Sulfuric Acid Startup Program

Applicability / Location: Concentrates		**Last Revised Date:** <Date most recent change(s)	**Version Number:** 2
Document Owner: EHS Services Director – Phosphates Business Unit		**Originating Department:** Environmental Health & Safety – Phosphates Business Unit	
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Introduction

Purpose

To outline requirements or procedures for Sulfuric Acid Plant Startup.

Scope

This applies to all Concentrate sites in the Phosphate Business Unit.

Definitions

Key terms used in this standard operating procedure are defined below.

Term	Definition
Aerodynamic Downwash	Increased wind speed causes air patterns to direct stack discharge to the earth.
Code Blue	A warning system used to notify all facility personnel of a plant announcement.
Field Observer	A person downwind of a sulfuric plant startup who observes SO2 levels and plant conditions.
Fumigation	Solar heating causes ground air to rise and forces stack discharge to be eddied to the earth.
Inversion	An air layer in which the temperature increases with elevation.
Plume Looping	Thermal eddies sporadically drive stack discharge to the earth.
Plume Trapping	Stack discharge is physically trapped between the earth and an upper inversion.

Responsibilities

The following table contains a listing of responsibilities for specific groups /jobs as required by this standard operating procedure.

Group or Title	Responsibilities
General Manager	Ensures that this standard is applied at their facility.
Area Manager	Upholds the requirements set forth in this program.
Production Supervisor	Ensures program requirements are met prior to approving and/or seeking approval for sulfuric plant start up.
Field Observer	Communicates stack and plant conditions to the SAP Operator during sulfuric startups.
SAP Operator	Completes the site pre-startup checklist. Obtains proper approval prior to starting up the plant.

Approver	Approves safe conditions under which a sulfuric acid plant may be started up. May be a general manager, area manager, or production supervisor as defined by this program.

Continued on next page

Introduction, Continued

References

The following documents serve as a reference for this document.

References
OSHA 1910.165; *Employee Alarm Systems;* February 1, 2008 N/A
Koogler & Associates Environmental Services: *Meteorological Conditions and Plant Operating Conditions Affecting the Ground-Level Concentrations of Sulfur Dioxide from Sulfuric Acid Plants*; May 1997.
Mosaic Fertilizer, LLC. SAP Operating Procedures
Mosaic Matrix for Final Safety Approval
SO2 Inversion Research ***"Some Restrictive Meteorological Conditions to be Considered in the Design of Stacks",***

Training

Any person whose work is governed by this document must be trained.

Documentation Requirements

Each site must develop and maintain the following documentation as part of this program.

Document Title	Description
Sulfuric Quick Trip Startup Procedure	A procedure for starting up a plant that has been down for less than 30 minutes (sulfur to sulfur).
Sulfuric Plant High SO2 Startup Procedure	A procedure for starting up a plant with high SO2.
Sulfuric Plant Startup Procedure	A standard operating procedure for starting up the plant under normal conditions.
Sulfuric Pre Startup Checklist	Site specific pre startup checklist described within.

Startup Requirements

Startup approval requirement

All startups of a sulfuric acid plant require approval.

Condition	Approval
Between sunrise and 11:00AM	Area or General Manager
Morning or evening shift change	Area or General Manager
All other times	Production Supervisor Level or Above

Startup – less than 30 minutes

If the plant has been down for less than 30 minutes (sulfur to sulfur), and was not tripped due to high sulfur dioxide (SO2) emissions, the following must be done:

- Follow the Sulfuric Quick Trip Startup Procedure
- Record conditions using the Sulfuric Pre Startup Checklist
- Obtain approval(s)

Note: *No field observer is necessary if the plant supervision approves.*

Startup – more than 30 minutes

If the plant has been down for more than 30 minutes, the following must be done:

- Follow the Sulfuric Plant Startup Procedure
- Use a downwind field observer
- Record conditions using the Sulfuric Pre Startup Checklist
- Obtain approval(s)

Startup – High SO2

If the plant was shut down for high SO2, the following must be done:

- Follow the Sulfuric Plant High SO2 Startup Procedure
- Use a downwind field observer
- Record conditions using the Sulfuric Pre Startup Checklist
- Obtain approval(s)

