 UGEE CHEMICALS	HHC MSG SOP	SOP Standard Operating Procedure
NOZZLES OPERATION & CONFIGURATION		
UCL/IBDMSG/CD/Q/06.0	Issuance Date: As at Last Signature Revision Date: Maximum 2 Years from Effective date.	
	Effective Date: 20 working days from the issuance date	Page 1 of 9

PURPOSE:

To outline the step by step procedure for operating spray nozzles in the tower, for detection and clearing nozzles blockage(s), replacement of damaged nozzles and effecting intended nozzle configuration.

SCOPE:

Crutched slurry exiting in the Ageing Vessel / Hold Tank is transferred via a series of pumps to spray nozzles to effect atomization in the drying Tower. Occasionally during slurry spray-drying, un-dissolved solids and insoluble foreign matter e.g. metal chips, rust particles are transferred causing nozzle clogging and blockage

RESPONSIBILITY:

Control room Operator: Operates the nozzles, observes the spray pressure indicator on the SCADA at during regular spray drying operation, detects blocked nozzles and communicates to nozzle room operator to clean the nozzles

Nozzle Room Operator: Operates the nozzle on manual mode and maintains the nozzles and does other tasks as directed by the control room operator

Tower Runner: supports the nozzle room operations.

POTENTIAL RISKS:

- Bruise
- Contact with hot surface, slurry, and moist powder
- Splash
- Inhalation of powder
- Skin/Eye irritation

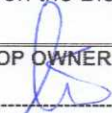

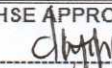
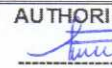
REQUIRED PPE:

- Heat resistant glove
- Heat resistant Jacket
- Cotton gloves
- Face Shield

PROCEDURE:

MEASURES:

Zero impact on the Blown Powder Quality.

SOP OWNER  Agbadu Lawrence Date: 11/02/22	QA APPROVAL  Alawode Oluide Date: 11/02/22	HSE APPROVAL  Adebiyi Adegoyin Date: 11/02/22	AUTHORISATION  Nadeeb Daramola Date: 11/02/22
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Pro-active detection and clearing of nozzle blockage to minimize unplanned downtime and PR loss.

Zero Safety Incidents.

A. PREPARATION OF NOZZLES FOR TOWER START-UP:

1. Confirm that the Boiler is working and that the steam pressure is greater than or equal to 4 bar on the pressure gauge in the boiler room.
2. Close the six (6) auto valves connecting each nozzle arm to the slurry line. Wear heat resistant gloves and Face shield.
3. Steam-out each nozzle by completely opening the manual valve connecting the main steam line to the nozzle, do this for each nozzle one after the other. Wear heat resistance gloves, jacket, and face shield.
4. Open the drain valve fitted along the main steam line to discharge liquid condensate. Wear cotton gloves.
5. Flush the spray nozzles one after the other by opening the manual 'steaming' valve connecting each nozzle arm to the main steam line. Wear heat resistance gloves, jacket, and Face shield.
6. Close the manual valves, when the peculiar 'whistle' sound signaling steam entry into the Tower is heard. Wear heat resistant gloves and Face shield

B. NOZZLES OPERATION DURING START-UP

1. Ensure that all the manual slurry valves are in open position.
2. Open slurry delivery valves to the individual nozzles selected for operation automatically from the SCADA
3. Ensure Nozzle 6 is the first to be opened to avoid dead legs on the nozzle circuit

C. DETECTING NOZZLES BLOCKAGE DURING SPRAY DRYING OPERATION.

1. Control room operator observes the spray pressure indicator on the SCADA at intervals during regular spray drying operation. The pressure reading displayed on the SCADA should be relatively constant and within limit of the prescribed centerline (50 – 80 bar).
2. An increase in spray pressure that is out of centerline for the HPP rpm indicates a blockage in one or more nozzles
3. To check for which nozzle is blocked, open an extra nozzle (one that was not running initially) from the SCADA and close a running nozzle. If the HPP pressure increases, it means that there is no blockage in that nozzle.
4. Repeat Steps 1 to 3 for all the running nozzles one at a time. For any of the nozzles being tested, an unchanged or low-pressure value indicates that that nozzle is blocked.
5. Inform the nozzle room operator to clean the blocked nozzle.

