



MALFUNCTION ABATEMENT PLAN

Wet Flue Gas Desulfurization

Lafarge North America, Inc. Alpena Cement Plant

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1. Introduction

This document is intended to satisfy the requirement of submitting a malfunction abatement plan (MAP) as specified under Rule 911^[1] of the MDEQ^[2] Air Pollution Control Rules and in the first amendment of the Consent Decree^[3] between Lafarge and the USEPA^[4].

This MAP includes an outline of the preventive maintenance activities and malfunction response measures to be taken in order to minimize both the frequency and duration of any malfunction that may occur.

It is consistent with the requirements contained in Rule 911 which states:

- (1) *Upon request of the [MDEQ], a person responsible for the operation of a source of an air contaminant shall prepare a malfunction abatement plan to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limitation.*
- (2) *A malfunction abatement plan required by subrule (1) of this rule shall be in writing and shall, at a minimum, specify all of the following:*
 - (a) *A complete preventative maintenance program, including identification of the supervisory personnel responsible for overseeing the inspection, maintenance, and repair of air-cleaning devices, a description of the items or conditions that shall be inspected, the frequency of the inspections or repairs, and an identification of the major replacement parts that shall be maintained in inventory for quick replacement.*
 - (b) *An identification of the source and air-cleaning device operating variables that shall be monitored to detect a malfunction or failure, the normal operating range of these variables, and a description of the method of monitoring or surveillance procedures.*
 - (c) *A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emissions limits.*

It is also consistent with the requirements contained in the first amendment of the Consent Decree which states:

..., Lafarge shall operate each Wet FGD^[5] [system] in compliance with a malfunction abatement plan that is approved by EPA and the Affected State pursuant to Section XI (Review and Approval of Submittals) and that contains the following:

- (1) *A comprehensive preventive maintenance program, including a description of the items or conditions that will be inspected, the frequency of these inspections or repairs, and an identification of the types and quantities of the replacement parts which will be maintained in inventory for quick replacement;*
- (2) *An identification of the source and the operating variables of the Wet FGD [system] that will be monitored in order to detect a Malfunction, the normal operating range of these variables, and a description of the monitoring or surveillance procedures and of the method of informing operating personnel of any Malfunction, including alarm systems, lights and/or indicators; and*
- (3) *A description of the corrective procedures that will be taken in the event of a Malfunction in order to achieve compliance with any Emission Limit as expeditiously as practicable and procedures to be implemented to minimize emissions, to the extent practicable during the period of Malfunction, including but not limited to the operation of a redundant pump to ensure operation of the scrubber in the event of a pump failure.*

¹ R 336.1911; "Air Pollution Control Rules"; Part 9. Emission Limitations and Prohibitions – Miscellaneous; 11 September 2008

² Michigan Department of Environmental Quality

³ Civil Action No. 3:10-cv-44-JPG; original Consent Decree filed 10 March 2010; first amendment filed 28 April 2011

⁴ United States Environmental Protection Agency

⁵ Wet flue gas desulfurization (a.k.a. wet gas scrubber)

A malfunction is defined under 40 CFR § 60.2⁶ as:

"... any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions."

2. Applicable Air Pollution Control Technology

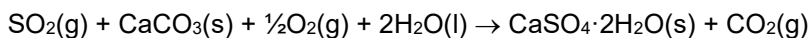
This MAP covers the single wet flue gas desulfurization system (a.k.a. wet gas scrubber, or, simply, scrubber) installed at Lafarge's Alpena, Michigan plant. The Alpena plant produces Portland cements and operates 24 h/d, 365 d/yr.

The scrubber cleans process gases exhausted from Kiln 22 (K22) and/or Kiln 23 (K23), collectively known as Kiln Group 6 (KG6). Each kiln system utilizes the long dry kiln process whereby dry, powdered kiln feed (ground limestone and other raw materials) is introduced into the rotary kiln and subjected to high temperatures resulting from the combustion of fossil and alternative fuels. Chemical reactions take place during this heating process, converting the kiln feed into an intermediate product called *clinker*. Once the clinkerization process is complete, the clinker passes through an air-quenching cooler to reduce the clinker temperature such that it can be handled by conveying equipment.

During the clinkerization process, sulfur dioxide (SO₂) and other pollutants are generated and become entrained in the exhaust gases exiting the rotary kiln. These gases first pass through a waste heat recovery boiler and mechanical dust collection device (a.k.a. multiclone). Next they pass through the kiln induced draft (ID) fan and then the reverse air fabric filter. As part of the scrubber system, a booster fan then conveys the gases to the absorber vessel (a.k.a. spray tower).

The gases entering the absorber have a temperature of typically between 180-220 °C. The gases are quenched immediately to ~ 55 °C by an alkaline slurry which is sprayed at the inlet to and in the body of the absorber. The calcium-based reagent used to make the slurry is the raw meal produced by the plant in the raw grinding process. Alternative reagents include quick lime, limestone, and cement kiln dust (waste dust).

Through a series of reactions, SO₂ in the exhaust gases reacts with calcium carbonate (CaCO₃) in the reagent to form calcium sulfite (CaSO₃). The CaSO₃ is oxidized via oxygen (O₂) present in the exhaust gases and combines with water (H₂O) present in the slurry to form calcium sulfate dihydrate (CaSO₄·2H₂O), i.e. gypsum. The slurry remains at the bottom (sump) of the absorber for several minutes to allow time for these reactions to take place. The overall FGD reaction is:



The slurry in the absorber sump is then either circulated back to the spray layers for further SO₂ removal or evacuated to the dewatering system where the gypsum will be dried. The filtrate from the dewatering equipment is returned to the absorber while a bleed stream containing chlorides and inert materials will be conveyed to the clinker coolers. The bleed stream water evaporates while the precipitates become part of the clinker. The clinker and the gypsum, along with other materials, are then interground to form the finished product, cement.

