REPORT

International Cyanide Management Code Recertification Audit

Anhui Anqing Shuguang Chemical Co., Ltd– ICMC Production Recertification Audit Summary Report

Submitted to:

International Cyanide Management Institute (ICMI)
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WASHINGTON DC 20005
UNITED STATES OF AMERICA

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Submitted by:

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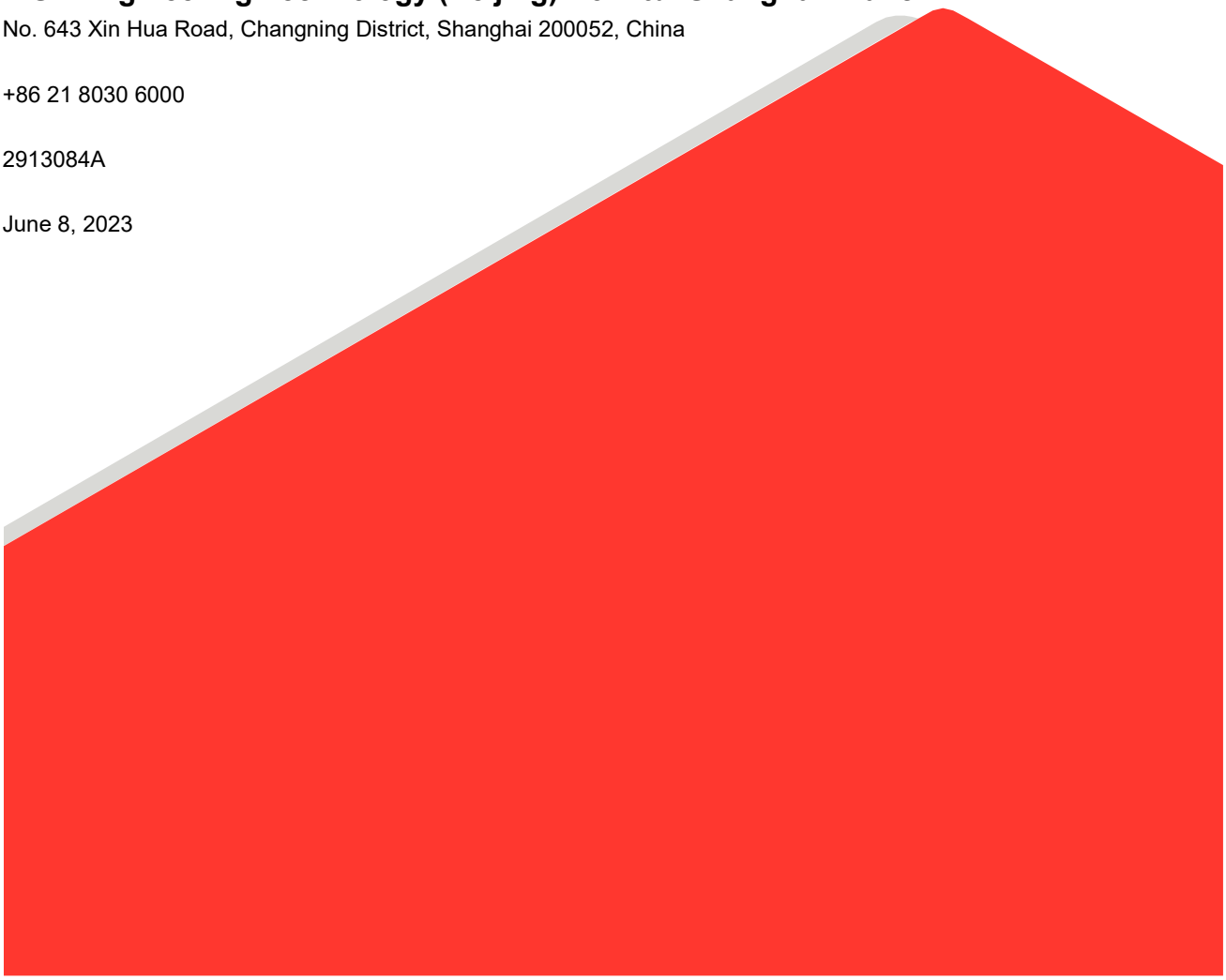
June 8, 2023



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1.0 INTRODUCTION

1.1 Operational Information

Name of Production Facility:	Anhui Anqing Shuguang Chemical Co., Ltd.
Name of Facility Owner:	Anhui Anqing Shuguang Chemical Co., Ltd.
Name of Facility Operator:	Anhui Anqing Shuguang Chemical Co., Ltd.
Name of Responsible Manager:	Mr Changbin Chen, Senior Vice President
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1.2 Operation Location Detail and Description

Anhui Anqing Shuguang Chemical Co., Ltd. (Shuguang) was established in 1994. It is a joint-stock enterprise with 195 employees. The company operates under a Dangerous Chemical Safe Production License issued by the Anhui Province Work Safety Bureau, and valid from April 20, 2020 to April 19, 2023. It is one of the largest production bases of cyanide and its derivatives in China. The company has been approved by ISO (International Organization for Standardization) 9001:2015, ISO 45001:2018 and ISO 14001:2015 management system. The company has the right for import and export. The products are sold to South America, Europe, Asia, Australia, and South Africa.

Shuguang is located at Jingbei Road, and it is surrounded by the acrylonitrile unit of Sinopec Anqing Branch with east, south and west boundaries. As a by-product of acrylonitrile manufacturing, hydrocyanic acid is delivered to Shuguang by pipelines for manufacture of solid sodium cyanide. Shuguang Facility is about 9 km to the southwest of Anqing Tianzhushan Airport, 5 km to southeast of Anqing Bei Train Station, and 4 km to the southwest of Anqing Train Station

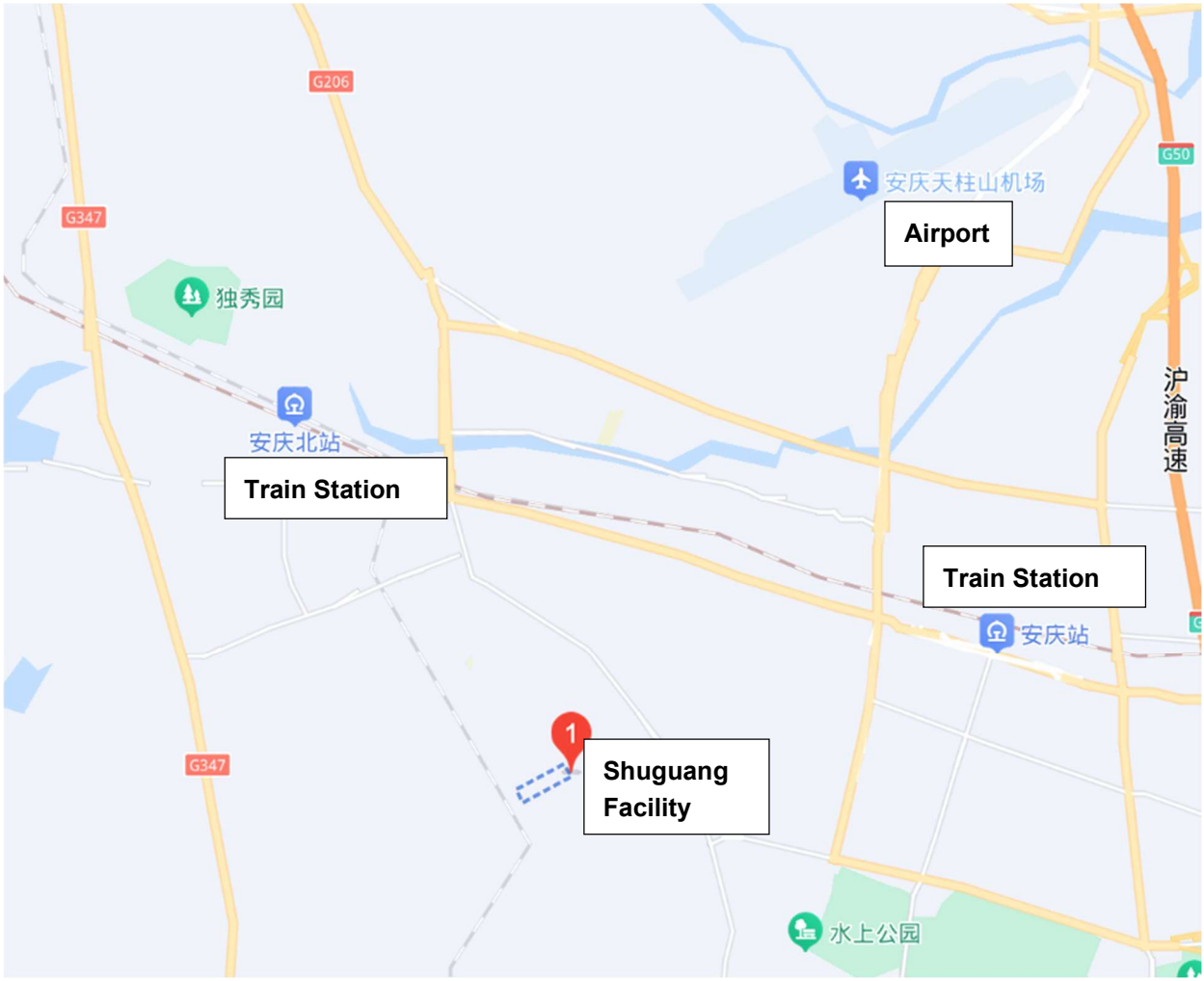


Figure 1: Regional Location Map

The part of the Site used to manufacture liquid sodium cyanide and then convert the liquid sodium cyanide into solid sodium cyanide is referred to in this report as 'the cyanide facility'. The term 'the Site' is used in this report to refer to the entire Shuguang facility and includes a large number of manufacturing plants, these manufacturing plants are not subject to this report.