Stack Inversion Startup Considerations

Startup between sunrise – 11:00AM has a higher risk of inversion and should be avoided. If inversion is a risk, approvers must consider the following:

- Consider the potential of stack inversion due to weather conditions
  - Wind Speed and Direction
  - Plume trapping due to inversion risks
  - Plume Looping
  - Fumigation
  - Aerodynamic Downwash
- Consider in-plant occupancy and shift change
- Reference the approval and startup flow charts – Process Flows A and B

Note: *While the risk is greatest from sunrise until 11 am, the atmospheric conditions listed could be present at any time.*

Control Requirements

Downwind Field Observer Tasks

The Field Observer will record and communicate to the SAP operator:

- Stack and plant conditions of the plant starting up
- SO2 levels downwind of the plant, including zero readings
- Time of observations

Note: *Site will determine appropriate range allowed for downwind observation.*

Downwind Field Observer Tools

Each plant's Field Observer must have the following to perform their tasks:

- Vehicle
- SO2 monitor
- Respiratory PPE
- Radio/phone
- Field observer checklist – Appendix A

Note: *In the event the Field Observer has a high SO2 >2PPM reading and/or stack appearance condition that may require plant shutdown, refer to plant startup procedure for re-starting.*

Pre Startup Checklist

Each plant must use a checklist during startup which includes the following minimum requirements:

- Damper & valve positions
- Sulfur gun valves positions
- Memorandum of understanding conditions via DCS or PI or recorded on startup check sheet
- Field observer is in place for startup observations
- Code blue and PA System startup alarm/notification
- Contact record (who/when) startup confirmation from all departments that have been notified of startup and taken appropriate actions
- Potential of stack inversion due to weather conditions is considered and risk is acceptable. Atmospheric Conditions to be considered:
    - Wind Speed and Direction
    - Plume trapping due to inversion risks
    - Plume Looping
    - Fumigation
    - Aerodynamic Downwash
- Other facility specific critical parameters (plant check list etc.)
- Sign off section (may be verbal):
    - observer
    - supervisor
    - operator

Sulfuric Acid Startup Training Requirements

General Awareness Training

Within 60 days of hire, the following topics are required by Mosaic Phosphates for all facility employees

- Roles and responsibilities
- Interlocks and monitoring
- Announcement systems
- Work required to be stopped during startup

Functional Training

Within 60 days of hire and annually thereafter, the following topics are required by Mosaic Phosphates for all sulfuric personnel, plant field observers, and plant approvers.

- Weather conditions affecting plume dispersion
- Required documentation
- Tools, checklists and procedures required to be used for startup
- Logic diagrams.