⁶ Code of Federal Regulations, Title 40 - Protection of Environment; Chapter I – Environmental Protection Agency (continued), Subchapter C – Air Programs (continued), Part 60 – Standards of Performance for New Stationary Sources, Subpart A – General Provisions, Section 60.2 – Definitions

3. Malfunction Abatement Plan

The scrubber commenced continuous operation on 13 December 2013 and is currently in the optimization phase. As such, the operational settings are still under development. The following paragraphs are provided using the best available data and vendor recommendations. Revisions may be required after commissioning has been completed (see § 5 – *Revision*).

The Consent Decree between Lafarge and the USEPA stipulates that once the wet FGD system is installed and has commenced continuous operation, the permittee shall not operate an affected kiln unless the associated control equipment is maintained and operated in a satisfactory manner.

3.1. Preventive Maintenance Program

Operations personnel will inspect the affected air pollution control system (i.e. scrubber) routinely and monitor its performance using the continuous emissions monitoring system (CEMS) as well as the plant process control system.

There are four (4) categories of inspections to be performed on a routine basis. These are:

- Production inspections / walk-throughs
- Mechanical maintenance inspections and/or repairs
- Electrical maintenance inspections and/or repairs
- Instrumentation inspections and/or repairs

A summary of each group's inspections can be found in Appendices A-D. The complete set of checklists and inspection sheets is available on the plant's electronic data repository. Each summary includes:

- Equipment number and name
- Type of inspection (i.e. running or stopped)
- Description of inspection
- Frequency of inspection (daily, weekly, ...)

Persons (roles) responsible for implementation of the scrubber PM program are:

- Production shift coordinator
- Maintenance supervisor – kilns
- Electrical and instrumentation supervisor

Lists of the primary spare parts to be maintained in inventory are located in Appendix E.

3.2. Operating Variables

Emissions and operating variables are monitored using the following methods:

- SO₂ emissions [ppm and lb/ton clinker] are monitored using the continuous emissions monitoring system (CEMS). The values are displayed on the process control system human-machine interface (HMI) screens.
- Operating variables are displayed continuously on the process control system human-machine interface (HMI) screens.
- If a fault should occur then the process control system will activate a visual and/or audible alarm to notify the operator so that he may take corrective action.
 - In the case of critical failures, e.g. loss of power, the control system's program logic will initiate shutdown procedures.

The primary operating variables, to be continuously monitored and recorded, and their expected operating ranges (under normal operating conditions) are:

- Booster fan inlet pressure [-0.1 to -0.5 kPa]
- Scrubber differential pressure [0.15-1.00 kPa]
- Stack temperature [40 to 60 °C]
- Scrubber outlet flow [$> 134,000$ scfm (wet)]
- pH [4.0 to 6.0]
- Slurry density [1.08 to 1.17 kg/L]
- Absorber liquid level [60 to 90 % (of maximum)]

3.3. Corrective Procedures

The following procedures are to be followed in the event of a malfunction related to the scrubber system.

If a system problem is detected that has the potential to exceed 30 minutes for the corrective actions or to cause SO₂ emissions to exceed the normal operational level, log all pertinent details.

The shift coordinator or his designee must investigate the problem and record the start time and problem scope in the plant's web-based operations log. This investigation should occur immediately when a problem is detected.

The shift coordinator must make a determination within 30 minutes after the investigation period if the problem can be rectified in one (1) to two (2) hours while maintaining kiln SO₂ emission performance or if it is longer to consult with plant management and the environmental department on the next course of action. Log start time of corrective actions.

When the equipment is released for operation and/or repairs have been completed, a qualified employee will inspect the affected equipment/system prior to acceptance. The shift coordinator will then log the time and initial acceptance of the malfunction correction.

The reason for system problems must be logged. The corrective measures taken to alleviate the problem must be identified, including documenting total time of the system issue and the time the equipment resumed normal operation.

Several redundant pieces of equipment are installed to enhance the scrubber system's reliability. Examples of redundant equipment are:

- Spare (back-up) spray pump
- Spare (back-up) quench pump

All spray and quench pumps will be rotated in and out of service to prevent slurry settling as well as to ensure they are operational when needed.

Critical equipment (e.g. quench pumps) are tied into an emergency back-up generator to protect the scrubber equipment in the event of a power outage.

In the event an operating variable falls outside its normal range, corrective actions may include the following, depending on the applicable operating variable:

- Check monitoring instrument to ensure accuracy; calibrate or repair as necessary
- Perform manual/physical testing of sample to confirm results
- Troubleshoot system (pumps, valves, etc.) to determine root cause

In the event of a CEMS malfunction, the following are possible courses of action:

- Troubleshoot and repair the affected CEMS components
- Operate back-up data acquisition system (DAS)
- Apply Part 75^[7] for any missing data

In the event that SO₂ emissions exceed the normal operational level, corrective actions may include (note that the normal operational level will not be determined until after the Demonstration Period as defined in the Consent Decree is completed):

- Adjustment of the scrubber slurry pH level
- Adjustment to the scrubber slurry pumps

4. Reporting

Malfunctions shall be reported per Rule 912^[8] of the MDEQ Air Pollution Control Rules as described in the plant's operating permit^[9], general condition 25.