Shuguang solid sodium cyanide manufacturing processes include:

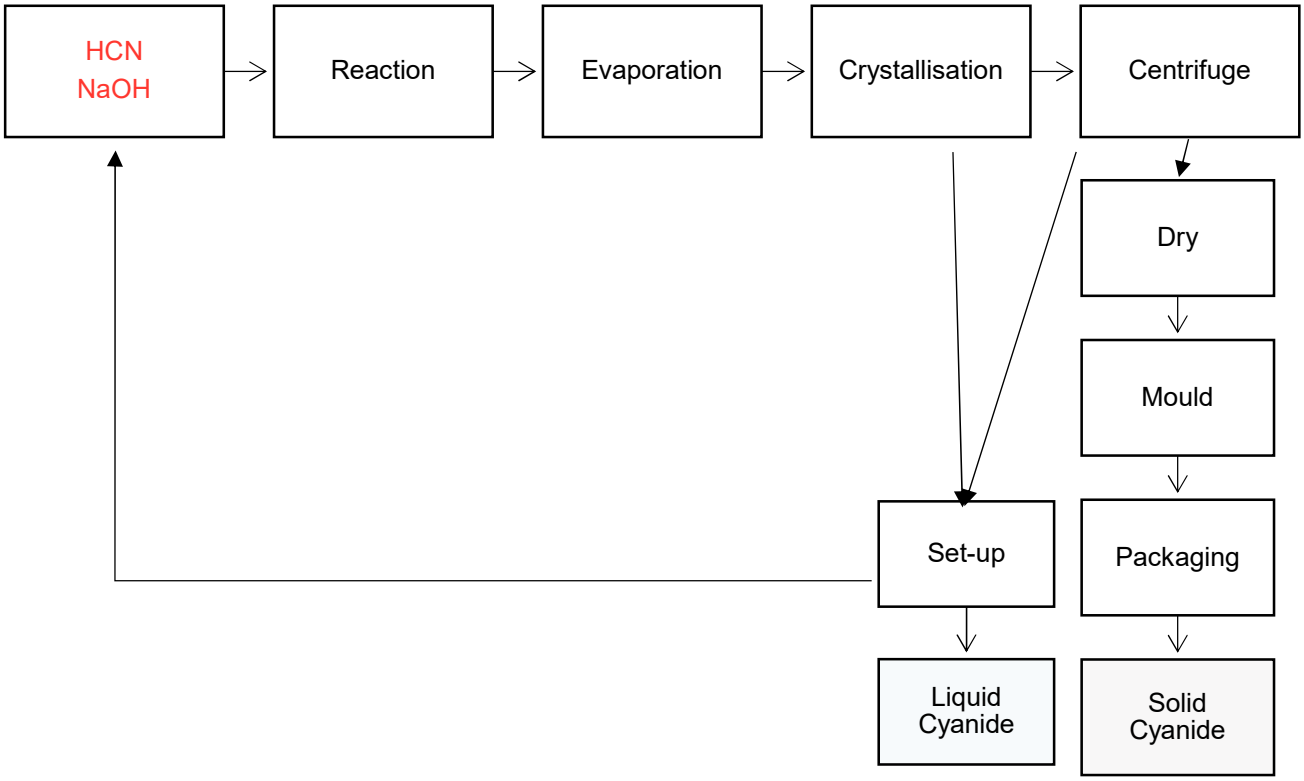


Figure 2: Solid Sodium Cyanide Manufacturing Process

General production processes are described as below:

- Reaction – liquid hydrocyanide acid (above 99.5% in purity) supplied by the adjacent acrylonitrile units of Sinopec Anqing Branch is reacted with 48% sodium hydroxide to generate 40% liquid product;
- Evaporation and Crystallisation – saturated sodium cyanide solution is pumped into a vacuum evaporator to remove water and the concentrate is fed to the crystalliser;
- Centrifuge – wet crystals are generated by continuous solid-liquid separation of the concentrated crystal pulp;
- Drying – the sodium cyanide crystal is heated in the dryer to evaporate the residual water, and crystals are dried into dry powder;
- Moulding – Dry sodium cyanide powder is moulded into “pillows” or flakes;
- Packaging – sodium cyanide is delivered to the tablet tank through an oscillatory conveyor and then weighted in the weighing and packing machine. Products are tested by random sampling and the qualified products are packed with 50 kg or 380 kg iron drums or 1,000 kg timber boxes with inner polyethylene liners. The packaged cyanide is stored in the warehouse at the cyanide facility prior to despatch from site.

There were some promotion modifications to the cyanide facility in 2021 and 2022 are shown as below:

- DCS (Distributed Control System) System Update for Liquid Cyanide Storage Tanks (620 A/B/C).

- Solid Cyanide Package Process Line Automatic Renovation.
- Solid Cyanide Reactor (V101) Replacement.
- Unloading Platform Renovation of Liquid Cyanide Tank Area.

There are three units on Site to manufacture cyanide, and the Site has separated stormwater drains and wastewater pipeline. All the wastewater from floor cleaning, canteen, toilets and first 15 minutes rain flush water will be collected and treated by Site wastewater treatment plant. No wastewater is generated from cyanide production process. After that, the treated wastewater will be discharged into Sinopec Anqing Branch wastewater treatment plant.

The infrastructure at the cyanide facility mainly comprises:

- Reaction facilities with three units.
- Liquid cyanide storage tanks, located within an open concrete lined pit.
- Sodium hydroxide tank farm.
- Production facilities with three units.
- A products warehouse for storage of packaged solid sodium cyanide.
- Liquid cyanide loading facilities (platform and fill lines).
- Two administration buildings.
- Control Centre.
- Air emission treatment facilities.
- Wastewater treatment facilities.

The facility is paved with concrete. The vessels and tanks containing liquid sodium cyanide are located within concrete bunded areas. The solid sodium cyanide production buildings are both self-bunded with concrete floors, concrete walls and bunds at each doorway. The first flush stormwater is piped to a first flush system comprising one open concrete pit (312m^3) at the wastewater treatment plant which services the entire site.

The facility operates on 8-hour shifts, 24 hours per day, seven days per week, with four production teams.

No cyanide exposure incidents were noted during the audit period.

2.0 AUDITORS FINDINGS

Shuguang Facility is

☒ **in full compliance with**

☐ in substantial compliance with

☐ not in compliance with

The international Cyanide Management Code

Shuguang Facility has not experienced any compliance issues during the previous three-year audit cycle.

2.1 Auditor Information

The audit was undertaken by (Lead Auditor and Technical Specialist) and Zoey Tang (Auditor Trainee) of WSP Engineering Technology (Beijing) Co. Ltd. Shanghai Branch. Auditors' information is as below:

Audit Company: WSP Engineering Technology (Beijing) Co. Ltd. Shanghai Branch

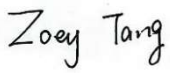
Audit Team: Hongtao Hu- Lead Auditor and Production Technical Specialist

Zoey Tang- Auditor Trainee

Email: hongtao.hu@wsp.com

zoey.tang@wsp.com

Names and Signatures of Other Auditors:

Name	Position	Signature	Date
Hongtao Hu	Lead Auditor and Production Technical Specialist		8 June 2023
Zoey Tang	Auditor Trainee		8 June 2023

Dates of Audit: 6 to 8 March 2023

2.2 Auditor Attestation

I attest that I meet the criteria for knowledge, experience and conflict of interest for a Cyanide Code Certification Audit Lead Auditor, 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 Cyanide Code Auditors.

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

3.0 PRINCIPLES AND STANDARDS OF PRACTICE

3.1 Principle 1 – Operations

Design, construct and operate cyanide production facilities to prevent release of cyanide.

3.1.1 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**

☐ in substantial compliance with **Production Practice 1.1**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

Quality control and quality assurance (QA/QC) programs have been implemented during construction and modification of cyanide production facilities and storage facilities, and the QA/QC records have been retained. Appropriate qualified personnel have reviewed the construction of facility and provided documentation that the facility has been constructed as proposed and approved.

The plant was designed and constructed in 1995. The plant was constructed by China National Chemical Engineering Third Construction Co., Ltd., a large construction company in China. In addition, documents have been retained that record the certification of various organisations engaged in the design, fabrication and construction of cyanide facilities. Construction Acceptance Records for Cyanide Production Facility Expansion dated December 2012 were provided for review as well as tank function changes records of sodium hydroxide to sodium cyanide dated February 2013.

No significant changes for the process production from last audit in 2020, except several promotion modifications have been taken as below:

- DCS System Update for Liquid Cyanide Storage Tanks (620 A/B/C).
- Solid Cyanide Package Process Line Automatic Renovation.
- Solid Cyanide Reactor (V101) Replacement.
- Unloading Platform Renovation of Liquid Cyanide Tank Area

Modification records were provided for review, which included EHS (Environment, Health and Safety) concerns, quality concerns, involved department discussion and approval, responsible manager approval, acceptance approval, delivery of the changes to involved employees.

The facility was previously assessed as compliant with the Code and Quality control and quality assurance documentation is available for the cyanide facilities. Since the 2020 rectification audit, several promotion modifications to the plant have been made and records were retained for these modifications. Records of these modifications were provided for review.

The materials used for construction of cyanide production facilities are compatible with the reagents used and processes employed.

No changes to the materials or processes employed have been undertaken during the audit period. The materials used for the cyanide facilities comprises the following:

- Cyanide production facilities and cyanide storage tanks – 304 grade stainless steel
- Pipe work – 304 grade stainless steel
- HCN pipeline– double-deck SUS316L grade stainless steel

- Compressed air storage tanks – carbon steel
- Wastewater storage tanks – mild carbon steel with polyethylene
- Wastewater pipeline – carbon steel (Q235B)
- Tank unloading hose – high-pressure-rated chemical resistant neoprene rubber

These materials are recognised as being compatible for use with liquid sodium cyanide.

There are automatic systems and “interlocks” that shut down production systems and prevent releases due to power outages or equipment failures.

Two power supply lines are maintained at the site, therefore in the event of one power line failure, the other power line will be initiated.

In the event of power failure or other upset, causes any of the nine parameters (Acid and alkali mother liquor circulating pumps of 3 reactors, circulating flow of 4 acid and alkali mother liquor circulating reaction tubes, reactor pressure, HCN density) to migrate outside of normal operating conditions, the Distributed Control System (DCS) will initiate the emergency shutdown system.

In the event of HCN leakage, the HCN detectors will deliver the signal to the Central Control Room, triggering the DCS to initiate the emergency shutdown system to limit the extent of HCN release and to limit the impact of the release water spray operation.

All storage tanks are equipped with radar level meters and are connected to the central control room. The tanks are equipped with high-level switches. If the tank exceeds the high level (80% of the volume), the central control room will receive a signal from the level meter and the level switch will be automatically initiated to shut down the cyanide supply.

The reactors are equipped with interlock system which includes a high-pressure alarm, high level alarm, high level gauge and shutoff entry valve connected to DCS system. If the high level is reached, the DCS closes the inlet valve and triggers the transfer of the solution through the evaporator to the crystallisation vessel, which in turn can overflow to a buffer tank, which can maintain the flow for 10 to 20 minutes. These transfers are controlled by the DCS. If the pressure in the reactor reaches a nominated high level, the inlet valve is closed, the reaction slows down, the cooling water cools the reactor and the pressure decreases. At the same time, the product is transferred to the evaporator to further reduce the pressure. Excess reactants can also be transferred to one of the other two reactors. The site has never had a situation where there was not enough power to operate reactors.

The 330 m^3 sodium cyanide storage tank (converted from storage of sodium hydroxide) is equipped with a thermometer, level meter, transfer pump and is connected to the DCS so that the delivery of sodium cyanide to the tank can be shut off when the tank reaches its high-level point. If the high level of the tank is reached, the DCS overrides the manually opened transfer pump.

The cyanide facility areas are covered with concrete pavement to prevent seepage to the subsurface.

The two Cyanide Tank Farm bunds are also lined with concrete and epoxy coating. The capacity of the tanks is 75 m^3 and in a tank farm that has a bund capacity of the tank farm is approximately 132 m^3. This capacity provides more than 110% of the capacity of the largest tank (75 m^3 in volume). The other sodium cyanide storage tank has a volume of 330 m^3. This tank is located in a bund with a capacity of 510.23 m^3 which in excess of 110% of the tank volume.

There is no storage of HCN at the facility. The HCN is supplied through a double-layered stainless steel pipeline from Sinopec Anqing Branch that is transported the reactor an elevated pipe bridge. The ground surface along the pipeline was paved with concrete to provide containment in the event of a leak.

The packaging workshop and cyanide products warehouse are also constructed with concrete floors and were observed to be in good condition.

The facility does employ, inspect, test, and maintain systems to prevent the overfilling of cyanide process and storage vessels, including level indicators and high-level alarms. All the signals indicated on the DCS.

