 UGEE CHEMICALS	HHC MSG SOP	SOP Standard Operating Procedure
TOWER START-UP AND SHUTDOWN		
UCL/IBDMSG/CD/Q/07.0	Issuance Date: As at Last Signature Revision Date: Maximum 2 Years from Effective Date	Page 1 of 24
	Effective Date: 20 working days from the issuance date	

PURPOSE:

To describe the procedure for Tower Start-up and Shutdown.

SCOPE:

This procedure covers all activities involved in starting up and shutting down of MSG tower in Ibadan plant.

RESPONSIBILITY:

- **Control Room Operator:** Start-up, run and shut-down the tower in a safe manner while producing quality blown powder.
- **Shift Team Leader:** Responsible for coordinating standard start up and shut down of the tower.
- **Shift Tower Runner:** Starts-up and shuts down the Boiler, Air injection compressor, Air dryer and executes the Tower Startup and Shutdown checklist
- **Shift Admix Runner:** Starts-up and shuts down all electrical panels for MSG operations and executes the Admix Startup and Shutdown checklist
- **Shift Satlab Operator:** Completes CMM, BP Moisture, Density and CatSO₃ analysis and communicated to the CRO when BP is within validated limits. Executes the Satlab operator Startup and Shutdown checklist.

POTENTIAL RISK:

Tower Fire

Blockage of slurry line

Powder Inhalation



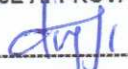
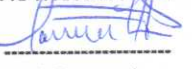
REQUIRED PPE:

- Protective Clothing,
- 3M 7500 Nose Mask
- Face Shield
- Cotton Glove and Safety shoes.

PROCEDURE:**START UP**

For Power Generator;

- Check that the Power generator is started up at the range of 400 - 415V
- Put on all the electrical panels in the following order:

SOP OWNER  Agbadu Lawrence Date: 11/02/2022	QA APPROVAL  Alawode Olujide Date: 11/02/2022	HSE APPROVAL  Adebiyi Adedoyin Date: 11/02/2022	AUTHORISATION  Nadeeb Daramola Date: 14/02/2022
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1. MDP 30 Panel.
2. UPS Panel
3. MCP 31, MCP 32, MCP 33, MCP 34, MCP 11 breakers and their corresponding panels.
4. Press the reset buttons of the panels to clear shutdown/startup alarms.

For Air Compressor;

- Check that the Air Compressor is started up.
- Check that the pressure at the display is at 6.0 Bar
- Check that compressed air is available on the line.

For Air Dryer;

- Check that the Air Dryer is started up.

For Boiler

- Start up the Boiler.

For the Slurry Making DCS System;

- Ensure that the Crutcher outlet valve is closed.

For the Admix DCS System;

- Check that instrument air valve to the admix filter is open.
- Start the admix de-dusting filter.
- Start the admix DCS Fan.
- Start the admix rotary valve.

For the Nozzle ring (Cold Start);

Ensure the nozzles are cleaned and flushed referencing the Nozzles Configuration & Operation. PRD-MSG 04

Slurry Line and pumping system warm up;

Ensure the line is warmed up and washed out referencing the "Pumping warm up and Start up procedure" MSG Job aid 083.01 before pumping slurry through the line to clean out crystals and to prevent sedimentation.

Air Heater Start-Up;

Startup the Air heater referencing the Air heater start-up and shutdown SOP - PRD-MSG 03.01

Crutcher Operation;

Prepare slurry batch referencing the Slurry Batch Making SOP PRD-MSG 01.01

Slurry Pumping;

- Check that all the drain valves for the slurry circuit to be used are closed.
- Verify that all the manual slurry delivery valves are opened at the nozzle room
- Verify that the process water valve is opened from the process water tank and that valves to the line are opened.
- Verify that there is water in the cooling water tank.
- Set the blown powder diverter to the streamlining bin.
- Start the PWS belt and scrapper
- Start the PWS flapper and the gravity separator rotary valve
- Start the airlift filter rotary valve
- Start the airlift filter screw conveyor.