Malfunctions shall be submitted in the semi-annual report as stipulated in the plant's operating permit.

Malfunctions where efforts to correct the problem are not consistent with these procedures shall be reported within two (2) working days as required by the operating permit.

5. Revision

As operational experience is gained for the scrubber this MAP will be reviewed and updated as necessary to document the actual range of operating variables as well as any appropriate changes to the preventative maintenance program and/or corrective procedures.

The MAP shall also be revised if there is an event meeting the characteristics of a malfunction which is not addressed by the plan.

⁷ Code of Federal Regulations, Title 40 – Protection of Environment, Chapter I – Environmental Protection Agency (continued), Subchapter C – Air Programs (continued), Part 75 – Continuous Emission Monitoring, Subpart D – Missing Data Substitution Procedures

⁸ R 336.1912; "Air Pollution Control Rules"; Part 9. Emission Limitations and Prohibitions – Miscellaneous; 11 September 2008

⁹ Renewable Operating Permit no. MI-ROP-B1477-2012

Appendix A – Production Inspections

#SJBR 5N5P89
12/2/2013

KILN FEED END SHIFT WALK-THROUGH REPORT

Date: _____

Name: _____

Reviewed By: _____

	Check Shift Time		Comments are necessary when defects are found * Use Additional sheet if needed *
	6A-6P		
	6P-6A		
	MUST write "OK" if no defect(s) found		
SAFETY (include ALL issues)			
LIGHTING			
HOUSINGS			
BOILER HOPPERS			
5 GRP DUST & FEED			
6 GRP DUST & FEED			
SCREWS			
ELEVATORS			
COMPRESSORS			
PUMPS			
COLLECTORS (BAGHOUSES)			
FANS			
SOOTBLOWERS			
BOILERS			
BOILER SCREWS			
GAMMA			
SCRUBBER			
HOUSEKEEPING NEEDS			

Feed End PA route – Walk Thru addendum

During the route any unusual items noticed using sight, sound, smell and touch need to be investigated completely. Ensure that the PA walk through report is filled out completely and any defects are documented/reported (work orders written when applicable). This route may not be in sequence but will aid in ensuring basics are inspected each shift.

- Inspect all kiln housing/boiler hoppers for plug ups and for boiler water leaks. Ensure mechanical collector hopper/tiplers are empty. 3 times a shift at a “minimum”.
- Check each boiler’s sight glass and Promag.
- All compressors – 5KG reclaim, 5KG feed pump, 5KG feed silo, 6KG feed pump & feed silo and reject dust compressor rooms. Check for heat and vibration. Backwash, compressor water flow & temperature set between 90 °F to 110 °F, drain drip legs and check air filter indicators. Inspect for oil line leaks. Empty oil pails. Inspect temperature of the Adams after coolers and set to 110 °F. Manually drain the bowser filters.
- Drain silo cycling valve drip legs. All 4 feed silos and 5 Group reclaim dust tank.
- ID fan for all kilns. Inspect for vibrations and water flow to bearings, on 5KG water flow to the oil coolers. Inspect oil level in the fan bearings. 5KG inspect oil level in the fluid drive. In-leakage, doors, expansion joints, duct work.
- Inspect reverse air fans for vibration and fan bearing temperatures with the heat gun.
- All kiln bag-house hoppers/rotary feeders need to be warm. Use heat gun.
- SNCR kiln rotary coupling. Inspect for leaks (ammonia & glycol) and if the tube bundle support rollers are turning.
- Look at back end kiln seals. Check for missing and/or loose blocks.
- Inspect feed pumps for 5 & 6 KG. Inspect reject dust pumps for 5 & 6 KG and #2 dust pump rooms.
- Inspect kiln drive pier room. Check for abnormal conditions.
- Inspect DAA silo bottom for any lime leaks.
- Inspect shaker chip pile for clean-up needs.
- Poke boilers as needed.
- Inspect Gamma area for leaks and function.
- Inspect WGS area for leaks, excessive equipment vibration, water flow on pump seals, tank & sump levels, and function of equipment.
- Observe and note any abnormalities concerning screws, elevators, soot blowers, and collectors. Inspect for any safety and housekeeping needs, including lighting.

FEED END CLEAN UP AREAS

- | | |
|--|----------------|
| | Initial |
| • FOURTH FLOOR 5 KG. | □ _____ |
| • UNDER BATMAN TANK | □ _____ |
| • SCALE DECK 5 KG | □ _____ |
| • FEED/DUST FLOORS ABOVE BOTTOM FLOOR 6 KG | □ _____ |
| • FIFTH FLOOR ALEVEATOR DECK | □ _____ |