The methods applicable to each vessel are as follows:

- Reaction tanks: monitoring the parameters of temperature, liquid level, pressure, flow rate and density of HCN.
- Evaporators: monitoring the parameters of temperature, liquid level, pressure and vacuum.
- Crystalliser: monitoring the parameter of temperature.
- Centrifuge: monitoring the parameter of electric current.
- Regulating tanks: monitoring the parameters of temperature and liquid level.
- Liquid cyanide storage tanks: monitoring the parameters of temperature and liquid level.

When the liquid level reaches the 90% of the set value, the alarm will sound and the level switches will be initiated through the DCS system.

Weighing scales and electronic load cells are used in the packing lines to prevent the overfilling of solid cyanide. There are automatic and manual filling lines. When the automatic filling lines is running, cyanide can be filled automatically using the electronic load cell, but the drums should be covered manually. While filling manually, the operation is initiated by pressing the “Manual Filling” button and the indicator light comes on when the drum is filled with the required quantity, prompting the operator to press the “Manual Stop” button to finish the filling process. A Metering & Packing Operation Procedure that specifically control the operator’s actions during manual filling.

The two 75 m^3 storage tanks for sodium cyanide and one 330 m^3 storage tank for sodium cyanide that are each fitted with high level volume meters (V-602A, V602B and LT1110) connected to the DCS. The DCS alarm activates if the high-volume limit is reached.

Secondary containments for process and storage tanks and containers are constructed of materials that provide a competent barrier to leakage and sized to hold a volume greater than that of the largest tank or container of cyanide solution within the containment and any piping draining back to the tank, and with additional capacity for the design storm event.

The secondary containments for cyanide process and storage tanks and containers comprise two tank farm bunds, two reactor bunds (two reactors in one bund and one reactor in the other bund), the production building and the wastewater collection tank bund.

There have been no changes to the previously certified containment systems and calculations to demonstrate bund capacities were available for review. The Site has an emergency collection tank for liquid cyanide leakage and initial flush stormwater with the capacity of 312 m^3 to enable containment and re-use or testing and treatment prior to discharge if needed.

Spill prevention or containment measures are provided for all cyanide solution pipelines.

The pipelines are located on overhead gantries which pass over concrete paved pedestrian walkways and roadways.

There are no buried cyanide pipelines on the cyanide facility. Valve guards are used on all cyanide solution pipes on aboveground pipelines.

There are no leak alarms on the cyanide pipelines. But HCN leak alarms have been set in the connection flange with warning alarm on Site and in Control room.

Pipelines used to transfer cyanide solutions are constructed of stainless steel (316) which is suitable for such use. The pipes are continuously welded (no flanges) except for some valve and instrument connections.

1-hourly inspections are undertaken of the cyanide storage tank farms and pipelines. The inspections include pipe work, flanges, pumps, high level alarms and tanks to identify leaks. The inspector will submit the inspection results dayshift and night shift after inspection.

In the event of loss from a pipeline within a bunded area, the spill would drain to a sump from where the liquid would be pumped to the Emergency Storage Tank for re-use in the process.

The cyanide facility undertakes monitoring of the pipe wall thicknesses every year via ultrasonic inspection. The inspection records note the integrity of the pipe and support structures. X-ray detection for the cyanide pipelines has been conducted by the qualified authority (General Administration of Quality Supervision,

Inspection and Quarantine) every three years. In the event that a leak of cyanide solution from a pipeline is not trapped by the silica-based insulating compound or the stainless-steel casing, the leak would discharge onto concrete paving leading to the facility's emergency tanks of stormwater.

Cyanide is stored with measures to avoid or minimize the potential for exposure of cyanide to moisture and adequate ventilation to prevent the build-up of hydrogen cyanide gas and cyanide dust.

Solid cyanide is stored in 1000 kg or 1100 kg plastic bags within timber intermediate bulk containers (IBCs) and 50kg plastic bags within metal drums to avoid or minimize the possibility for moisture exposure to the cyanide. The IBCs are stored in a secure warehouse building prior to despatch from the Site. The warehouse is enclosed with concrete floor, walls and roof to prevent exposure of cyanide to moisture.

The walls of the building are equipped with vents to ventilate the building. The build entry points have large doors which also provide for ventilation of the building during moving IBCs in and out.

There are 20 fixed HCN monitors in the warehouse which connected to the DCS system in control room.

The entrance of the warehouse for employee inspections or maintenance are normally locked, which is manned by a security person and fitted with security cameras which transmit to the security office. Visits to the warehouse are logged on paper records in log-books.

The warehouse building is surrounded by a concrete/brick wall. Access to the Site is only via a manned security gate. Public access is prohibited.

Only solid cyanide stored in the warehouse which is separately from incompatible materials.

Liquid cyanide stored in four 330m3 tanks in a tank farm with separate secondary containment in an open-air environment. Two fixed HCN monitors in the area which connected to the DCS system in control room. Only authorized personnel can enter the tank farm.

3.1.2 Production Practice 1.2

Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

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

Summarise the basis for this Finding/Deficiencies Identified:

The facility has procedures that describe the standard practices necessary for its safe and environmentally sound operation.

Shuguang operates under an integrated Management System Manual, which addresses ISO9001, IS014001 and ISO45001. The System has been certified by third party certifiers.

Facility documentation is controlled through the document management system by designated personnel. Site workers access hard copies of the procedures at their work area.

The *Process Operating Procedure of Sodium Cyanide Production Process* address safety for each process across the whole of the operation, including warehousing, hot work, working at height, fire safety, confined space and management of personal protective equipment.

The *Safety Technology Code for Cyanide Facility* identifies key safety characteristics of hydrogen cyanide and sodium cyanide and specific safety requirements for each part of the production process, such as the reactors, evaporators, crystallisation, centrifuge, dryers and packaging. For the reactors, evaporators and crystallisers, it states that when the two reagents are being mixed, the composition of the mixture must be managed to avoid excessive generation of HCN. The concentration of sodium hydroxide in the reaction mixture is required to be kept between 1.0% and 1.5%. Hourly manual monitoring is undertaken of the hydroxide concentration to guide the supply settings of the reagents.

The *Process Operation Procedures for Sodium Cyanide Production Process and Safety Technology Code for Cyanide Facility* provide work instructions addressing the following:

- General safety requirements including:
  - Operation safety requirements for unloading of cyanide solutions.
  - Safety requirements for cleaning of cyanide pipes.
  - Safety requirements for cleaning of cyanide equipment.
- Start-up and shut-down of the production facility standard operating requirements.
- Standard operation requirements – e.g. evaporation, crystallisation, centrifuge, drying, pressing, packaging.
- Standard operation requirements for the operation of the wastewater treatment plant and cooling towers.

The Process Operation Procedures for Sodium Cyanide Production and Safety Technology Code for Cyanide Facility show detailed operational steps for each job.

The *Cyanide Facility Operation Rules* notes that before any operation, the operators must check that the instrument air is functioning, pressure is stable, exhaust system and valves work well; functioning of the weight scale; and that the power and instrumentation are reliable. In case of any failure of the packing line, the operation will be stopped until the problem has been solved.

The Maintenance Procedures for Critical Equipment also specify the maintenance requirements for critical equipment, including:

- Reactors
- Evaporator
- Crystalliser
- Centrifuge
- Vacuum Filter
- Pumps
- Dryer
- Shaping Machine
- Weight Scale
- Capper
- Heating and Decomposition Tank
- Cooling water pumps in production building

Three safety assessments are undertaken: Hazardous Resource Identification, Safety Status Quo Impact Assessment (required every three years under Chinese Law) and Hazardous Chemical Significant Hazards Risk Assessment (required annually under Chinese Law).

The Hazardous Resource Identification are undertaken by Shuguang. The Hazardous Chemical Significant Hazards Risk Assessment and the Safety Status Quo Impact Assessment is undertaken by expert third parties.

The Facility has contingency plans for non-standard operating situations that may present a potential for cyanide exposures or releases.

The Emergency Response Plan (ERP) for Production Safety and Process Operating Procedure of Sodium Cyanide Production Process include detailed emergency practices for abnormal conditions, including:

- Power Failure
- Steam Failure
- Instrument Air Failure
- Pipe Rupture of Circulating Water

- Instrument Failure for the Reaction System
- HCN leakage
- Pressure Raise in the Reactors
- Leakage in the Liquid Cyanide Storage Tanks
- Solid Cyanide Spill

Other abnormal conditions are specific to the kinds of processing upsets and incidental conditions that may arise irregularly during operations, such as machine failures (agitators, pumps) and pipeline blockages.

The facility uses menu displays configured in the DCS to monitor abnormal operating conditions from the control room. Should there be a cyanide exposure or release these are managed via the site's emergency response plan documents that provide details on the response actions.

The facility has a procedure which identifies when cyanide facilities or operating practices have or will be changed from those on which the initial design and operating practices were predicted.

The Change Management Procedure applies to all plant modifications to ensure that they are implemented without risk to safety, health, the environment or physical security. For all potential modifications, possible risks and appropriate control measures must be identified to manage the health, safety and environment impacts. Modification proposals are reviewed by a appropriately qualified personnel from EHS, Production and Equipment and Maintenance departments.

Before being enacted, the proposed change must be signed off by the General Manager, or delegate.

Based on the sample change applications reviewed, the EHS Manager had participated in the risk assessment process and the changes were all signed off by the General Manager.

The cyanide facility has implemented preventative maintenance programs and documented activities for equipment and devices necessary for cyanide production and operation.

A preventive maintenance program is managed by the maintenance department with three separate teams responsible for mechanical plant, civil structures and instruments. The overall strategy of annual plan development for each department is described in its departmental procedure.

The Maintenance Procedures for Critical Equipment specifies the type of equipment requiring maintenance and the maintenance frequency. This information is used to prepare an annual maintenance plan.

The Equipment Maintenance Plans list and describes the maintenance requirements of the equipment and for each item. Equipment maintenance plans for cyanide facilities were review for the audit period and correlated with the description of maintenance activities provided by site engineers.

For reactive maintenance the operator verbally reports issues to the maintenance department, then the maintenance department raises a maintenance request in writing for action by the maintenance department.

Process parameters are monitored with necessary instrumentation and the instrumentation is calibrated according to manufacturer's recommendations.

The procedure requires that the calibration should be conducted according to the planned frequency. Following calibration, a calibration notice must be placed on the equipment. The facility maintains annual calibration lists detailing the instruments on the plant that require calibration during the year. The instruments included: fixed and portable hydrogen cyanide detectors, portable flammable gas detector, high pressure gauges, vacuum pressure gauges, numerical temperature displays and flow meters.

The calibrations of pressure gages, HCN detectors and flowmeters are undertaken by an independent external qualified company:

- Pressure gages, calibrated by Anqing City Institute of Metrology Items
- HCN detectors and flowmeters, calibrated by Anhui Province Institute of Metrology Items

Liquid level indicators are calibrated by Shuguang instrument department.

The calibration records were sampled at random and were available covering the audit period.

Procedures are in place and are being implemented to prevent unauthorised/unregulated discharge to the environment of any cyanide solution or cyanide-contaminated water that is collected in a secondary containment area.

Water that collects in the facility's secondary containment areas is considered to be potentially contaminated with cyanide. Accordingly, all secondary containment areas are configured to drain to the Shuguang Wastewater Treatment Plant to enable treatment of the contaminated water before it is discharged under agreement to the Sinopec Anqing Branch treatment plant for further treatment before discharge to the Yangtze River. The cyanide reagent tanker unloading area has also been considered as part of a secondary containment area. The unloading area is drained to the first flush basin which also then forms part of the secondary containment. Arrangements are in place for the first flush basin to be pumped clear to the Wastewater Treatment Plant in the same way as other secondary containments.