D: NOZZLE CLEANING/ CHANGING DURING SPRAY DRYING OPERATION:

1. Control room operator notifies the Nozzle room operator of his intentions to clean out or change a nozzle, stating the nozzle number and replacement nozzle.
2. The control room operator automatically shuts off slurry delivery to the nozzle which is suspected / determined to be blocked and informs the nozzle room operator to clean the nozzle.
3. The nozzle room operator drains the steam line from the steam separator in the nozzle room and then the condensate line on the blocked nozzle and close afterwards. He then opens the manual steam valve connection to the nozzle arm to steam out. Listen for the peculiar 'whistle' sound that signals steam

discharge through the nozzle orifice into the tower. Wear heat resistance gloves, jacket, and Face shield.

This operation will bleed / vent off trapped pressure in the nozzle arm.

4. After 90 seconds, close the manual steam valve connecting nozzle arm and open the quick coupling of the nozzle arm to remove the affected nozzle.
5. Use the C-Spanner to turn the coupling in an anti-clockwise direction to release the nozzle arm. Apply pressure at the insertion point with a rubber head mallet. Wear heat resistance gloves, Jacket and Face shield
6. Remove the nozzle arm serving the blocked nozzle. Wear heat resistant gloves, Jacket and Face shield.
7. Secure the nozzle arm in the jaws of the provided bench vice. Slowly unscrew the nozzle cap from the nozzle body by turning it in a counterclockwise manner till it is completely free. Wear heat resistant gloves, Jacket and Face shield.
8. Remove all individual components of the nozzle. Wear heat resistant gloves, Jacket and Face shield.
9. Using the provided water line, wash the component parts of each nozzle with a stream of fresh water. The individual parts to be washed are the Nozzle Orifice and Swirl Chamber. Wear heat resistant gloves, Jacket and Face shield. There are 3 main parts of the nozzle assembly namely, Orifice, whirl chamber and nozzle cap.
10. Use a thin metal piece to remove any bits of foreign matter, metal chips etc jammed in the nozzle orifice and/or swirl chamber
11. Re-assemble the nozzle by reinserting the nozzle tip into the nozzle cap.
12. Place the swirl chamber inside the nozzle cap and hold securely in place by tightening the lock screw.
13. Screw the cap tightly into the nozzle body.
14. Re-attach the nozzle tightly to the nozzle arm by turning it in place in a clockwise manner. The nozzle is perfectly aligned with the threading around the tip of the nozzle arm; the nozzle is fitted securely in place eliminating the possibility of leaks and nozzle fall-off into the tower. Wear heat resistant gloves, Jacket and Face shield.
15. Re-insert the nozzle arm into the spray tower through the insertion hole and reattach the nozzle arm to the slurry circuit using the provided steel pole or C-Spanner to turn the nozzle arm release spindle. Wear heat resistant gloves and Face shield.
16. The nozzle room operator informs the control room operator when he has finished the cleaning operation

E: NOZZLES OPERATION DURING SHUTDOWN:

1. The control room operator sprays until water gets to the nozzle and confirms that there are no powder on the BOT belt
2. The control room operator stops the pumping operations and shuts off all automatic valves linking the operated nozzles to the slurry line and informs the nozzle room operator,
3. The nozzle room operator proceeds to flush all spray nozzle arms and nozzles one after the other using steam (See Section D on same JSA). Steam is determined to be passing through respective nozzle arms via observation of a peculiar 'whistling' sound plus visual check
4. Repeat action steps (3) for all the six (6) nozzle arms.

F: NOZZLES CONFIGURATION:

1. Refer to the Process Centerline Sheet for the optimum nozzles configuration per formulation.

2. During regular slurry spray-drying operation, the control room operator opens the specific nozzles as recommended in the Tower start-up and Shutdown procedure. PRD-MSG 05.01

BASIC DEFINITION:

Nozzles Configuration: A defined selection and alternation of nozzles operated during Spray drying process. The intent of nozzles configuration is to optimize efficiency of the Spray drying operation whilst maintaining the quality of the Blown powder intermediate.

REASON FOR UPDATE:

VERSION 1: Change in SOP numbering to match the I-quality standard from MSG 0925.5 to PRD-MSG 04.01 and inclusion of step-up card

VERSION 2: Replaced "Runner" in the responsibility section of the SOP to "Tower runner" to drive clarity. Updated the section for detecting nozzle blockages during spray drying operation to remove ambiguity. Removed references to P&G nozzles.

VERSION 3: 2 years SOP renewal; Changed steam-generator to boiler and steam pressure from 4.5 bar to 4 bar.

VERSION 4: Updated to comply with Veeva SOP standard

VERSION 5: Updated to reflect spray pressure centerline to 50-80bar
Updated required safety PPE to include heat resistant jacket

End of Procedure

SOP RELATED ATTACHMENTS

Attachment 1 – Training & Qualification
Attachment 2 – Model Answers
Attachment 3 - Step-up Card