Interlocks and Warning System Requirements

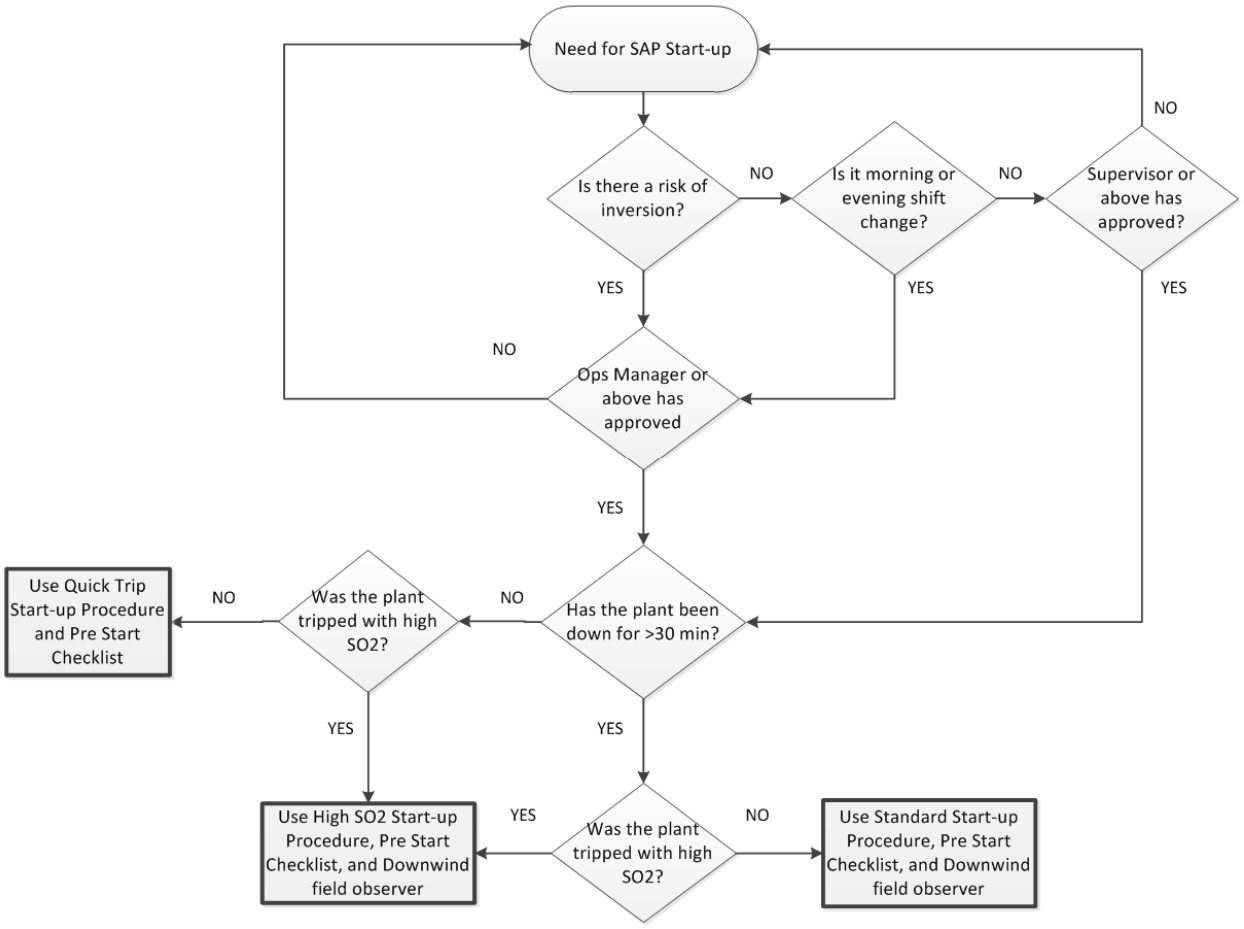
Interlocks	The following interlocks are required: • SO2 monitor trips a plant wide high SO2 siren and PA system at 1,000 PPM • SO2 monitor trips sulfur flow to the furnace and main air blower at no greater than 2,000 PPM ***Note:*** *In the event of a 2,000 PPM trip, refer to "High SO2 startup" in this procedure.*
SO2 monitoring	SO2 emissions must be continuously monitored during startup.
Startup and high SO2 notification	The following systems must be included to address communication with facility personnel and contractors regarding imminent startup and high SO2 events. • Code Blue notification via radio or phone • High SO2 siren • PA system announcing the imminent startup of the plant or high SO2 ***Note:*** *PA announcements will include which plant is starting up and wind direction.*
Suspension of work	Upon activation of the SO2 alarm or interlock all of the following work must be suspended until an "All Clear" is called: • Confined space permits • Aerial lift work • Scaffold access • Site railroad and trucking activity ***Note:*** *<u>Upwind work only</u> may continue at the discretion of affected area management with safe work permit approval.*
All Clear Notification	All Clear notification will be called when the following minimum requirements are met: • The plant converter beds are in control for conversion • Stack SO2 emissions are <1,000 ppm and reducing to meet emissions requirements
Announcement Systems	• Plant wide siren and PA system will be tested at Wednesday, 12:00 noon for all facilities. • Alarms will sound the same from facility to facility. ***Note:*** *Test procedures will meet OSHA compliance.*

Revision Log

Rev. No.	Requested By	Approved By	Revised By	Rev. Date
0	No revision			2/14/2012
0	Reformat for ISO		R. Withers	5/21/2012
1	Review Cycle Due	HSS Director – Phosphates	SME Review	12/3/15
2	Revision Update	SME	SME Review	3/31/17

Process Flows

Flowchart A Sulfuric Acid Plant Approval Logic Diagram



Flowchart B Sulfuric Acid Plant Startup Logic Diagram