There are on-line monitoring instruments and alarms installed on both the discharge point from the Shuguang Wastewater Treatment Plant and from the stormwater pipeline that normally discharges stormwater from plant road surfaces that are expected to be nominally clean of cyanide contamination. If either alarm sounds, the relevant outlet valve is closed immediately, and the potentially contaminated water is collected in the Wastewater Treatment Plant or in the First Flush Basin (in the case when usually clean stormwater has been detected as contaminated). Procedures require these conditions to be reported to the Shift Supervisor. The water quality is then monitored, and if over limit, it will be treated using sodium thiosulfate with close monitoring and the cause will be investigated. Backing up the procedures for dealing with the discharge of contaminated stormwater, there are also procedures of a more preventive nature that clearly specify steps to be undertaken in the event of leakage of cyanide into the bunds or unloading bay and imposing risk to stormwater. The procedures include the following specific items:

- Leakage during production
  a. In the event of any leakage during production, check and ascertain the leakage source, shut down the production lines, and then correct it.
  b. After completion of repair, the surface of the bunds is flushed using water which will be collected into the Wastewater treatment plant;
- Leakage during unloading

  In the event of any leakage during the unloading, unloading is stopped immediately, the outlet valve from the tanker and drainage valve are closed, leaked liquid cyanide is absorbed using adsorption pad, then the surface of the bunds is flushed using water which will be collected into the Wastewater treatment plant;
- Leakage of storage tanks
  a. In the event of any leakage from the storage tanks, the outlet valve from the bund must be confirmed to be closed immediately and then reported to the supervisor;
  b. Site is inspected by qualified personnel from the liquid production line, leaked liquid cyanide is pumped to the emergency collection pond or transported by tankers, in addition, drainage valve of the stormwater is closed;
  c. Water quality of the drainage pipelines is monitored;
  d. Liquid cyanide in the bunds is recycled using submerged pump
  e. After the recycling the liquid cyanide, flushing water is collected into the Wastewater Treatment Plant.

With regards to the stormwater collected in the bund and the first flush (collected from potentially contaminated areas within the first 15 minutes of a rainfall event), these streams are collected through underground pipelines and directed to the Wastewater Treatment Plant. The water quality of nominally clean stormwater is monitored both manually and automatically. Water meeting the target level of 0.2 mg/L total cyanide will be delivered into the stormwater system operated by Sinopec Anqing Branch and subsequently discharged to the Yangtze River after dilution with urban stormwater flows from the Anqing municipal drainage system.

The types of solid waste include:

- Contaminated product which cannot be sold to the customer.
- Contaminated packaging materials, such as plastic bags, plastic drums and timber.
- Protective clothing such as coveralls, respirator filter cartridges and gloves.

Waste cyanide is reprocessed at the cyanide facility in accordance with a Hazardous Waste Disposal Permit.

The procedures clearly indicate the steps involved in disposal of cyanide or cyanide-contaminated solids.

The Management Procedure for Solid Waste states that sludge from the WWTP (Wastewater Treatment Plant) should be treated with sodium thiosulfate for 48 hours and then be sent to the licenced waste disposal contractor.

The Procedure for Remediation of Contaminated Soil states that contaminated soil will be tested for cyanide concentration. If the concentration exceeds the criteria (5 mg/L total cyanide), the soil will be placed in solid soaking pit, mixed with sodium thiosulfate and soaked for 48 hours. After the pre-treatment, the soil is to be transferred to licensed waste disposal contractor if it meets the criteria.

The Production Design Management and Emergency Response Procedure, state that in case of any leakage of cyanide solids (including the wet crystalloid), the solid sodium cyanide will be scraped up and placed in steel drums and disposed of at the site's solid dissolving pond.

The following actions will be undertaken to prevent environmental contamination:

a. Clean and collect the spilled cyanide solids which are then dissolved and recycled through the dissolving pond. Direct flushing using water at the site of the spill is prohibited;
b. After solid cyanide is removed to the extent achievable, the affected surface will be flushed using water. Wastewater from the flushing is directed to the Wastewater treatment plant.

Under the terms of the Hazardous Waste Disposal Permit, contaminated solids are required to be cleaned by soaking in water in the dissolving pond for 48 hours and soaking in sodium hypochlorite solution for another 48 hours. And the end point of the dissolving process is determined when the leached cyanide concentration in the water being applied for soaking is measured falls below 1 mg/L total cyanide. Non-ferrous solids, after treatment (and meeting treatment specifications), will be transported to Anhui Haoyue Environmental technology Co. Ltd. or Anqing Tianyun Fine chemicals Co. Ltd. for further management in accordance with their permit to receive waste materials.

There are procedures to ensure that the cyanide is packaged and labelled as required by the political jurisdictions through which the packaged cyanide will pass.

The cyanide facility packages cyanide in accordance with the Chinese regulatory Standard for Packing of Solid Cyanide. The standard was prepared to meet the requirements of the United Nations Recommendation on the Transport of Dangerous Goods – Model Regulations, (2005).

The Standard for Packing of Solid Cyanide specifies the requirements for packing cyanide for export, including the packaging materials and method for inspecting the packaging. The facility purchases their drums and IBCs from a third party that provides compliance certificates with each supply of the packaging.

The cyanide facility's packaging procedure in the Provision for Products Packaging and Labelling specifies the packaging requirements, including that the packaging must meet the Standard for Packing of Solid Cyanide.

The Anhui Anqing Entry-Exit Inspection and Quarantine Bureau inspected the cyanide facility's packaging systems for each supply consignment during the audit period (2020-2023) and approved the packaging systems for international transport of the cyanide.

Stored cyanide was observed to be labelled in Chinese and English with global harmonised system GHS pictograms and UN (United Nations) number identifying the product.

3.1.3 Production Practice 1.3

Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.

☒ **in full compliance with**

The operation is ☐ in substantial compliance with **Production Practice 1.3**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The facility conducts routine inspections of tanks, valves, pipelines, containments and other cyanide production and storage facilities, including:

- Tanks and vessels holding cyanide solutions for structural integrity and signs of corrosion and leakage
- Secondary containments for their integrity, the presence of fluids and their available capacity, and to ensure that any drains are closed and, if necessary, locked to prevent accidental releases to the environment, and
- Pipelines, pumps and valves for deterioration and leakage.
- Containers used for transportation, where the producer is responsible for their integrity.

As specified in *Maintenance Procedures for Critical Equipment*, annual or monthly maintenance plans are developed and implemented for different facilities.

Tank Inspections

The equipment register lists the equipment in the cyanide production plant. A reactor (V-2101), sodium cyanide storage tank (V-602A) and an evaporator (V-4201) were identified on the register.

The Maintenance Procedures for Critical Equipment specifies that cyanide equipment shall be undertaken monthly.

The Monthly Tank Inspection Records require observation of the physical condition of the tank and signs of corrosion and leakage.

There are detailed tank inspections records including diagrams showing the tank function and geometry, components, instruments, accessory pipes and valves, foundations, anti-corrosion coating, heating insulation layer to support recording of observation of integrity as well as any signs of corrosion or leakage during monthly inspections. Ultrasonic test for the thickness of tanks is tested annually to ensure any corrosion is detected early and preventive action taken. In addition to Shuguang's own tests of the tanks, pipes and valves, tests are conducted every three years by the China General Administration of Quality Supervision, Inspection and Quarantine.

Tanks and Vessels

The facility maintains a register of tanks and vessels and identifies which ones contain cyanide solutions. Inspections on the integrity of the tanks are conducted monthly, which including pipe work, flanges, pumps, high level alarms and tanks to identify deterioration and leaks. The inspection records are dated.

The inspection records are dated and detail the results of inspection including the following items:

- Tank foundation stability
- Insulation and corrosion prevention materials
- Stairs and fences
- Bund
- Tank volume indicator
- High level alarms
- Tank valves
- Tanks signage
- Pipeline connection integrity
- Flanges and valve condition
- Wastewater collection facilities
- Presence of tank corrosion or leakage.

In addition to the inspection, the wall thickness of the vessels is tested annually.

Secondary Containments

Refer to new procedure. A site inspection confirmed that secondary containments were in reasonable condition and evidence of periodic maintenance and patching was observed. The facility has updated its inspection procedures to better define standards for secondary containments.

Discharge from the secondary containment is via underground pipe system, that discharges to the stormwater first flush containment tanks at the site's wastewater treatment plant, or for a concentrated liquid cyanide spill, to a mobile tanker for re-use at the cyanide facility.

Pipes – Pipe Wall Thickness Testing

The thickness of the wall of cyanide transport pipelines are monitored internally by ultrasonic testing annually internally. The inspection records note the integrity of the pipe and support structures. The inspection records are dated. Records were sighted for selected pipelines. The integrity test will be conducted every three years or six years, depending on the results of the last test results by third certified parties.

Containers used for transportation

For the containers used for transportation from the production area to the cyanide warehouse, the warehouse keeper conducts daily inspection for the vehicles before internal transportation.

Based on interviews, inspection of the facility and content if the inspection records the frequencies are considered sufficient to assure that the equipment is functioning within design parameters.

The facility has documented inspections that are retained. The documentation identifies specific items to be observed and includes the date of the inspection, the name of the inspector, and observed deficiencies. The nature and date of corrective actions were noted as being documented, and records are retained. The facility also assigned Training Centre for the management system documents maintenance.

3.2 Principle 2 – Worker Safety

Protect workers' health and safety from exposure to cyanide

3.2.1 Production Practice 2.1

Develop and implement procedures to protect plant personnel from exposure to cyanide.

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

Summarise the basis for this Finding/Deficiencies Identified:

The Facility has developed procedures to minimise worker exposure during:

a) Normal plant operations from receipt of raw materials through finished product packaging and shipping

b) Non-routine and emergency operations

c) Maintenance related activities

The Process *Operating Procedure of Sodium Cyanide Production Process* provides a comprehensive procedure covering the entire cyanide production and packaging operations. The procedures cover both normal and non-routine operations and the production facility is managed through the DCS in the control room.

In addition to the operating procedures there is a permit to work system that covers:

- Working at heights
- Confined space
- Lifting
- Digging
- Machinery maintenance
- Flow isolation plate, and
- Hot work.

The procedure discusses the PPE that must be worn and to conducts a field level risk assessment prior to commencing work. It also requires the maintenance team to communicate with the local cyanide department prior to the start of work commencing and must report any unsafe conditions to the department supervisor. For the equipment which has been in contact with cyanide, the Facility has strict decontamination process in the procedure, and a test will be conducted for the cleaned wastewater after deep clean of the equipment to verify the decontamination process.

The safety permit requires a field level risk assessment to be undertaken prior to the start of work, the use of a buddy system, records of tagging out, checking of PPE and undertaking gas testing.

The Facility does solicit and considers worker input in developing and evaluating health and safety procedures.

The employees are involved in the hazard identification and risk control measures through specific meetings, team meetings and suggestions from employees.

Employees can make suggestions regarding process or procedural changes to their supervisors or management via Office Automation system. Based on records review, the has established online tracking system to make sure prompt response to the valuable suggestions. The facility also gives awards to the staff who has provide the valuable suggestions.

The Facility has identified areas and activities where workers may be exposed to HCN gas or sodium cyanide dust at more than 4.7 ppm (5 mg/m^3) or less, as cyanide, and requires the use of personal protective equipment as necessary in these areas when these activities are being performed.

