

# ***INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE***

## ***Production Summary Recertification Audit Report***

Sasol Polymers Chlor Vinyls -  
Cyanide 1 & 2 Production Facility

Midlands Site

7<sup>th</sup> –11<sup>th</sup> September 2009

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



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**SUMMARY AUDIT REPORT**

Name of Cyanide Production Facility : Chlor Vinyls Business - Mining  
Reagents Business

Name of Facility Owner : Sasol Polymers a division of Sasol  
Chemical Industries Limited

Name of Facility Operator : Sasol Polymers a division of Sasol  
Chemical Industries Limited

Name of Responsible Manager : Mr EHJ Fourie

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**Location detail and description of operation:**

Sasol Polymers is a division within Sasol Chemicals Industries Ltd and consists of a number of Business Units of which the Chlor Vinyls Business is one. The Mining Reagents Business is a department within the Chemicals Business.

The Mining Reagents Business is a production facility consisting of two operating plants, namely Cyanide 1 & Cyanide 2, located in the North West corner of the Sasol Polymers Midland 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.

Sasol Infracem is a division within Sasol Chemicals Industries and is responsible for the provision of plant utilities (instrument air, process water, etc) and specialised services to the various business units on the Midlands site. The Mining Reagents Business has service level agreements with various sections of Sasol Infracem for the provision of the following services:

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

***Auditor's Finding***

This operation is

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

with the International Cyanide Management Code.

\* For cyanide production operations seeking Code certification, the Corrective Action Plan to bring an operation in substantial compliance into full compliance must be enclosed with this Summary Audit Report. The plan must be fully implemented within one year of the date of this audit.

Audit Company: Eagle Environmental

Audit Team Leader: Arend Hoogervorst

E-mail: [arend@eagleenv.co.za](mailto:arend@eagleenv.co.za)

Names and Signatures of Other Auditors:

Name of Auditor	Signature of Auditor	Date
Peter Lotz		17.02.2010
Dawie Viljoen		10/2/2010

Adrian Packman                      Observer

Date of Audit: 7<sup>th</sup> – 11<sup>th</sup> September 2009


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.


Sasol Polymers Cyanide Plants 1 & 2

Name of Facility

Signature of Lead Auditor

  
9/2/2010  
Date

Sasol Cyanide Plants 1 & 2

Signature Lead Auditor  


9<sup>th</sup> February 2010

**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**       in full compliance with  
**X in substantial compliance with      Production Practice 1.1**  
 not in compliance with

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

Lack of full QA/QC documentation at the certification audit was augmented by an Engineer's Fit for Purpose inspections and reports. The subsequent related repairs were successfully completed and subsequent inspection documentation supports continued plant operation within established parameters. The plants have a set of plant trip mechanisms which include interlocks to respond to temperature variations, pressure differentials and flow rates.

A comprehensive repair program was put in place for cracks in the concrete pads and containments. This program has been satisfactorily completed and confirmed by the auditors.

*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**  
 in substantial compliance with      **Production Practice 1.2**  
 not in compliance with

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

The facility has the same, well established, set of procedures, work instructions, and plans, augmented by effective checklists, which are used by a seasoned and experienced workforce. A new Process Safety Management (PSM) is being implemented throughout Sasol and the main areas currently introduced are in the permit to Work System and the Management of Change process. STAR is a planning system introduced to manage work scheduling and this effectively controls the planned inspections and maintenance work. Effective instrumentation is in place to monitor process parameters and calibration is carried out systematically, and according to manufacturer's recommendations, built into the PMS schedules.

There is an effective Complex and plant water and waste water management system which ensures that all waste water is appropriately contained, using accurate model to simulate scenarios during wet and dry seasons. Cyanide waste is managed optimally with

innovative methods to prevent release of solids to the environment whilst being transported to an appropriate waste disposal site.

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

**X in full compliance with**  
**The operation is**       in substantial compliance with      **Production Practice 1.3**  
    not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*  
The SAP and STAR (computerized) systems are used to control and document inspection, monitoring, and maintenance of cyanide production facilities. Inspections are undertaken by Sasol's on-site Statutory Inspection Authority and are triggered by statutory requirements. They are also undertaken by both plant operational and maintenance staff. Frequency of inspections is governed by a combination of equipment supplier recommendations, a history of observations which have prompted modification and improvement and a formal failure mode analysis. Inspections are linked to a works order system to ensure effective response and follow-up of actions.

**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.*

**X in full compliance with**  
**The operation is**       in substantial compliance with      **Production Practice 2.1**  
    not in compliance with

*Summarize the basis for this Finding/Deficiencies Identified:*  
Personal protective equipment (PPE) requirements are listed in all procedures and are reviewed regularly by management and workforce through Health & Safety meetings and Safety Circle Shift meetings. All routine activities are covered by effective procedures and work instructions which link to the facility's baseline risk assessment and issue-based risk assessments. The permit to work system and clearance certificate requirements trigger the requirement for risk assessments and hazard identification for all non-routine activities. A new Management of Change system and procedure is in place and is being routinely applied. The "buddy" (standby) system is well integrated into procedures and permit to work requirements. The plant has a well established and sound signage system to reinforce and remind of safety, PPE and risk minimization requirements. An effective clothing change policy covering employees, contractors and visitors is in place and all cyanide plant personnel return their overalls and work clothing at the end of each shift for on-plant laundering.

The plant has eight Crowcon portable gas monitors which are used to monitor HCN gas levels and these are calibrated weekly. The majority of “hot spots” are activity-driven rather than area based. Appropriate controls are built into procedures, covering these activities, which are regularly checked through formal job observations. Periodic health risk assessments are also undertaken.