* PA = Production Assistant

Appendix B – Mechanical PMs

Exp/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Frequency							Recorded in Log Book / PM File	Spare Parts On Hand	
							Daily	Weekly	Monthly	6-week	Quarterly	Semi-annual	Annual			2-year
ALP304BC02	Gypsum Belt	Daiikui Webb		Stopped Inspection	Perform safe isolation of equipment. Inspect conveyor belt, head and tail shafts, drive components, drum pulleys, and belt scraper for wear. Adjust guarding and mounting hardware. Give back to control room for operation.	MISSBC150									Yes	Yes
ALP304DC11	Reagent Dust Collector			Stopped Inspection	Perform safe isolation of equipment. Inspect fan motor, drive belt/sheaves, fan/housing, ducting/vent pipe, pulse jet diaphragms/pipe, dust collector, and air plenum.	MISSDC004				X					Yes	Yes
ALP304FA10	Reagent Dust Collector Fan			Stopped Inspection	Perform safe isolation of equipment. Inspect fan motor, drive belt/sheaves, fan/housing, ducting/vent pipe, pulse jet diaphragms/pipe, dust collector, and air plenum.	MISSDC004				X					Yes	Yes
ALP304FA11	System Fan	The New York Blower Company	IM 100	Stopped Inspection	Perform safe isolation of equipment. Inspect for wear and tear of fan wheel, fan housing, seal on doors, tolerance of SLEEVE bearing, shaft, oil circulation rings, bearing oil, water jacket, mounting hardware, cooling system for bearings. Repair as needed.	MISSFA100				X					Yes	Yes
ALP304MX01	Reagent Handling Tank Mixer	Tschamber	NR363F-3	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001				X					Yes	No
ALP304MX02	Scrubber Agitator #1	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors. Inspect propeller for proper thickness with callipers.	MISSMX002				X					Yes	Yes
ALP304MX03	Scrubber Agitator #2	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors. Inspect propeller for proper thickness with callipers.	MISSMX002				X					Yes	Yes
ALP304MX04	Scrubber Agitator #3	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors. Inspect propeller for proper thickness with callipers.	MISSMX002				X					Yes	Yes
ALP304MX05	Hold Up Tank Agitator	Tschamber	SR3D7F-11	Running Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001					X				Yes	Yes
ALP304MX06	Building Sump Agitator	Tschamber	NR363F-3	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001					X				Yes	No
ALP304MX07	Reagent Sump Agitator	Tschamber	NR363F-3	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001				X					Yes	No
ALP304MX08	Recycle Tank Agitator	Tschamber	NR463F-4	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001				X					Yes	No
ALP304MX09	Bleed Stream Tank Agitator	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001				X					Yes	Yes
ALP304MX10	Dewatering Tank Agitator	Tschamber	NR463F-4	Stopped Inspection	Perform safe isolation of equipment. Fill out confined space sheet. Inspect shaft, impeller, motor and seals. Inspect seals and gaskets on doors.	MISSMX001				X					Yes	No
ALP304PU01	Reagent Pump #1	Dichtung Pumpen	MC-65-315	Stopped Inspection	Perform safe isolation of equipment. Inspect all guarding and remove. Inspect drive, coupling, and seals. Dismantle safely and inspect internal parts for wear and build-up. Reassemble and de-isolate.	MISSPU100				X					Yes	Yes
ALP304PU02	Reagent Pump #2	Dichtung Pumpen	MC-65-315	Stopped Inspection	Perform safe isolation of equipment. Inspect all guarding and remove. Inspect drive, coupling, and seals. Dismantle safely and inspect internal parts for wear and build-up. Reassemble and de-isolate.	MISSPU100				X					Yes	Yes

Appendix C – Electrical PMs

Exp/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	6-week	Quarterly	Semi-annual	Annual	2-year	5-year	Recorded in Log Book / PM File	Spare Parts On Hand
ALP304B02	Belt Conveyor - Reversing for Gypsum			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304FA10	Fan - Bin Dust Collector	The New York Blower Company	IM 100	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304FA11	Fan - Scrubber Booster			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304FA11	Fan - Scrubber Booster			Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X				Yes	
ALP304MX01	Mixer - Reagent Handling Tank	Tschamber	NR3G3F-3	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304MX01	Mixer - Reagent Handling Tank	Tschamber	NR3G3F-3	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X				Yes	
ALP304MX02	Mixer - Scrubber Sump #1	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304MX02	Mixer - Scrubber Sump #1	Tschamber	SR3D7F-11	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X				Yes	
ALP304MX03	Mixer - Scrubber Sump #2	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304MX03	Mixer - Scrubber Sump #2	Tschamber	SR3D7F-11	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X				Yes	
ALP304MX04	Mixer - Scrubber Sump #3	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	
ALP304MX04	Mixer - Scrubber Sump #3	Tschamber	SR3D7F-11	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X				Yes	
ALP304MX05	Mixer - Hold-up Tank	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01						X				Yes	

Expt/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	Quarterly	Semi-annual	Annual	2 Year	5-Year	Recorded in Log Book / PM File	Spare Parts On Hand
ALP304MX05	Mixer - Hold-up Tank	Tschamber	SR3D7F-11	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304MX06	Mixer - Pumphouse Sump	Tschamber	NR3G3F-3	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304MX06	Mixer - Pumphouse Sump	Tschamber	NR3G3F-3	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304MX07	Mixer - Reagent Area Sump	Tschamber	NR3G3F-3	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304MX07	Mixer - Reagent Area Sump	Tschamber	NR3G3F-3	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304MX08	Mixer - Recycle Tank	Tschamber	NR4G3F-4	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304MX08	Mixer - Recycle Tank	Tschamber	NR4G3F-4	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304MX09	Mixer - Bleed Stream Tank	Tschamber	SR3D7F-11	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304MX09	Mixer - Bleed Stream Tank	Tschamber	SR3D7F-11	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304MX10	Mixer - Dewatering Tank	Tschamber	NR4G3F-4	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304MX10	Mixer - Dewatering Tank	Tschamber	NR4G3F-4	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304PU01	Pump - Reagent	TECO-Westinghouse	AHH8P-005	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU01	Pump - Reagent	TECO-Westinghouse	AHH8P-005	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance data base and return all equipment to operations.	EISSMT002					X				Yes	