The areas identified include:

- Packaging Operation
- Packaging Control Room
- Storage Warehouse
- Centrifuging Operation
- Drying Operation
- Reactor Areas
- Vacuum Filters
- Shaping Control Room
- Central Control Room.

Forty-five fixed HCN monitors are located around the facility in cyanide bearing areas.

The overall extent of the operation where there are risks of cyanide exposure has been demarcated with a distinctive red line. There are defined PPE requirements applicable to entry to the area within the fence. Signs displayed, and Standard Operating Procedures set out requirements for the use of defined PPE specific to the distinct areas listed above. Minimum PPE requirements and hygiene practices apply everywhere within the red line.

During inspections of the facilities workers were observed to be wearing PPE as outlined in the procedures and signage displayed in the work area.

The Facility uses monitoring devices and associated alarms to confirm that controls are adequate to limit worker exposure to hydrogen cyanide gas and/or cyanide dust exceeding 10 parts per million (ppm) on an instantaneous basis or 4.7 parts per million continuously over 8-hour, as cyanide.

Forty-five fixed HCN monitors are installed throughout the cyanide bearing areas within the production facility and warehouse. Additionally, personnel have access to fourteen portable HCN monitors. The fixed monitors are set to alarm at 2.0 ppm and the portable monitors are set to alarm at 1.9 ppm. Portable monitors are used for task specific activities and the fixed monitors are to provide detection of an issue with the process. Personnel are required to evacuate the immediate area of the alarm and the supervisor for the area undertakes an assessment of the reason for the alarm. Further evacuation of the plant maybe undertaken depending on the cause of the alarm.

In addition to gas monitoring, Shuguang undertake daily, weekly, fortnightly and monthly manual cyanide dust monitoring at a number of locations throughout the facility. The monitoring frequency is dependent on the level of risk to personnel. These locations include:

- Packing area
- Reactor area
- Main control room
- NaCN storage tank
- Dryer operations area
- Northern factory gate
- Western factory gate
- Centrifugation workshop
- Moulding control room
- Vacuum filter
- Laboratory

- Warehouse.

Analysis of dust sampling is undertaken at the facility's laboratory. The Chinese standard is 1 mg/m^3. The records reviewed for 2020-2023 were all less than this standard.

When HCN gas levels trigger the alarm levels, the Site operator shall evacuate the Site area immediately. The emergency treatment personnel must wear air breathing apparatus and wear heavy protective clothing to the Site to find out the leakage source and block the leakage.

The HCN monitoring equipment is maintained, tested and calibrated according to manufacturer's recommendations. The records are retained for three years. There are fixed detectors within the plant area and portable detector used for task specific activities. Calibration certificates were reviewed for the monitoring equipment.

The facility has provisions to ensure that a buddy system is used or workers can otherwise notify or communicate with other personnel for assistance if necessary The *Production Design Management and Emergency Response* procedure clearly specifies that all the operations must be conducted by at least two operators, and generally by four operators. Also, at least one doctor and one nurse are present during each shift in the First Aid Station.

The workers are equipped mobile phones and walkie talkies and there are several fixed calling points located in the major HCN bearing areas, e.g. reaction areas, centrifuge operation area, shaping operation area, storage warehouse and etc, which were sighted during the site audit. Any emergency happens, they can choose the fast way to report.

The facility assesses the health of employees to determine their fitness to perform their specified tasks.

All workers have a medical examination every year at Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital. The medical includes of checking blood pressure, lung capacity, electrocardiography (ECG), blood, urine and a liver scan depending upon the working location and duration of the employee.

The site has records for each worker detailing the date of the examination and whether they have passed.

The Clothes Exchange and Shower Procedure in the Occupational Disease Prevention System details that all employees and contractors must enter into the exchange room and exchange clothes before work, after the shift they must shower and exchange clothes again.

Every employee working in the cyanide department is provided with 4sets of clothes every year and all employees in the cyanide department have their clothes washed for them on site by the department. If wear out of the clothes, the employee can get the new one.

Visitors are supplied with laboratory coats for use while visiting the facility.

Additional PPE is required in the packaging area including the use of coveralls, gloves, boots cover and full-face respirators. Personnel leaving the packaging facility must head via change room for shower and clothes change.

Warning signs advising workers that cyanide is present and that, if necessary, suitable PPE must be worn, are located around the Facility.

Warning signs for both sodium cyanide and hydrogen cyanide are placed in all process and storage areas. The signs include PPE requirements.

Warning signs were observed to be located on the outside of the warehouse buildings at entrance points and within the warehouse. Warning signs were present at production area.

All personnel are prohibited from smoking, eating and drinking, and having open flames in areas where there is the potential for cyanide contamination. All process and storage areas have signs stating no smoking, no eating or drinking and no open flames.

3.2.2 Production Practice 2.2

Develop and implement plans and procedures for rapid and effective reslponse to cyanide exposure.

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

Summarise the basis for this Finding/Deficiencies Identified:

The facility has developed specific written emergency response plans for cyanide exposures and an on-site disposal method to illustrate detailed treatment procedure after a spill or exposure.

The operation has access to trained medical personnel at all times and the persons interviewed knew to relocate exposed person off site, take anti-cyanide capsules, remove contaminated clothes, inject exposed person with cyanide resistant injection, rinse the contaminated part with moving water, contact the first-aid clinic and hospital for emergency care.

Qualified doctors provide annual first aid training to the employees. Topics include:

- Poisoning rates and exposure pathways
- First aid measures
- Safety protection and prevention.

An Emergency Response Knowledge Question and Answer Card has been prepared and distributed to each on-site employee. This card specifies the emergency response procedures in case of cyanide exposure involving skin contact, eye contact, or inhalation.

Warning signs that provide emergency response procedures are also posted in the plant.

Showers, low-pressure eye wash stations and non-acidic fire extinguishers are located at strategic locations throughout the Facility. They are maintained and inspected on a regular basis. The Facility has a monthly preventative maintenance inspection and servicing programme. According to the equipment list of 2022, there are 203 dry powder fire extinguishers assigned throughout the Facility. Weekly inspection has been conducted by fire safety officer as well as monthly inspection conducted by production team. There are 18 emergency showers/eye wash stations assigned production and storage area within 15 m radius of the nearest workstation, biweekly inspection has been conducted.

The Facility has oxygen, a resuscitator, anti-cyanide capsules, ambulance and a means of communication or emergency notification readily available for use in the plant.

First aid kits are reported and observed in the following areas: production workshop, packaging workshop, storage warehouse, and control rooms of the production building. These medical kits are checked by the First Aid station personnel on weekly basis.

The emergency response equipment maintained on site includes the oxygen cylinders, oxygen cylinder trolley, resuscitators and ambulance. Antidote injection medicine and anti-cyanide capsules are stored in the first aid station. Each cyanide related workstation is also provided with amyl nitrite as the antidote. Mobile phones, walkie-talkies and fixed calling points are readily available as a means of communication in the event of emergency.

Personnel interviewed knew the location of antidotes and the emergency notification process. Inspection records were sampled reviewed during the audit period and found to be in order.

The Facility inspects its first aid equipment regularly to assure that it is available when needed. The first aid and emergency response equipment are stored and tested as directed by their manufacturer and replaced on a schedule so that they will be effective when used.

Biweekly inspection has been conducted for emergency showers/eye wash stations and the other emergency equipment is inspected as follows:

- Cyanide Antidote and Anti-cyanide capsules– weekly
- Oxygen cylinders – monthly
- Other first aid consumables (e.g. gauze, bandages etc.) – monthly

Antidotes are stored under temperature conditions per manufacturer's specifications.

The antidote and anti-cyanide capsules produced by China People Army Medicine Science Institute, has instructions that state that it should be stored at room temperature and out of the sun. The antidote was stored appropriately and was in date.

There are four doctors and four nurses assigned on Site for each shift. The site's first aid clinic doctors inspect the oxygen bottles and resuscitators in the clinic each month.

Fire extinguishers are sent in rotation to an off-site facility fire facility company for servicing and refilling as required by the manufacturer. Fire extinguishers inspected were charged and had servicing dates.

Safety data sheets (SDS) and first aid procedures on cyanide safety are in the language of the workforce (Mandarin) and are available to workers at the site. All the signs and procedures are in Chinese, which is the official language. The SDS has been developed in accordance with global harmonised system (GHS) requirements.

The *Emergency Response Knowledge Question and Answer Card* is distributed to all employees. This card describes the first aid procedures in the event of a cyanide exposure.

Dangerous Chemical Safety Notification Cards for cyanide are posted on the wall in work areas where there is a potential for exposure with cyanide. The main information contained in the MSDS (e.g. hazards, first aid measures, emergency response measures, etc.) are included in the notification cards in the Chinese language. The drum and IBC external packaging also provides information on cyanide hazards.

All storage and process tanks and piping are labelled to clearly identify the contents and chemical formula in both Chinese and English.

The flow directions are clearly indicated on the pipelines and the content (e.g. NaCN) are also posted in Chinese together with the chemical formula.

The facility has a decontamination policy or procedure for employees, contractors and visitors leaving the areas with the potential for skin exposure to cyanide.

All visitors and facility workers receive induction training detailing information about the danger of cyanide, risks at the plant and safety information in general, including cyanide exposure procedures.

The procedures specify the cloth changing and showering procedures for workers undertaking work in areas where they may be exposed to cyanide. This procedure applies to personnel in the laboratory, packaging, evaporation, maintenance personnel, centrifuge, drying, modelling and cyanide storage areas. They are required to have change clothes and shower when they exit the work area. For the visitors, if they have visited in areas where they may be exposed to cyanide, they shall follow the same policy as the workers of the Facility. If they only visit the designated route with rare cyanide exposure risk, they shall wear the disposal cloth and take off the cloth and wash hands before leaving the area.

In the case of skin exposure, the procedures specify that the clothes must be removed, and the person involved must be washed using showers for at least twenty minutes and then seek assistance from the First Aid Station.

The Facility has its own on-site capability to provide first aid to workers exposed to cyanide. The site has its own on-site capability to provide first aid or medical assistance to workers exposed to cyanide. The site has an on-site first-aid clinic which is staffed 24 hours a day by four fully qualified doctors and four nurses.

All the doctors have been certificated by Hygiene Department of Anhui Province.

If any cyanide exposure, it will be treated by site medical staff in the first instance. Should the injuries be too severe to successfully treat on-site, patients can be transferred to the Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital via ambulance, which is a 3.0 km journey. The ambulance is stationed in Shuguang Facility and is available 24 hours a day.

Shuguang has signed a medical cooperation protocol with the Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital for the treatment of cyanide injuries, which is in validation during Site visit.

The Facility has developed a procedure to transport exposed workers to locally qualified, off-site medical facilities.

Shuguang has signed a medical cooperation protocol with the Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital for the treatment of cyanide injuries, which is in validation during Site visit.

If any cyanide exposure, it will be treated by site medical staff in the first instance. Should the injuries be too severe to successfully treat on-site, patients can be transferred to the Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital via ambulance, which is a 3.0 km journey. The ambulance is stationed in Shuguang Facility and is available 24 hours a day.

The Facility has alerted local hospitals, clinics, etc. of the potential need to treat patients for cyanide exposure, and the Facility is confident that the medical provider has adequate, qualified staff, equipment and expertise to respond to cyanide exposures.