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

**The operation is**                    **X 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 Plant has its own Emergency Response procedure to respond to cyanide exposures. Emergency response, first aid, evacuation and hospitalisation plans are in place and are exercised regularly. A fully equipped Medical Centre/day hospital with doctors and nurses on standby after hours, adjoins the facility and ambulance/fire response are minutes away in the main Sasol chemical complex, of which the plant is a part. Safety showers are strategically placed throughout the plant, which uses eye wash bottle stations instead of eye wash stations connected to safety showers. Fire extinguishers and first aid boxes are located throughout the plant and are checked and maintained regularly. Water, medical oxygen, and antidote are readily accessible on the plant and a radio communication system is used throughout the plant. A well established decontamination procedure is in place and is regularly exercised during drills and practices. Plant wide and Complex wide emergency drills are regularly held to practice responses to various cyanide emergency scenarios.

**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**                    **X in full compliance with**  
 in substantial compliance with            **Production Practice 3.1**  
 not in compliance with

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

Although the plant has a direct discharge to surface water, the discharge passes through holding dams and a aquatic dam which is controlled and monitored. A probabilistic water balance has established control scenarios to assess and manage the risk of releases. Cyanide levels are monitored daily and no discharges are released until the water analyses have been checked. Detailed studies have been undertaken to assess surface and

seepage risks and short, medium and long term investigations and plans are in place to manage and remediate contaminants. Although cyanide is included, there are other higher risk contaminants that are being are being focused upon. An extensive ground and surface water monitoring program is in place to monitor cyanide. Groundwater monitoring for cyanide is conducted six monthly on 50 boreholes (where they contain water) and surface water monitoring is conducted daily at the outfall.

Gaseous emissions are monitored daily according to procedures and HCN gas stack emissions are controlled at 15ppm with a trigger warning at 10ppm.

**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**  **X in full compliance with**  
 in substantial compliance with **Production Practice 4.1**  
 not in compliance with

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

Plant specific cyanide training is conducted annually for employees and six monthly for contractors. PPE training is presented in a module that is a part of the annual and six monthly induction training. The effectiveness of annual induction and refresher training was tested through staff interviews and found to be good. A formally qualified trainer (with 20 years service in chemical production) has developed very effective, practical training modules which benchmark well against best industry standards. A training matrix has been developed which describes each job on the plant (including emergency response personnel) and the training and qualifications required to progress through a career succession plan for employees. A personal training file is opened for each employees which contains job and training requirements, job description, competency requirements, assessments, and job observation records. Employees are trained, assessed and declared competent according to National Qualification Framework (NQF) unit standards applying to chemical manufacture.

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

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

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

Procedures used are the Level 1 (Plant), level 2 (Complex) and Level 3 (External) Emergency Action Plans which are trained during induction and further trained and



exercised during regular full and partial drills. All employees are trained in emergency response procedures on site and records were checked to confirm training and refresher training was undertaken. The monthly "spare shift" is used to carry out training and re-training of emergency procedures. Interviews with workers confirmed good understanding of procedures and responses. Drills are conducted regularly and the trainers are fully involved in observing drills and evaluating response effectiveness. Training records are kept in the employee's personal training file.

**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**  **X in full compliance with**  
 in substantial compliance with **Production Practice 5.1**  
 not in compliance with

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

The plant emergency response plan was reviewed and found to be appropriately detailed, including appropriate, site specific, potential cyanide failure response scenarios. The emergency response plan can also be escalated from a local situation (Level 1) to a Level 2 (beyond site boundaries) emergency via the senior operator in the control room or a Level 1 can be escalated to a level 2 by Emergency Action Controller (Procedure for Level 1 Emergency, Level 2 Emergency or Level 3 Emergency Condition affecting community outside Sasol Complex boundary) on the Cyanide plant.

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

**The operation is**  **X in full compliance with**  
 in substantial compliance with **Production Practice 5.2**  
 not in compliance with

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

Facility personnel are adequately involved in the emergency response planning process through the Health and Safety Committee, emergency preparedness drills and post mortems thereof. Community involvement is via the Complex's liaison structures which include regular meetings of a Sasolburg Community Working Group (including community stakeholders), the Taaiboschspruit Forum (a local water users Forum), the Complex Inter-company Working Group and the local branch of the National Association for Clean Air. Regular contact is maintained with local authorities, Police, Fire Brigade, traffic authorities and medical response agencies.



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

**The operation is**            **X in full compliance with**  
 in substantial compliance with            **Production Practice 5.3**  
 not in compliance with

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

Primarily responders and their back ups are clearly identified in the emergency response plan (including escalations from Plant level 1 to level 2 and 3) and call outs and contact details are readily available. Emergency equipment inventories were checked and noted to reflect actual availability. Emergency Response Teams are identified in the Emergency Response Plan and they receive appropriate training. Outside responders (i.e. the Complex's medical and fire teams) were found to be readily available.

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

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

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

The Complex's weekly updated, detailed Hazmat emergency contact list includes all plant contact details and plant and complex procedures indicate who needs to be notified, in case of different emergencies. The Sasol Group Communications procedure describes the management of communications, information flows for all external communications, including reporting.

*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**            **X in full compliance with**  
 in substantial compliance with            **Production Practice 5.5**  
 not in compliance with

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

A specific, detailed procedure has been developed to deal with clean up, remediation and disposal associated with cyanide incidents on and off site and this is integrated with the site and Complex's wider emergency response mechanisms. The procedure states that no attempt should be made to neutralize or complex sodium cyanide that has entered a water course.

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

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

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

The Level 1 plan (plant) being a site procedure, is reviewed annually. Level 2 and Level 3 plans, require review at least every 5 years or after any significant changes, or after a major significant incident or as required by the Management of Change Process, or after any actual emergency. Drills are undertaken on the plant monthly for each shift and Level 2 and level 3 drills are carried out every four years.