Expt/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	Quarterly	Semi-annual	Annual	2-Year	5-Year	Recorded in Log Book / PM File	Spare Parts On Hand
ALP304PU02	Pump - Reagent	TECO-Westinghouse	AEH8P-005	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU02	Pump - Reagent	TECO-Westinghouse	AEH8P-005	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304PU03	Pump - Slurry Recirculation #1	TECO-Westinghouse	AEHG-PA	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU04	Pump - Slurry Recirculation #2	TECO-Westinghouse	AEHG-PA	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU05	Pump - Slurry Recirculation #3	TECO-Westinghouse	AEHG-PA	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU06	Pump - Slurry Recirculation #4	TECO-Westinghouse	AEHG-PA	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU07	Pump - Quench #1	TECO-Westinghouse	AEH8P-001	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU08	Pump - Quench #2	TECO-Westinghouse	AEH8P-001	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU09	Pump - Hydrocyclone	TECO-Westinghouse	AEH8P-007	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU09	Pump - Hydrocyclone	TECO-Westinghouse	AEH8P-007	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304PU10	Pump - Hold-up	TECO-Westinghouse	AEH8P-005	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU10	Pump - Hold-up	TECO-Westinghouse	AEH8P-005	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002					X				Yes	
ALP304PU11	Pump - Scrubber and Dewatering Area Sump			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	
ALP304PU12	Pump - Reagent Area Sump			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001					X				Yes	

Expt/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	Quarterly	Semi-annual	Annual	2-Year	5-Year	Recorded in Log Book / PM File	Spare Parts On Hand
ALP304PU14	Pump - Dewatering	TECO-Westinghouse	AEH8P-005	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304PU15	Pump - Recycle	TECO-Westinghouse	AEH8P-005	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304PU15	Pump - Recycle	TECO-Westinghouse	AEH8P-005	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X			Yes	
ALP304PU17	Pump - Bleed Stream			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304PU17	Pump - Bleed Stream			Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X			Yes	
ALP304PU18	Pump - Thicken Underflow			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304PU18	Pump - Thicken Underflow			Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X			Yes	
ALP304RA01	Rotary Airlock - Reagent			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304RA01	Rotary Airlock - Reagent			Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X			Yes	
ALP304SP02	Separator - Centrifuge	ANDRITZ	449TD	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304SP03	Separator - Thickener	AKW	KF97DRS100M5/TF/V	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	
ALP304SP03	Separator - Thickener	AKW	KF97DRS100M5/TF/V	Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRC fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002						X			Yes	
ALP912PU30	Pump - Water #1	TECO-Westinghouse	AEHH/324T	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMC001						X			Yes	

Eqpt/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	6-week	Quarterly	Semi-annual	Annual	2-year	5-year	Recorded in Log Book / PM File	Spare Parts On Hand
ALP912PU31	Pump - Water #2	TECO-Westinghouse	AEHH/324T	Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts and indicating light. Make repairs and give back to operations.	EISSMCO01							X			Yes	
ALP912PU32	Pump - Boiler-Blowdown #1			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01							X			Yes	
ALP912PU33	Pump - Boiler Blowdown #2			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01							X			Yes	
ALP922CM07	Compressor			Stopped Inspection	Perform safe isolation of equipment. Inspect handle, clean cubicle, check connections on breaker and starter, contacts, and indicating light. Make repairs and give back to operations.	EISSMCO01							X			Yes	
ALP922CM07	Compressor			Operating Inspection	Inspect junction box, conduit, seal tight. Clean motor and check SIRG fittings. Inspect for missing or loose covers. Inspect 110 V outlets in area for condition and working order. Complete PM in maintenance database and return all equipment to operations.	EISSMT002							X			Yes	

Appendix D – Instrumentation PMs

Exp/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	6-week	Quarterly	Semi-annual	Annual	2-year	5-year	Recorded in Log Book / PM File	Spare Parts On Hand
ALP304DA03	DAB00H Fresh Air Damper				Perform safe isolation of equipment if needed. Have control room move damper to different percentage set points and verify that it meets set points and runs smoothly, verify that proximity switches are working properly. Give back to operations.	IISDA000ALP						X				Yes	
ALP304DA04	DA040H Damper/Beck Drive	Harold Beck & Sons	22-309		Perform safe isolation of equipment if needed. Put drive in local and verify damper positions at set percentages to verify signal feedback. Return to auto and give control back to operations.	IISDA000ALP					X					Yes	
ALP304FA11	FAL10H Temperature Transmitter	Endress+Hauser	Omnigrad TR13-APBBAFSX92000		Perform safe isolation of equipment if needed. Pull transmitter. Inspect for wear and clean. Perform 3-point temperature check with hot box. Reinstall. Write follow-up work orders as required.	IISY7001ALP					X					Yes	
ALP304FA11	FAL10H Pressure Transmitter				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISY4005ALP					X					Yes	
ALP304HD10	HO100H Level Switch				Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed, ensure sensor gap is clean and correct. Replace and give back to operations.	IISXU005ALP					X					Yes	
ALP304H011	HO110H Level Switch				Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXU006ALP					X					Yes	
ALP304SP03	SP030H Thickeners Density Probe				Perform safe isolation of equipment if needed. Mark probe before pulling. Inspect and clean. Reinstall. Write follow-up work orders as required.	IISXU001ALP					X					Yes	
ALP304SP03	SP030H Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISY4000ALP					X					Yes	
ALP304TN01	TN010H Level Switch	Endress+Hauser	Liquiphant M FTLS1-3U5K0/0 FTLS1-3U5L7/0		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXU012ALP					X					Yes	
ALP304TN01	TN010H Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISY4011ALP					X					Yes	
ALP304TN03	TN030H Level Switch	Endress+Hauser	Liquiphant M FTLS1C-RALKBKLE4AA		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXU007ALP					X					Yes	
ALP304TN03	TN030H Level (Pressure) Transmitter				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISY1002ALP					X					Yes	
ALP304TN03	TN030H Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISY4006ALP					X					Yes	
ALP304TN04	TN040H Stack Temperature Transmitter				Perform safe isolation of equipment if needed. Pull transmitter. Inspect for wear and clean. Perform 3-point temperature check with hot box. Reinstall. Write follow-up work orders as required.	IISY7002ALP					X					Yes	
ALP304TN04	TN040H Pressure Transmitter				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISY4002ALP					X					Yes	