As described in above, if any cyanide exposure, it will be treated by site medical staff in the first instance. Should the injuries be too severe to successfully treat on-site, patients can be transferred to the Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital via its own ambulance with 15 minutes.

In addition, a copy of the latest version of the procedure SG/Z09-016-2018 has been provided to the hospital and the acceptance record has been retained.

As reported by Dr. Ming Li, Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital is an integrated hospital with appropriate equipment, and qualified and experienced staff to treat patients with cyanide poisoning.

Procedures are in place to investigate and evaluate cyanide exposure incidents to determine if the operations programmes and procedures, to protect worker health and safety and to respond to cyanide exposures, are adequate or need to be revised.

The procedure for cyanide exposure incident investigation and evaluation is detailed in the Accident Management Procedure as well as non-cyanide-related incidents. It details an accident classification system which determines the type of investigation required, as well as accident reporting process and accident communication process. The most serious accident and exposures require investigation by government or external agencies. For accidents without lost workdays, the investigation will be conducted by the EHS department along with the production department to determine the root cause of the accident.

The accident and treatment report will detail the accident, the accident analysis, the prevention measures, the responsible person/s and their monetary punishment decision. It proceeds to a corrective measures section which tabulates the hazard, corrective measure, date for implementation and the responsible person.

No cyanide exposure or cyanide release incidents were reported during this ICMC (International Cyanide Management Code) recertification period as well as the other lost workdays accidents.

3.3 Principle 3 – Monitoring

Ensure that process controls are protective of the environment.

3.3.1 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 **Production Practice 3.1**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The Facility does not have a direct discharge to surface water.

According to the Self-monitoring records of discharges from the site wastewater treatment plant provided for review. The test results of total cyanide are between 0.04-0.38mg/L.

The Facility does not have a direct discharge to surface water.

The facility has its own wastewater treatment plant (WWTP) for preliminary treatment. The wastewater is then piped to the wastewater treatment plant of the Sinopec Anqing Branch together with other wastewater generated by Sinopec Anqing Branch is further treated before ultimate discharge to the Yangtze River about 11 km south of Shuguang Facility. Domestic wastewater (e.g. bathroom, toilet, laundry room) is discharged directly to Sinopec Anqing Branch without on-site treatment by the facility's WWTP. Shuguang conducts daily wastewater monitoring and annual wastewater monitoring by a third-party testing institute. Online monitoring system is installed at the final outlet before discharge into Sinopec Anqing Branch wastewater system. The internal and external wastewater monitoring records from 2020 to 2022 were provided for review, and the records shown the total cyanide content in the wastewater discharging to Sinopec Anqing Branch are between 0.04-0.38mg/L.

Clean stormwater runoff from the facility is collected and stored in an on-site stormwater storage tank (312 m^3) before discharge to the stormwater collection system of Sinopec Anqing Branch and finally to the municipal stormwater drainage system of Anqing City. The first flush storm water from areas where the water may possibly be contaminated by cyanide is segregated and treated in the WWTP of Shuguang Facility. Stormwater self-monitoring records (SG/J09-01-050) conducted by Shuguang for 2020 to 2023 were provided for review and the randomly selected reports shown the results ranges from 0.015 to 0.019 mg/L for total cyanide, which meet the Class III of Environmental Quality Standards for Surface Water (GB3838-2002) specified in Environment Impact Assessment (EIA) Report (total cyanide ≤0.2 mg/L).

As described above, there is no direct discharge from the facility to surface water. The process wastewater and potentially contaminated stormwater collected on site are treated before being discharged from the Sinopec Anqing Branch treatment system. The clean stormwater is discharged to the municipal stormwater drainage system which merges with other water streams before finally being discharged to the Yangtze River.

In addition, reported by the EHS manager, surface water quality monitoring is conducted monthly by Anqing Environmental Monitoring Station (EMS) at the cross-section of Yangtze River close to the wastewater discharge outlet of Sinopec Anqing Branch and the results for total cyanide in recent three years are below 0.022 mg/L as per the communication with the Anqing EMS. However, the relevant monitoring reports maintained by the Anqing EMS were not available for review during the site audit.

The cyanide facility does not have an indirect discharge to surface water.

The nearest surface water body is a local lake which is located about 3.0 km east of the facility.

The process wastewater after pre-treatment is discharged to the WWTP of Sinopec Anqing Branch for further treatment before finally being discharged to the Yangtze River, which is about 11 km away from Shuguang

Facility. As the wastewater is sent via further treatment and Shuguang meets acceptance criteria, subsequent discharge from this facility is not considered to be an indirect discharge from Shuguang.

Clean storm-water runoff from the facility is collected and stored in the on-site storm water storage pit (312 m^3) before being discharge to the storm water collection system and finally to the municipal storm water drainage system of Anqing City. The first flush storm water from areas with possible contaminated cyanide are segregated for treatment in the Shuguang Facility's WWTP.

Three groundwater monitoring wells have been installed at the western and eastern site boundaries (up-gradient and down-gradient of the cyanide plant) to inspect any seepage potentially containing cyanide. Groundwater at the two groundwater monitoring wells was sampled and monitored December 9, 2020. The result of total cyanide is below 0.004mg/L which showed compliance with the applicable Chinese groundwater quality standards (Groundwater Quality Standard, GBT14848-2017) and were consistent with the monitoring results obtained by Shuguang for the same period.

Based on the monitoring undertaken of groundwater at the facility, there is no evidence of groundwater contamination at the facility that could impact on surface water quality to the extent specified by the Code.

The facility monitors for cyanide in groundwater up and down gradient of the cyanide facility at three locations. Three groundwater monitoring wells have been installed at the western and eastern site boundaries. Groundwater monitoring is conducted by a third-party vendor on annual basis.

As reported in the Environmental Impact Assessment (EIA) Report for the facility, there are no beneficial groundwater uses for domestic/production within the vicinity of the facility were identified.

The groundwater monitoring conducted on December 9, 2020 has showed that the cyanide concentrations are well below the applicable Chinese Groundwater Quality Standard, (Class III, ≤0.05mg/L for total cyanide).

The results of total CN cyanide in the groundwater monitoring wells are below 0.004 mg/L. The internal and external wastewater monitoring records from 2020 to 2022 were provided for review, and the records shown the total cyanide content in the wastewater discharging to Sinopec Anqing Branch are well below the regulatory limit.

In addition to cyanide the other parameters monitored are pH, total hardness, total dissolved solid, sulfate, chloride, heavy metal, etc. The monitoring results shown compliance with Class III limit of the Chinese Groundwater Quality Standard.

Seepage from the Facility has not caused the concentration of cyanide in the groundwater to exceed that necessary to protect its beneficial use.

In the *Pollution control remediation management procedures*, remedial activity to prevent further degradation and restore beneficial uses have been specified in event of cyanide contamination.

The facility limits the atmospheric emissions of hydrogen cyanide gas such that the health of workers and the community are protected.

Engineering controls for minimising emissions of hydrogen cyanide include the following,

a) Pre-treatment of air emissions from the drying process by cyclone-type dust removal, water scrubber and alkaline scrubber prior to discharge through a 50 m high stack. An online HCN meter is installed in the dryer stack;

b) Air emission from the shaping and packing process is discharged through local exhaust ventilation for processing equipment and mechanical ventilation system is installed for the workshop.

There are forty-five fixed HCN detectors that constantly monitor the manufacturing processes. The HCN detectors are mainly located at liquid hydrocyanic acid inlet pipes, reaction area, evaporation area, crystallisation area, centrifuge area, modelling area, packing area, boundary area and warehouse.

Shuguang has retained a licensed third-party contractor to conduct annual air emissions monitoring. In the report prepared by Anhui Ruixiang Safety and Environmental Protection Consulting Co. Ltd. from 2020 to

2022, the results for hydrogen cyanide are all below 0.09 mg/m^3, below the applicable Chinese standard of 1.9 mg/m^3.

The local environmental monitoring station under the local Environmental and Ecological Bureau (EPB) conducts annual monitoring as well.

The online HCN monitoring records are also indicate compliance with the applicable Chinese air emission standards (1.9 mg/m^3).

The discharges from the cracking furnaces pass through the condensers, bag filters and then to absorption tanks in a closed system. A fixed hydrogen cyanide gas detector is located between the two tanks in each pair of absorption tanks. Online monitoring gas detectors with 1ppm alarm limitation have been installed at the outlets.

Monitoring is conducted at frequencies adequate to characterise the medium being monitored and to identify changes in a timely manner.

The frequency of monitoring undertaken at the cyanide facility is:

- Wastewater discharges –online monitoring, annually externally
- Stormwater discharges – daily internally during showering
- Groundwater quality – twice a month internally, annually externally
- Air quality – online monitoring, annually externally.

These frequencies are considered adequate in the operating circumstances to meet Code requirements.

3.4 Principle 4 – Training

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

3.4.1 Production Practice 4.1

Train employees to operate the plant in a manner that minimises the potential for cyanide exposures and releases.

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

Summarise the basis for this Finding/Deficiencies Identified:

The operation does train workers to understand the hazards of cyanide and refresher training is periodically conducted. New employees have three levels of training comprising company, departmental and operational level training.

Company level training consists of three days of classroom training. One main booklet called 'Safety Training material' is given to all employees during the training. These books are available at the end of the course in the control room of the cyanide department.

Departmental level training consists of three days training. The training is conducted in the conference room and on Site to demonstrate chemical hazards, emergency response and PPE. New employees are shown the entire cyanide production plant operation. For the employees who may encounter cyanide, the training will include the topics such as the health effects of cyanide, symptoms of cyanide exposure, and procedures to follow in the event of exposure.

Operational level training consists of three days of on-Site training in the area of the cyanide department where the new employees in the cyanide department will be working, each employee is designated an experienced worker to teach them how to operate the machines in that area. During these three days, they do not operate the machines on their own, and at the end of the three days, they have an exam. In addition, they have to pass the operating procedures.

Refresher training is conducted in the form of monthly training sessions. Each month, the safety adviser of the cyanide department conducts approximately two hours of training. The training includes the safety requirement for cyanide-related work tasks. At the end of the training, a test is required to verify their understanding of the safety requirement for cyanide-related work tasks.

72 hours are required for the new employee training and 24 hours are required for the refresher training at least.

Interviews with personnel and training records confirmed that workers are trained in cyanide hazards prior to undertaking works and refresher training is provided.

Annual training Plans include training target, training method, training date and training time, training topic, trainer.

The Facility trains workers in the use of personal protective equipment (PPE) and when and where this equipment is required.

PPE training is covered in all three levels of training (company, departmental and operational) and there are specific management and departmental procedures regarding PPE storage, maintenance and which type of PPE is required in the different operations within the cyanide department.

In the Emergency Knowledge Q&A Manual for each employee, there is detailed requirement for PPE usage for each post.

Interviews with employees has confirmed that training was provided on how and when to use PPE.

The Facility trains workers to perform their normal production tasks with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases.

An annual training plan is developed at the beginning of the year which includes training elements on the physical and chemical properties of cyanide, fire prevention, personal protection equipment, EHS management procedures, Emergency Response Plan, safety operation process, occupational health requirement, maintenance requirement etc., and also specific training materials regarding each post. New employees are partnered with an experienced individuals to learn the job tasks and are supervised by the supervisor for the area.

The department leader has overall responsibility for the provision of training and delegates the training sessions to the qualified trainees (normally the experienced and knowledgeable engineers).

