purposes or stock watering.

There is a procedure for monitoring the stacks at Cyanide 1 and 2 Plants. It requires monitoring of gaseous emissions to demonstrate compliance with the permit conditions and specifies monitoring of Hydrogen cyanide gas, amongst others. Hydrogen cyanide gas emissions are limited to 15ppm derived from the National Environmental Management (NEM) : Air Quality Act (with a trigger warning at 6ppm). Data from 1/01/ 2012 to 17/11/2015 was sampled with all results being at or below limits of detection (less than 4 ppm Hydrogen cyanide gas) for both stacks at Cyanide 1 and 2.

Currently the site monitors for cyanide in groundwater up and down gradient of the site. Surface water monitoring is only down gradient of the site as up gradient flows are low and intermittent and not from a significant water course. Groundwater monitoring for cyanide is conducted 6 monthly for boreholes where the boreholes contain water. Stack emissions are monitored twice daily at 04h00 and 16h00. Surface water sampling is through continuous on-line monitoring, 4 hourly samples, daily samples and external third party monthly samples. Frequencies are reviewed on a case by case basis with consideration of performance, normal, abnormal and emergency conditions or other factors which might influence results. Monitoring for cyanide in surface and ground water conducted at frequencies which are deemed to be adequate to characterize the medium being monitored and to identify changes in a timely manner.

**4. TRAINING: Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.**

*Production Practice 4.1: Train employees to operate the plant in a manner that minimizes the potential for cyanide exposures and releases.*

The operation is  in full compliance with  in substantial compliance with  not in compliance with Production Practice 4.1

*Summarize the basis for this Finding/Deficiencies Identified:*

Plant specific induction training is conducted annually for employees and three yearly for contractors. Training includes induction training, plant specific training, special skills training, and work instructions including hazards associated with the respective task. Training is continually reviewed and revised and PSM (Process Safety Management) requirements from the wider site are also included in the work instructions. Use is made of the spare shift to provide additional, or to reinforce, training. Refresher training is scheduled in the training matrix. The induction training contents changed to a Sasol generic induction which is not specific but Plant

specific induction includes plant detail and cyanide information. Refresher “on-the-specific-job” is done every time a permit is issued for a job. Task risk assessments are done before every task commences.

A standardised PPE training module is now in place covering the entire Midland operations. Every works instruction indicates what PPE is required. PPE training is covered in the Permit to Work process or if identified during the task risk assessments. PPE signage is in place for each specific area. Decontamination is discussed as part of the task risk assessments.

The Training Matrix includes all employees and the training requirements for the various jobs. Linked to the matrix is the employee’s individual profile with the training to be undertaken and the progress completed. The revised training system is being implemented following Project Phoenix. Competency assessments are undertaken by experienced plant personnel. Training of replacement staff is done through a structured program supported by training quality control systems and records. Experiential requirements for each job are documented, and backed up with a personal development plan (PDP) and succession plan for each employee. The training is provided by appropriately qualified personnel.

Employees are trained, assessed and declared competent according to National Qualifications Framework (NQF) unit standards applying to chemical manufacture. New or transferred employees must be "passed out" on new work or tasks to be undertaken.

After theoretical training, an employee is given an assessment test. Practical training in the plant is checked by the training officer and the appropriate shift foremen. Shift foremen will monitor progress and return an employee for additional training, if necessary. Planned job observations (PJOs) are used to check worker competency. Competency assessments are done by experienced plant personnel.

*Production Practice 4.2: Train employees to respond to cyanide exposures and releases.*

The operation is  in full compliance with Production Practice 4.2  
 in substantial compliance with  
 not in compliance with  
 not subject to

*Summarize the basis for this Finding/Deficiencies Identified:*

All employees are trained in emergency response procedures on site and records were checked to confirm training and refresher training was undertaken. The training is checked during planned exercises/mock drills. The planned exercises/ mock drills cover health and safety and environmental scenarios. Contractors are covered by fulltime Sasol officials while on site.

A feedback (post mortem) meeting is held after emergency exercises and recommendations are made. The post mortem report, including recommendations, is fed back to the Training Department.

Training records are held throughout the working life of the employee with full records covering trainer, courses attended, dates, and performance and test results. The training matrix contains the electronic training records on training scheduled and completed for all cyanide plant employees. Training hard copy records are retained and are being recorded to the SAP electronic system, prior to being archived.