- Start the airlift fan.
- Start the tower belt and scrapper.
- Start the cyclone screw conveyor.
- Start the cyclone rotary valve.
- Start the exhaust fan and set the tower vacuum to -5mm H₂O from the tower SCADA page.
- Ensure that the air heater is started and is on stack position.
- Open the ageing vessel discharge valve to allow slurry flow by gravity into the booster pump.
- Start the process water pump
- Start the cooling water pump.
- Start the Reitz filter.
- Start the Low-Pressure Pump and set the pressure to 4bar.
- Start the HPP lubrication pump.
- Set the HPP rpm to 9% and start the HPP
- Set the dilution fan damper to 50% for gas and 50% for diesel.
- Set the burner inlet temperature to **150°C** and divert heat to the tower by clicking the "divert to tower" button on the burner page of the SCADA HMI. Note that the inlet temperature should be ramped up in 20 degrees intervals during gas operation of the air heater.
- When the tower exhaust is at **85°C** open nozzle 6 automatically from the SCADA (Nozzle 6 needs to be the first nozzle to be opened to avoid dead legs on the CUL DE SAC ring)
- Adjust HPP rpm to maintain HPP pressure at startup centerline pressure.
- For ODOS run, go to the ODOS pop up page on the SCADA and acknowledge all alarms
- Press the ODOS start button to start the injection, this should be started less than 2 mins into the run.
- Check that blown powder flows to the control room density station.
- Check blown powder moisture to ensure powder is within validated limits.
- Inspect the PWS to ensure powder is free flowing with no screen blockage.
- When blown powder moisture is at target, increase burner inlet temperature to 240°C and open nozzle 2
- Adjust HPP rpm to maintain HPP pressure at startup centerline pressure.
- Increase burner inlet temperature set point to three nozzles centerline inlet temperature and the dilution damper setting to centerline.
- Open three nozzles when exhaust temperature rises above 90C and blown powder is dry.
- Adjust HPP rpm to maintain HPP pressure at startup centerline pressure.
- Inspect the PWS to ensure powder is free flowing with no screen blockage.
- Check blown powder moisture again to ensure powder is not wet.
- Achieve centerline inlet temperature on 3 nozzles.
- Adjust HPP rpm to maintain HPP pressure at centerline pressure.
- Inspect the PWS to ensure powder is free flowing with no screen blockage.
- Note that the tower inlet temperature must not exceed 330°C for safety reasons
- Spray start up powder into a streamlining bin.
- Check quality window data every 15 minutes to ensure none of the centerlines below is OOL.
 - a. Tower inlet temperature.
 - b. Tower exhaust temperature.

- c. LPP pressure.
- d. HPP pressure.
- e. Temp before Reitz (for ODOS)
- f. Temp after Reitz (for ODOS)
- g. Tower vacuum.
- h. BOT temperature.
- i. ODOS differential temperature
- j. ODOS injection ratio

For Initial Base Powder Routing;

- Spray drying at startup should be into the streamlining bin.
- Once the streamlining bin is filled and any product goes to the good bin, hold the proceeding buggies.
- When Satlab operator confirms the Blown Powder characteristics (Density, Moisture) are within validated limits, divert to the good Bin.
- Take the CatSo3 analysis sample as soon as tower is on 3 nozzles, ODOS injection ratio, ODOS differential temperature, HPP rpm and discharge pressure are within validated limits.
- Ramp down tower rate to 2 nozzles after taking CatSo3 samples until Satlab confirms results are within validated limits.
- Ensure CatSo3 results is ready within 40minutes of sampling. If CatSo3 result is not ready within the time frame, stop the line to obtain the results.
- If CatSo3 fails, follow the CatSo3 troubleshooting guide otherwise proceed to continuous operation.

Process conditions during spray drying operations;

- Complete all Process Audits- Centerlines audit and the first audit of the Uptime inspection checklist during the first hour of the startup.
- If wet powder is sprayed, stop the line, clean the accumulation on tower shell and follow the high BP moisture mitigation guide.
- Wet powder is sprayed when a BP moisture $\geq 4.0\%$ is recorded during normal operation.

Power Failure Emergency Procedure;

- Close the manual valves for the slurry delivery to the nozzles.
- Open the steam valves to each nozzle until the nozzle squeals as sign of steam entering the tower.
- Evacuate the building.

SHUT DOWN

For Crutcher washout process.

- Stop the slurry batch making process.
- Transfer the last batch to the ageing tank and close the Crutcher discharge valve.
- Transfer 150kg of water into the Crutcher, agitate at high speed to completely clean out any residual slurry.
- Open the magnetic filter drain valve and the Crutcher auto valve to empty the content of the Crutcher to pit.
- To flush the Crutcher line to ageing vessel.
- Ensure that the main water valve is OPEN to the Flushing water pump.

- From the SCADA (Odos Making page), OPEN the flushing water injection valve beneath Crutcher Valve.
- Start the flushing water pump and Set pump speed at 60%.
- Flush until the Ageing vessel level raise to 150kg and STOP.
- OPEN the Ageing vessel Chain valve to dump the content in the vessel.
- The Ageing vessel chain valve, Crutcher valve and the magnetic filter drain valve must be kept in OPEN position at shutdown.

To flush the HPL and LPL:

- From the SCADA (Odos Making page), OPEN the flushing water injection valve beneath the Ageing Vessel valve.
- Start the flushing water pump and Set pump speed at 60%.
- Start all tower ancillaries except the ODOS system.
- Spray the wash water through the 6 nozzles by spraying 2 opposite nozzles at a time
- Run Nozzle 3 & 6 as the last pair to avoid dead legs on the ring.
- Check that the powder flow on PWS has stopped.
- STOP the flushing water pump and close the water injection valve.
- Stop all Tower axillaries and Open all HPL and LPL drain Valve
- Set the airlift and cyclone diverters to the big bag position.
- Introduce fresh water and steam into the low pressure line and spray water into the tower
- Divert the Air heater to Stack Position and reduce to low fire.
- Stop the High-Pressure Pump.
- Stop the HPP lubrication pump.
- Stop the Low-Pressure Pump.
- Stop the Reitz Filter.
- Stop the cooling water pump.
- Stop the Process water pump.
- Stop the cyclone rotary valve.
- Stop the cyclone screw conveyor.
- Stop the air-lift fan.
- Stop the airlift filter screw conveyor.
- Stop the airlift filter rotary valve.
- Stop the gravity separator rotary valve.
- Stop the PWS flapper.
- Stop the PWS belt and scrapper.
- Switch off the Air heater Burner.
- Operate the Cleaning ring to clean the walls of the tower.
- Collect cleanout to a containment, check that the Tower conveyor is empty.
- Stop the tower belt and scraper.
- When the tower outlet temperature is 55degC or less; switch off the Exhaust fan.

Shutdown for Tower Cone / Cyclone Cleaning (Operational Maintenance).

- Run the Cleaning Ring prior to a long Tower Shut down (> 8hours). Refer to the "Tower shell cleaning at shutdown" MSG Job aid 084.01 to ensure a safe operation.
- Clean the tower cone every 2-week run
- If the Tower Cone is to be cleaned and the Exhaust Cyclone Fan is shutdown, the Airlift Fan and its ancillaries must be kept running while the Tower cone cleaning is going on and the powder diverted to a "Bad Bin".
- In the same vein, while the Airlift Duct is cleaned, the Exhaust Fan must be kept running.

Emergency Shutdown Procedure;

Stop the LPP, HPP, Reitz filter, Air Heater and Air Lift Fan and all connected equipment by pressing the E-Stop button.

- Stop further addition slurry batch making process.
- Leave the agitator running.
- Open the steam inlet valve to the slurry high pressure circuit and open the HPP drain valve.
- **Inform the next level manager and the thermal system owner for the department.**

DEFINITION:

MDP - Main Distribution Panel

UPS - Uninterruptible Power Supply

MCP - Main Control Panel

DCS - Dust Control System

HPP - High Pressure Pump

PWS - Parallel Wire Screen

LPP - Low Pressure Pump

BOT - Bottom of Tower

HPL - High Pressure Line

LPL - Low Pressure Line

REASON FOR UPDATE:

VERSION 1: Change in the SOP numbering from MSG 0935 6 to PRD-MSG 05.01

VERSION 2: Routine SOP review. Removed manual adjustment of cyclone and airlift diverter positions

VERSION 3:

- Routine SOP review.
- Changed Shift mech to Tower runner and shift Electrician to Admix runner.
- Included that the tower and admix runners execute their respective startup and shutdown checklist
- Included that the operator should switch on the corresponding cabinets of the MCP 31, 32, 33 AND 34 breakers and that he should press the reset button to clear all startup alarms.
- Included Boiler as another name for the steam generator.
- Removed the chiller startup because it is no more in use
- Removed the water flow indicator lights as they are no more in use
- Values of dilution fan damper changed to the currently validated of 50% for gas and 50% for diesel
- Removed the instruction about the manual diverting valve as this is now done from the SCADA
- Attachment of the Tower startup and Shutdown checklist

VERSION 4: Updated to include:

- Slurry line and pumping system warm up following MSG Job aid 083.01
- Cleaning ring should be run prior to a long shutdown and the "Tower shell cleaning at shutdown" MSG Job aid 084.01 should be followed.

VERSION 5: Updated to include:

- Routine review for the SOP.
- Tower exhaust temperature reduced from 70degC to 55degC before stopping the exhaust fan.
- Clean tower cone every 8 days of run.

VERSION 6: Updated to include:

- Compliance with standard Veeva SOP format.

VERSION 7: Updated to include:

- Once the streamlining bin is filled and any product goes to the good bin, hold the proceeding buggies.
- Take the CatSo3 analysis sample as soon as tower is on 3 nozzles, ODOS injection ratio, ODOS differential temperature, HPPrpm and discharge pressure are within validated limits.
- Ensure CatSo3 results is ready within 40minutes of sampling. If CatSo3 result is not ready within the time frame, stop the line to obtain the results.
- If CatS03 fails, follow the CatS03 troubleshooting guide otherwise proceed to continuous operation.
- If wet powder is sprayed, stop the line, clean the wet accumulation on tower shell and follow the high BP moisture mitigation guide.
- Wet powder is sprayed when a BP moisture $\geq 4.0\%$ is recorded during normal operation.

VERSION 8: Updated to include:

- Process Audits and First audit of the uptime inspection checklist must be done within first hour of Tower startup.
- Ramp down tower rate to 2 nozzles after taking CatSo3 samples until Satlab confirms results are within validated limits.
- Tower shutdown checklist includes that boiler should be shutdown from boiler HMI before panel switch
- Tower cone should be inspected to be clean and freely rotating.

End Of Procedure

SOP RELATED ATTACHMENTS

Attachment 1 – Training & Qualification
Attachment 2 – Model Answers
Attachment 3 – Step-up card
Attachment 4 – Tower startup and shutdown checklist