Emergency response training is conducted in the department level safety training and annual refresher training held by the EHS Department.

Employees are trained before they are allowed to work with cyanide. Workers must complete the company and department training before being allowed to perform the work. New employees are expected to work with experienced operators and are not allowed to work unsupervised until the shift supervisor is satisfied that the employee can perform the necessary tasks safely in accordance with procedures. Employees who change positions or transfer out of their previous position for more than 6 months are required to be retrained.

The refresher training on normal production tasks has been provided to ensure that employees continue to perform their work in a safe and environmentally protective manner.

Refresher training is provided in the form of monthly training sessions. The safety adviser of the cyanide department provides no less than two hours of training per month. A minimum of 24 hours of refresher training is required for employees. The training includes the safety requirement for cyanide-related work tasks. Irregular exam is arranged after annual testing to verify their understanding of the safety requirements for cyanide-related work tasks. The exam for all employees is scheduled in June.

The training elements are necessary for each job identified in training materials.

An annual training plan is developed at the beginning of the year, which includes training on the physical and chemical properties of cyanide, fire prevention, personal protection equipment, EHS management procedures, Emergency Response Plan, safety operation process, occupational health requirement, maintenance requirement etc., and also specific training materials regarding each post.

The Facility has 34 personnel certified in safety management involved in the regular safety management of the facility, including 8 national certified safety engineers. These qualified personnel and managers provide internal trainings to all employees on cyanide operations. Training for management is provided by Safety Director of Shuguang Group, who is national certified safety engineer. External trainings are provided by qualified agencies, such as local safety department, environmental protection department, fire-fight department, special equipment management department.

The Facility evaluates the effectiveness of cyanide training by testing and observations.

There are questionaries that are used for the three levels of training and are retained. New employees work with an experience person who demonstrates and observers the worker perform their tasks. Also, the Facility daily, weekly, monthly, annually inspection and evaluation for employees EHS performance.

3.4.2 Production Practice 4.2

Train employees to respond to cyanide exposures and releases.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 4.2**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

The Facility does train workers in the procedures to be followed if a cyanide release is discovered.

Workers are trained in company, departmental and operational training as well as monthly and weekly training on the procedures to follow if a cyanide release is detected. The Facility has 41 designated and qualified safety managers.

Workers interviewed were able to describe the response processes including evacuation to upwind, use of safety showers, reporting of incidents, and use of antidotes. In addition to the process workers, the facility has dedicated emergency response personnel who are trained in higher level response actions.

Also, the Facility has conducted emergency drills to train workers and test their skills for responding to cyanide releases once a year at least. Workers' performance in the drill about response skills has been included in the Drill Summary Report.

The Facility does train workers to respond to worker exposure to cyanide and are routine drills used to test and improve their response skills.

Mock drills hare conducted with workers to train them and test their response skills. Worker exposure scenarios have been conducted at the facility. The drills are documented and reports assess the performance of the drills and improvements needed.

Training records are retained throughout an individual's employment, and document the training they receive, including the names of the employee and trainer, the date of the training, the topics covered, and how the employee demonstrated an understanding of the training materials.

Training files for members of the Facility were reviewed and contained evidence of training, including course content, assessments and certificates.

All workers received trainings on personal protective equipment and emergency response procedures in the event of a spill or exposure, including daily, weekly, monthly and annually trainings.

3.5 Principle 5 – Emergency Response

Protect communities and the environment through the development of emergency response strategies and capabilities.

3.5.1 Production Practice 5.1

Prepare detailed emergency response plans for potential cyanide releases.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.1**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

The Facility has developed emergency procedures for the management of emergencies associated with the storage of chemicals including cyanide. The facility has the following emergency response plans:

- Emergency Response Plan for Production Safety Accident, Production Design Management and Emergency Response Procedure and Emergency Response Plan for Environmental Emergencies which provide high level guidance for the preparation of the following subordinate plans.
- On-Site Disposal Plan for sodium cyanide accidents from production facilities details the emergency response for potential releases of cyanide.
- Emergency Response Plan for Production Safety Accident, details the emergency response for potential releases of sodium cyanide and hydrocyanic acid in sodium cyanide production facilities, Solid Sodium cyanide warehouse, Liquid sodium cyanide intermediate tank area, Liquid sodium cyanide tank farm, respectively.

The emergency procedures do consider the potential failure scenarios appropriate for its Site-specific environmental and operating circumstances.

a) Emergency Response Plan for Production Safety Accident states the response measures in the event of catastrophic release of hydrogen cyanide. When a poisoning accident occurs, poisoned person is evacuated from the scene and transferred to the windward or side windward direction without air pollution. When available, respiratory and systemic protection should be provided immediately to prevent further inhalation of hydrogen cyanide. Hydrocyanic acid detoxification specific drugs were used for symptomatic treatment. For patients with respiratory and cardiac arrest, cardiac compression, cardiopulmonary resuscitation and oxygen will be performed immediately. Serious cases were taken to the hospital by ambulances equipped in the factory.

b) Emergency Response Plan for Environmental Emergencies details what to do in the event of a large leak. The Site controls the source of leakage by closing valves, pump the material leaking in the cofferdam into the accident tanks, stopping operations, The main methods of Site spill disposal are shown as below:

1). Close all the outlet valves of the company. Sodium thiosulfate is poured into the drainage to prevent contamination from string-in outside the plant, and the ground wastewater is collected from the wastewater treatment plant.

2). Emergency dispatch liquid cyanide tank into the company and use submersible water pump to collect liquid sodium cyanide in cofferdam into liquid cyanide tank car for storage.

3). Monitoring. The environmental monitoring station immediately monitored all drainage lines and groundwater in the installation area for total cyanide.

4). After the collection of liquid sodium cyanide at the site, the accident site was washed with sodium thiosulfate aqueous solution, and all the rinse water was collected to the sewage treatment station for treatment.

5). If soil contamination is involved, the contaminated soil was treated according to the pollution remediation control procedure. The accident emergency monitoring personnel will monitor the contaminated area of the soil at the leak with the monitoring instrument, and the area showing cyanide above 10ppm on the monitoring instrument will be defined as the soil area to be treated. The accident emergency rescue team will excavate the soil in the contaminated area with a spade, load it into a special steel bucket, and transport it to the solid waste soaking pool for treatment.

c) Emergency Response Plan for Production Safety Accident details what to do in the event of a release. If the fire is small, on-Site personnel use on-Site dry powder fire extinguishers to extinguish the fire themselves. If the condition meets the fire and explosion special accident emergency plan start conditions, will activate the corresponding plan immediately.

d) Production Design Management and Emergency Response Procedure details emergency actions to be taken in the event of rupture to pipes, tanks or valves.

e) Power outages and equipment failures are dealt with in On-Site Disposal Plan for sodium cyanide accidents from production facilities which details what to do in the event of power outages. The Systems Document contains a 'Plan for emergency treatment of power failure of sodium cyanide plant' that details that the emergency response plan for three situations is power failure caused by power grid fault, power failure caused by the fault of sodium cyanide device itself, and power shock.

f) Overtopping of ponds, tanks and waste treatment facilities will not happened in the plant, because all liquid devices in the plant are equipped with coffers that are 110% larger than the volume of liquid storage devices, and the emergency pool is calculated in detail during the design, and no overflow will occur.

The emergency procedures do describe specific response actions, as appropriate for the anticipated emergency situations, such as evacuating site personnel and potentially affected communities from the area of exposure.

a) Specific response actions, as appropriate for the anticipated emergency situations, such as evaluating site personnel and potentially affected communities from the area of exposure.

Chapter 7 of *Production Design Management and Emergency Response* sets out the specific response actions, such as evacuating site personnel and potentially affected communities from the area of exposure. The Section 5 in Chapter 7 of details the response actions required for each department involved in the management of the emergency which meet the requirement of ICMC.

b) Use of cyanide antidotes and first aid measures for cyanide exposure.

Production Design Management and Emergency Response describes cyanide first aid measures for persons impacted by HCN or cyanide.

c) Control of release at their source

The *Emergency Response Plan for Production Safety Accident* outlines 17 emergency scenarios of which nine are specifically related to cyanide release. The nine cyanide release-related scenarios are:

- HCN spill/leakage
- Power outages for cyanide manufacturing facilities
- Explosions of pressure vessels containing cyanide
- Cyanide release from tanks
- Explosions of cyanide reaction facilities
- Abnormal conditions of cyanide reaction facilities
- Steam outages for cyanide manufacturing facilities

- Environmental emergency response during hazardous chemicals release and explosions of pressure vessels
- Flood prevention for cyanide manufacturing facilities

And the detailed response process has been specified in the *On-Site Disposal Plan for sodium cyanide accidents from production facilities.* These seem appropriate for the site-specific environmental and operating circumstances.

d) Containment, assessment, mitigation and future prevention of releases.

The *Emergency Response Plan for Production Safety Accident* specified the containment steps which are outlined in response scenarios for containment measures.

Shuguang Facility also stipulate relevant measures in Section 3 and Section 4 of Chapter 7 of *Production Design Management and Emergency Response Procedure* which state that a cyanide release event should be reported to the supervisor and the relevant administrative department in the plant. An incident investigation team will be organized to investigate and identify the cause of the incident and other characteristics of the event, lessons learned and the corresponding corrective to be also drawn up to prevent similar incidents with the risk of cyanide exposure from recurrence or to improve the nature of the response if there is a recurrence.

3.5.2 Production Practice 5.2

Involve Site personnel and stakeholders in the planning process.

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

Summarise the basis for this Finding/Deficiencies Identified:

The Facility has involved its workforce and stakeholders in the emergency response planning process.

The EHS Manager indicated that the workforce has opportunities to comment on the emergency response documentation during annual training on its content.

Shuguang has identified the following external stakeholders:

- Anqing Petrochemical Fire-fighting Bureau sited next-door to Shuguang.
- Emergency Management Bureau
- Environmental Ecological Management Bureau
- Fire Prevention Bureau
- Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital
- First line staff

Each external stakeholder has received controlled copies of the emergency response documentation following each update of the documents. In addition, Shuguang has cooperation protocol with the local hospital.

The Facility has made potentially affected communities aware of the nature of their risks associated with accidental cyanide releases, and consulted with them directly or through community representatives regarding what communications and response actions are appropriate

Before the issue of the emergency response plan, the Site had noticed neighbouring industrial facilities that there may be a risk of cyanide leakage in the Site and the possible impact on them after the leakage. The measures for risk response have been agreed with neighbouring industrial facilities, and a risk response communication mechanism has been established. Mutual Aid Agreement for Emergency Rescue of Neighbouring Sites were provided for review.

The Facility has involved local response agencies such as outside responders and medical facilities in the emergency planning and response process.

The *Production Design Management and Emergency Response Procedure* details the roles of outside responders.

The outside responders include:

- Anqing Petrochemical Fire-fighting Bureau sited next-door to Shuguang.
- Emergency Management Bureau
- Environmental Ecological Management Bureau
- Fire Prevention Bureau
- Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital

As detailed above, these agencies have been provided with controlled copies of the emergency response documentation.

The operation engages in regular consultation and communication with stakeholders to assure that the Plan addresses current conditions and risks as detailed above.

Employees are involved in the regular cycle of training, drills and post-drill reviews as a means of testing the suitability of the emergency response documentation for current conditions and risks.