Expt/Tag No.	Control Device	Manufacturer	Model	PM activity	Description	PM Code	Daily	Weekly	Monthly	6-week	Quarterly	Semi-annual	Annual	2-Year	5-Year	Recorded In	
																Log Book /	Spare Parts
ALP304TN04	TN04OH Level Switch	Endress+Hauser	Liquiphant M FTLS1C-RALKBK1EAAA		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL004ALP							X			PM File	On Hand
ALP304TN04	TN04OH DP Pressure Transmitter				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISYX004ALP							X			Yes	
ALP304TN04	TN04OH Level (Pressure) Transmitter				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISYX001ALP							X			Yes	
ALP304TN05	TN05OH Level Switches	Endress+Hauser	Liquiphant M FTLS1C-RALKBK1EAAA		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL002ALP							X			Yes	
ALP304TN05	TN05OH Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISYX003ALP							X			Yes	
ALP304TN06	TN06OH Level Switch	Endress+Hauser	Liquiphant M FTLS1C-RALKBK1EAAA		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL010ALP							X			Yes	
ALP304TN06	TN06OH Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISYX008ALP							X			Yes	
ALP304TN07	TN07OH Level Switch	Endress+Hauser	Liquiphant M FTLS1C-RALKBK1EAAA		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL009ALP							X			Yes	
ALP304TN07	TN07OH Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISYX007ALP							X			Yes	
ALP304TN08	TN08OH Level Switch	Endress+Hauser	Liquiphant M FTLS1C-RALKBK1EAAA		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL011ALP							X			Yes	
ALP304TN08	TN08OH Pressure				Perform safe isolation of equipment if needed. Close isolation valve, bleed port and vent to atmosphere. Check zero, bleed entrained air, verify reading. Write follow-up work orders as required.	IISYX009ALP							X			Yes	
ALP304TS01	TS01OH Level Switch	Endress+Hauser	Liquiphant M FTLS1-3U584/0		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL008ALP							X			Yes	
ALP304TS02	TS02OH Level Switch	Endress+Hauser	Liquiphant M FTLS1-3U584/0		Perform safe isolation of equipment if needed. Remove and inspect probe, clean as needed. Ensure sensor gap is clean and correct. Replace and give back to operations.	IISXL003ALP							X			Yes	
ALP922X##	Air Dryer				Perform safe isolation of equipment if needed. Inspect for control fails, all gauges, pressure readings. Aquadex, dryer operation, muffler, dew point, AMLOCs and test valves. Write up follow-up work orders as required and give back to operations.	IISHD003ALP							X			Yes	