**5. EMERGENCY RESPONSE: Protect communities and the environment through the development of emergency response strategies and capabilities.**



*Production Practice 5.1: Prepare detailed emergency response plans for potential cyanide releases.*

The operation is  in full compliance with  
 in substantial compliance with  
 not in compliance with

Production Practice 5.1

*Summarize the basis for this Finding/Deficiencies Identified:*

The 'Procedure for Level 1 emergency, Level 2 emergency, or Level 3 emergency conditions on the cyanide plant' was sighted and details the actions to be undertaken in the event of an emergency on site to ensure there is a rapid and effective response to a potential cyanide exposure. (Level 1 is within the plants, Level 2 is site wide and Level 3 is outside site boundary.) The Works Emergency Action Plan (site procedure) is referenced to in the plant procedure for Level 2 and 3 emergencies and the Area Emergency Action Plan is referred to in the plant procedure.

The Works Emergency Action Plan includes all the relevant scenarios that have been identified, along with the appropriate response.

The cyanide emergency response plan would be triggered if the poisoning alarms were activated. Activation could also be via report to the Shift Manager or any supervisor. Emergency response plans can be escalated from a local situation (Level 1) to a Level 2 (site wide) emergency via the senior operator in the control room or a Level 1 can be escalated to a level 2 by the Emergency Action Controller.

*Production Practice 5.2: Involve site personnel and stakeholders in the planning process.*

The operation is  in full compliance with  
 in substantial compliance with  
 not in compliance with

Production Practice 5.2

*Summarize the basis for this Finding/Deficiencies Identified:*

All documents are quality controlled by a dedicated Quality Practitioner who has a specific document control function. The emergency documentation is circulated to all for comment as a part of the document management process. All employees on site have access to electronic documents and are computer literate.

The Stakeholder Engagement Plan for 2015 was reviewed which included general chemical and cyanide specific engagements which incorporate cyanide plant visits, newspaper advertisements, presentations, radio panel discussions and integrated community environmental projects.

During emergency exercises, external agencies such as Fire Brigade, ambulances, site clinic, Vaal Park Hospital, South African Police Service and traffic authorities are involved and participate in post mortem discussions as appropriate. There is a mutual aid agreement in place with the local authority, and all the companies located on the Midland complex.

*Production Practice 5.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.*

The operation is  in full compliance with  
 in substantial compliance with  
 not in compliance with

Production Practice 5.3

*Summarize the basis for this Finding/Deficiencies Identified:*

Primary responders and their back ups are clearly identified in the emergency response plan and call outs and contact details are readily available. Emergency equipment inventories were checked and noted to reflect actual availability. Outside responders (i.e. the Complex's medical and fire teams) were found to be readily available and a random drill test showed availability and speed of response.

The cyanide facility is part of a much larger Sasol chemical complex (Midland Complex) which has its own emergency response and support facilities. Roles and responsibilities for outside responders are part of the Complex's Emergency Procedures: Community members do not have specific roles in emergency procedures.

*Production Practice 5.4: Develop procedures for internal and external emergency notification and reporting.*

The operation is             in full compliance with            Production Practice 5.4  
    in substantial compliance with  
    not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*

The Sasol Group Communication Procedure is adhered to and referenced in the 'Works Emergency Action Plan'. The Corporate Affairs member of the Works Emergency Team is responsible for managing external communication and information flow as per the 'Group Crisis Communication Guidelines'. There are four named persons within the guidelines who are the primary contact persons. In the event of an emergency the on-site Clinic and the control room for Cyanide 1 and 2 Plants are directly in contact via telephone.

*Production Practice 5.5: Incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.*

The operation is             in full compliance with            Production Practice 5.5  
    in substantial compliance with  
    not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*

The Sasol remediation procedures cover the Midlands Complex, including the Cyanide Production Plant and include clean up, remediation and waste disposal associated with cyanide incidents on and off-site. No chemicals are used in neutralisation of cyanide contaminated media. Contaminated media such as soil is disposed of at a licenced hazardous waste disposal site.

The need for environmental monitoring to identify the extent and effects of a release, including sampling methodologies, are included in the Sasol remediation procedures. Where possible, the current monitoring locations would be used as the most likely locations for monitoring surface water and ground water, otherwise the location of the monitoring points would form part of the investigation. Surface water sampling is through continuous on-line monitoring, 4 hourly samples, daily samples and external third party monthly samples. Frequencies are reviewed on a case by case basis with consideration of performance, normal, abnormal and emergency conditions or other factors which might influence results.



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*Production Practice 5.6: Periodically evaluate response procedures and capabilities and revise them as needed.*

The operation is  in full compliance with  
 in substantial compliance with                      Production Practice 5.6  
 not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*

With the quality process being implemented after Project Phoenix, a dedicated Quality Practitioner has been assigned to the Cyanide Plant. All documentation, including emergency response procedures, is reviewed on a 3 yearly basis, or where significant change is necessary. Procedures require that plant drills (Level 1) be carried every second month, and Level 2 drills annually, according to the Emergency Management Schedule, with Level 3 drills, being conducted every three years.