Shuguang is in regular consultation with the following external stakeholders through the provision of updated emergency response documentation:

- Wuli Village
- Anqing Petrochemical Company
- Safety Protection Bureau
- Environmental Protection Bureau
- Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital

3.5.3 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 **Production Practice 5.3**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The emergency response documentation:

a) Does designate primary and alternate emergency response coordinators.

As specified in Chapter 7, Section 5 of the *Production Design Management and Emergency Response Procedure*, a commander team will be organized in case of emergency which included a cyanide-related emergency. General Manager will be the commander in chief, and Vice General Manager will be the backup. Leaders of each department will be the members of the commander team.

b) Identifies Emergency Response Teams.

Designated responders from each department consist of the emergency response and rescue team. Duties of each department are detailed in Chapter 7, Section 5 of the *Production Design Management and Emergency Response Procedure*.

A list of trained emergency responders is maintained by the EHS Department.

c) Requires appropriate training for emergency responders.

The *Production Design Management and Emergency Response Procedure* stipulates the requirement for annual training of Emergency Commanders. The *Safety Training and Education Procedure* outlines the requirements for regular emergency response training for employees. Training records indicate that employees receive annual training in emergency response and participate in annual mock drills.

d) Includes call-out procedures and 24-h contact information for the coordinators and response team members, and emergency response plans include call-out process for initiating a response to a cyanide-related emergency. The emergency team members have showed the knowledge and ability of cyanide emergency treatment during interview.

Section 6.2.4 in Chapter 7 of the *Production Design Management and Emergency Response Procedure* details contact information for all internal and external persons directly involved in the Emergency Response.

The EHS Department maintains a list of all emergency response trained employees, which includes contact information.

e) Specifies the duties and responsibilities of the coordinators and team members.

Section 5 in Chapter 7 of the *Production Design Management and Emergency Response Procedure* clearly specify the duties for the Command Team and each department to be involved in emergency response.

f) Lists all emergency response equipment that should be available.

Appendix 4 of the *Production Design Management and Emergency Response Procedure* lists the emergency response facilities and equipment, specifications for the equipment items, the number of each item that is required to be available, the locations of the facilities and items and identifies the department responsible ensuring the equipment is kept available and expected to use the equipment in an emergency response situation. The emergency response equipment mainly includes fire extinguishers (dry power and foam), fire hoses, eye wash bottles, shower and eye wash stations, fire hydrants, fire pumps, high temperature emergency clothing, SCBAs, chemical coveralls, gloves, light oil, HCN and ammonia detectors, emergency lighting, masks, chemical resistant gloves, sand, sand drum, shovel, and cyanide antidote.

g) Includes procedures to inspect emergency response equipment and assure its availability when required.

Section 5.3 in Chapter 7 of the *Production Design Management and Emergency Response Procedure*, requires that emergency response equipment should be inspected monthly. Inspections of fire extinguishers, cyanide antidote, eye wash bottles, fire hydrants, SCBAs, PPE, gloves, fixed and portable monitors, emergency lighting and masks, are undertaken as part of monthly inspections.

h) Describes the role of outside responders, medical facilities or communities in emergency response procedures.

The *Production Design Management and Emergency Response Procedure* clearly describes the call out procedures and contact information for outside responders, medical facilities and community representatives in Chapter 7, Section 6. The roles of outside responders are clearly described in Chapter 7, Section 5.4 of the *Production Design Management and Emergency Response Procedure*, supported by further details contained together with the agreement with Sinopec Anqing Branch and Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital.

The facility has confirmed that outside entities included in the ERP are aware of their involvement and are included as necessary in mock drills or implementation exercises.

The site has given the ERP to the Anqing Petrochemical Company (Sinopec Anqing Branch), Anqing Petrochemical Fire-fighting Bureau sited next-door to Shuguang, Emergency Management Bureau, Environmental Ecological Management Bureau, Fire Prevention Bureau and Nanjing Drum Tower Hospital Group Anqing Petrochemical Hospital.

The mock drills conducted in June annually. The outside responders have participated in mock drills in the last three year.

3.5.4 Production Practice 5.4

Develop procedures for internal and external emergency notification and reporting.

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

Summarise the basis for this Finding/Deficiencies Identified:

The emergency response documentation contains clear flow charts and contact information describing the call out procedures for notifying management, regulatory agencies, outside response providers and medical facilities.

Section 5 and Section 6 in Chapter 7 of *Production Design Management and Emergency Response Procedure* describe the duties of management, each department, regulatory agencies, outside responders, including the hospital as well as outlines the reporting procedures.

Section 6 in Chapter 7 and Appendix 1, Chain of command and emergency response process chart of *Production Design Management and Emergency Response Procedure* provides contact phone numbers for all internal and external responders.

In addition, contact information for the emergency response team, the on-site doctor, ambulance, fire control and hospital is on the obvious position of the Site.

The emergency response documentation includes procedures and contact information for notifying potentially affected communities and communication with the media.

Based on a review of potential releases from the Shuguang site and the distances involved. No villages in the 1000 m radius of the Site.

As an industrial neighbour also handles hydrocyanic acid, the Sinopec Anqing Branch's facility in Jingbei Road has been identified as potentially affected by incidents at the site.

As described in Chapter 7, Section 5.5 of the *Production Design Management and Emergency Response Procedure*, the command team is required to inform Sinopec Anqing Branch and if based on the estimation of affected scope, request them to evacuate. The contact information of the neighbouring company and the media contacts considered appropriate by Shuguang for emergency notification is detailed in Chapter 7, Section 6 of the *Production Design Management and Emergency Response Procedure*.

The operation has a written procedure for notifying ICMI of any significant cyanide incidents, as defined in ICMI's Definitions and Acronyms document.

Shuguang has established Production Design Management and Emergency Response Procedure that specifies the requirement of a significant cyanide incidents. Shuguang will notify ICMI of any significant cyanide incident.

As interviewed, no such significant cyanide incidents have occurred.

3.5.5 Production Practice 5.5

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

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

Summarise the basis for this Finding/Deficiencies Identified:

The emergency response documentation does describe specific, appropriate remediation measures, such as recovery or neutralisation of solutions or solids, decontamination of soils or other contaminated media and management and/or disposal of spill clean-up debris. Alternate drinking water supply is regarded as not applicable to the Shuguang site given that the drinking water supply is municipal water, and that the nearest surface water is approximately 3 km from the site. The drinking water source is the Yangtze River, which is about 11 km south-east of the Site.

The *Pollution control remediation management procedures* details response and remediation methods for:

- Soil contamination
  - Isolate area
  - Test soil for cyanide
  - If above 5 mg/L total cyanide
    - Neutralise using sodium hypochlorite
    - Excavate soil
    - Dispose of soil via a solid waste vendor
    - Retest area and continue to excavate if cyanide concentration is still above 5 mg/L total cyanide
- Groundwater contamination
  - Use a pump to extract groundwater
  - Analyse water for cyanide
  - Dispose water via the site's wastewater treatment station
  - Monitor groundwater every two hours Continue to extract underground water until cyanide concentrations are below 0.05 mg/L total cyanide.

Sodium hypochlorite solution with 12 concentration is stored in V531 Tank of 9.5 m^3 in the tank farm for neutralization of contaminated soil or groundwater.

If cyanide contamination occurs, Emergency Management Bureau and Ecological Management Bureau will be involved in the remediation. The detailed remediation method shall be reviewed and approved by these agencies. External laboratory will be hired to conduct the sampling and test in accordance with approved method. The final acceptance of the remediation will be reviewed and approve by external experts from local expert library.

The emergency response documentation prohibits the use of chemicals such as sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat cyanide that has been released into surface water.

Section 7.2.3 of *Production Design Management and Emergency Response* states that "*Sodium hypochlorite, ferrous sulfate and hydrogen peroxide should not be used to treat a cyanide release once it has entered surface water*".

Despite this requirement, the facility is located at least 3 km away from the nearest surface water and it is unlikely therefore that there will be any emergency with direct discharge of cyanide to surface water. The operation does not consider the release of cyanide to surface water through the stormwater system to be a credible scenario.

The emergency response documentation does address the potential need for environmental monitoring to identify the extent and impact of a release, and includes sampling methods, parameters and, where possible locations where feasible.

The environmental monitoring plan of groundwater and soil associated with an emergency is set forth in the *Pollution control remediation management procedures*. These procedures indicate relevant steps, test methods and concentration limits.

3.5.6 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

Summarise the basis for this Finding/Deficiencies Identified:

The emergency response documentation contains provisions for periodically reviewing and evaluating its adequacy and they are being implemented.

Chapter 7, Section 8.1 of the *Production Design Management and Emergency Response Procedure* states that the plan is required to be evaluated annually and updated if any deficiencies are identified during the implementation of the procedure. Evaluation records were provided for review.

Additionally, evidence of reviews of the procedure was provided in the form of signed receipts of acknowledgement from external stakeholders who are sent updates of the emergency response documentation.

Mock emergency drills are conducted periodically to test response procedures for various exposure scenarios, and the lessons learned from the drills are incorporated into emergency response planning.

The Plant undertakes four emergency response drills for cyanide related facilities each year in accordance with Chinese standards and the facility's Emergency Response Plan.

Examples of the drill reports for the following scenarios over the last three years were reviewed.

- Drill of disposal plan for cyanide tank area leakage accident. This mock drill is mainly to simulate the disposal method of liquid sodium cyanide storage tank leakage accident, a cyanide poisoning response (post-incident handling drills in the event of cyanide poisoning) was also included in the mock drill.
- Fire response (Emergency drills after a fire, including rescue, disposal of pollutants after a fire, etc.)
- Fire extinguisher training.
- Exposure accident drill of solid cyanide during transportation or moving in the warehouse and medium warehouse. This mock drill is mainly to simulate the disposal method of solid sodium cyanide boxes of drums broken accident, a collection response process was detailed specified. Ammonia liquid spills, which is mainly include the mock drill for the ammonia liquid spills in the tank farm, how to clean up the spills and evacuation of the affected area.

During an operation's three-year audit cycle, solid and liquid sodium cyanide exposure or leakage have been simulated as well as other identified scenarios.

In addition to the drills, employees receive annual training on emergency response procedures for the scenarios identified in the emergency response documentation.

For each drill the following is recorded:

- Description of emergency scenario
- Record of training attendance and assessment
- Photographs of the event.

Independent Emergency Drill Reports is prepared to identify the deficiencies of the ERP. And an updated version to address the deficiencies is prepared after the drill as required.

The facility has provisions to evaluate the plan after an emergency that required implementation of the plan, and for revising the plan as necessary.

Section 8.3 in Chapter 7 of *Production Design Management and Emergency Response Procedure* states that after each mock drill, evaluation team should be organized to assess the performance and effectiveness of the mock drill, and if any deficiencies identified, the elements of the emergency response plan should be corrected or improved in a timely manner.

During the site visit, post mock drill evaluation documents for 2020, 2021 and 2022 were reviewed, which indicated that no deficiencies were identified during the mock drill evaluation sessions. There have been no cyanide related emergencies since the last ICMC (International Cyanide Management Code) audit.

4.0 IMPORTANT INFORMATION

Your attention is drawn to the document titled – “Important Information Relating to this Report”, which is included in **Appendix A** of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

Signature Page

WSP Engineering Technology (Beijing) Co. Ltd. Shanghai Branch

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HH/OL

APPENDIX A

IMPORTANT INFORMATION

Appendix A Important Information

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by WSP Engineering Technology (Beijing) Co. Ltd. Shanghai Branch ("WSP") subject to the important limitations and other qualifications set out below.

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