Appendix E – Spare Parts List

Mechanical Spares

Item-No. (Pos.)	Part(s) Designation	Specification (Parts-No.)	Equipment-No. Schema
1 Spare parts of complex: Scrubber and process pumps			
1.1	Scrubber Pumps	MCC 400-520 I Evo Dötec-C ANSI-U	304 PU03/04/05/06
1.1.1	Rebuild kit	102	
1.1.5	Mechanical seal DÖTEC-C 190	230	
1.2	Quench Pumps	MCC 300-500 Dötec Standard ANSI-U	304 PU07/08
1.1.7	Rebuild kit	322.1	
1.2.10	Mechanical seal DÖTEC 140 MC LG 65	433	
1.3	Hydrocyclone Feeding Pump	MC 65-250 Dötec Standard ANSI-U	304 PU09
	Holdup Tank Pump		304 PU10
	Recycle Pump	MC 65-250 Dötec Standard ANSI-U	304 PU15
1.3.1	Rebuild kit	102	
1.3.8	Mechanical seal DÖTEC 80 MC LG 32	433,	
1.4	Dewatering Pump	MC 150-315 Dötec Standard ANSI-U	304 PU14
1.4.1	Rebuild kit	102	
1.4.8	Mechanical seal DÖTEC 90 MC LG 48	433	
1.5	Reagent Handling Pumps		304 PU01/02
1.5.1	Rebuild kit	102	
1.5.10	Mechanical seal DÖTEC 90 MC LG 42	433	
1.6	Fresh Water Pumps		304 PU30/31
1.6.1	Rebuild kit	102	
1.6.10	Mechanical seal DÖTEC 90 MC LG 42	433	
2 Spare parts of complex: Sump pumps			
2.1	Scrubber Sump Pump	VKPF 80-250 S	304 PU11
	Rebuild kit	101	
	Gasket	400.10	
2.1	Reagent Sump Pump	VKPF 80-250 S	304 PU12
	Rebuild kit	101	
	Gasket	400.10	
3 Spare parts of complex: Centrifuge			
		VZU 160/5G	ALP 3045P02
3.1 Bolting			
	Sealing tape	721192	
3.2 Filtration			
	Filter cloth	2645235	
	Binding wire	2540892	
	Backup mesh	2645235	
	Distance mesh	2645239	
3.3 Pneumatic peeler			
	Peeler knife	7004639	
	Guide bush	7004876	
	O-Ring	0726525	
	Roto Glyd Ring	2712117	
	O-Ring	0725416	
3.4 Drive			
	Power belt	4/5V1600 Powerbelt	
3.5 Lubricants			
	Grease	0751026	
4 Spare parts of complex: Dewatering			
		VZU 160/5G	
4.1	Annular Distributor / Hydrocyclone	ZVR 8-7g / RWT1530	304 SP01
	Rebuild kit		
4.2	Thickener AKASET 35/150		304 SP03
	Drive Motor		
	Spur gear motor with adapter		
	SEW friction coupling		
	Mobrey Mud mirror probe		
	PP- ring 262-176,3 x 140mm		
	Scraper		
4.3	Thickener underflow pump	BN 17-6L	ALP304 PU18
	Complete pump with motor		
	Rebuild kit		
	Mechanical seal	GRDB15065U01HOC4C4	
4.4	Flocculant station FS20		ALP304 FS20
	Rebuild kit		
	Mechanical seal	GRDB15080U01HOA7A7	
	Motor 0.24 HP		MX12MT10
	Joint kit	SGTH006MS000XN612	

Mechanical Spares

Item-No. (Pos.)	Part(s) Designation	Specification (Parts-No.)	Equipment-No. Schema
4.5	HMR station FS21		ALP304 FS21
	Rebuild kit		
	Motor 0.24 HP		MX13MT10
5	Spare parts of complex: Agitators		
	Mechanical seal ZDSL2-60 for side entry agitators		MX02/03/04/05/10
	Wear part set for mechanical seal ZDSL2-60 for side entry agitators		MX02/03/04/05/10
6	Spare parts of complex: Process valves		
6.0	Butterfly valves 1"		
6.0.1	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	
	Complete valve without actuator	13593019	
6.0.2	Butterfly valves 1.5"		
	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	
	Complete valve without actuator	13593018	
	Pneumatic actuator, fail close, FO4 flange, 14 mm sq drive	EBS.15Y540FOV11	
6.1	Butterfly valves 2"		
6.1.1	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- TN04VA20, PU09VA20, PU09VA30, PU10VA30, PU14VA30, PU14VA40, PU15VA30, PU15VA40, PU17VA40, PU17VA50, PU17VA60, PU18VA10
	Complete valve without actuator	ZD14050DLX21E1B0	
6.1.2	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PU01VA30, PU01VA40, PU02VA30, PU02VA40, PU03VA10
	Complete valve without actuator	ZD14050DLA22E1B0	
	Pneumatic actuator Pos. 6.1.1 and 6.1.2, double acting, FO4 flange, 11 mm sq drive	EB4.1DA0F04V11	
6.1.3	2014-A manual actuation	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PP16VA40, PP16VA50, PP17VA10, PU18VA20
	Complete valve without hand lever		
6.1.4	2014-A manual actuation	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	
	Complete valve without hand lever		304PP34VA20, 912- PU30VA30, PU31VA30, PP69VA30
	Hand lever for Pos. 6.1.3 and 6.1.4		
6.2	Butterfly valves 2-1/2"		
6.2.1	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304 PU17VA20
	Complete valve without actuator	13593016	
	Pneumatic actuator		
6.3	Butterfly valves 3"		
6.3.1	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PU03VA30, PU03VA40, PU04VA30, PU04VA40, PU05VA30, PU05VA40, PU06VA30, PU06VA40, PU07VA30, PU07VA40, PU08VA30, PU08VA40, PU15VA20, PU17VA10, PU17VA30
	Complete valve without actuator	ZD14080DLX21E1B0	
6.3.2	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PP34VA10, PU01VA20, PU02VA20
	Complete valve without actuator	ZD14080DLA22E1B0	

Mechanical Spares

Item No. (Pos.)	Part(s) Designation	Specification (Parts-No.)	Equipment No. Schema
	Pneumatic actuator for Pos. 6.3.1 and 6.3.2, dbl acting, F05 Flange, 14mm sq drive		
6.3.3	2014-A with pneumatic actuator		304 TNORVA30
	Complete valve without actuator		
	Pneumatic actuator		
6.3.4	2014-A manual actuation	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- TN04VA50, PP15VA20, PP16VA30, PU18VA30
	Complete valve without hand lever		
6.3.5	2014-A manual actuation	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PP34VA30, PP34VA40, PP34VA50, PP36VA10, 912PP69VA10
	Complete valve without hand lever		
	Hand lever for Pos. 6.3.4 and 6.3.5		
6.4	Butterfly valves 4"		
6.4.1	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PU01VA10, PU02VA10, 912-TN01VA10, TN01VA20
	Complete valve without actuator	2014100DL1A21E1B0	
	Rebuild kit	13593015	
6.4.2	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- TN07VA10, TN08VA10, SP01VA10, SP03VA10, SP03VA20
	Complete valve without actuator	2014100DL1X21E1B0	
	Rebuild kit	13593015	
6.4.3	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- PU10VA20, PU10VA40, PU11VA10, PU11VA20
	Rebuild kit		
6.4.4	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- FS06VA10, FA06VA20, FS06VA30, FS07VA10, FS07VA20, FS07VA30, FS08VA10, FS08VA20, FS08VA30, FS09VA10, FS09VA20, FS09VA30, FS10VA10, FS10VA20, FS10VA30, FS11VA10, FS11VA20, FS11VA30
	Rebuild kit		
6.4.5	2014-A manual actuation	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	912- PP63VA10, PP65VA10, PP69VA20
	Rebuild kit		
6.4.6	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- SP02VA10, SP02VA20
	Rebuild kit		
	Pneumatic actuator for positions 6.4.1 and 6.4.2, fail close, F05/F07, 17 mm sq drive	EB6.15Y555PCV17	
	Adapter for actuator, 17 mm - 14 mm sq	V17V14	
6.5	Butterfly valves 6"		
6.5.1	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304PU10VA50
	Complete valve without actuator	2014150DL1A21E1B0	
	Rebuild kit	13593014	
6.5.2	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304- TN04VA10, PU09VA10, PU10VA10, PU14VA20, PU15VA10
	Complete valve without actuator	2014150DL1X21E1B0	
	Rebuild kit	13593014	
6.5.3	2014-A manual actuation	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304PP52VA10
	Rebuild kit		

Mechanical Spares

Item- No. (Pos.)	Part(s) Designation	Specification (Parts-No.)	Equipment-No. Schema
6.5.4	2014-A manual actuation	Lug type Butterfly, ductile iron body, 316SS Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	912-PU30VA10, PU30VA20, PU31VA10, PU31VA20
	Rebuild kit		
6.6	Butterfly valves 8"		
	2014-A with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304PU14VA10
	Complete valve without actuator	2014200DL1X21E1B0	
	Rebuild kit	13593014	
6.7	Butterfly valves 16"		
	2014-A TS with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex TS Disc, 1.4122 shaft, 150 psi, EPDM liner, bare stem	304-PU07VA20, PU08VA20
	Complete valve without actuator	13593010	
	Rebuild kit	13593013	
	2014-A TS with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	
	Complete valve without actuator	13593006	
	Rebuild kit		
6.8	Butterfly valves 18"		
	2014-A TS with pneumatic actuator	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304 - PU07VA10, PU08VA10
	Complete valve without actuator	13593006	
	Rebuild kit		
6.9	Butterfly valves 24"		
6.9.1	F012-K1 TS with electric drive	Lug type Butterfly, ductile iron body, Duplex Disc, 430SS shaft, 150 psi, EPDM liner, bare stem	304-PU03VA10, PU04VA10, PU05VA10, PU06VA10
	Complete valve without actuator	13593001	
	Rebuild kit	13593005	
	Electrical drive AUMA		
6.9.2	F012-K1 TS manual actuation		304-PU03VA20, PU04VA20, PU05VA20, PU06VA20
	Manual actuator		
	Disc 1.4469 for positions 6.9.1 and 6.9.2		
	Sealing ring for positions 6.9.1 and 6.9.2		
	Shaft for positions 6.9.1 and 6.9.2		
6.10	High performance valve 3"		
	HP114-K1 with pneumatic actuator		304HO11VA40
	Rebuild kit		
6.11	Ball valves		
	KH2TF 2"		912PP79VA10
	Complete valve with hand lever		
	KH2TF 3"		912 PP71VA10
	Complete valve with hand lever		
6.12	Check valves		
	RSK 3, 6"		912- PU30VA40, PU31VA40
	Complete check valve	13593017	
6.13	Miscellaneous equipment		
	Solenoid valve type 2636047.3723, UL/CSA 5/2 Namur 120V60Hz	13628001	
	Switch box type NSK06 UL with 2 switches		
	Solenoid valve type 9710505.3723 (low temperature)		
	Switch box type NSK06 UL with 2 switches (low temperature)		
	Namur speed control block	5C4649171	
	O-Ring set for valves < 8"		
	O-Ring set for valves 10" to 16"		
	O-Ring set for valves 16" to 24"		
7	Spare parts of complex: Spray nozzles		304F501, F506, F507, F508, F509, F510, F511
	Twin Absorb - EV equilateral double full cone nozzle		
	Twin Absorb - EH equilateral double hollow cone nozzle		
	Twin Absorb - H double hollow cone nozzle		
	Twin Absorb - EH equilateral double hollow cone nozzle		

Mechanical Spares

Item- No. (Pos.)	Part(s) Designation	Specification (Parts-No.)	Equipment-No. Schema
	Union nut for quench nozzles		
8	Spare parts of complex: False air damper		304 DA03
	Packing ring 66/50x8		
	Ball and socket joint GES0ES		
	Shaft sealing ring WDR A050x065x08 NBK		
	AUMA actuator SA 10.3-G5125.3		
	Limit switch 871T-G4812		
	Brake cylinder HB-40-400-DD-M		
	Magnet Kendrion GT 150 B - 24 VDC		
9	Spare parts of complex: Pinch and slide gate valve	Type A pinch valve	
	Red valve 10" EPDM sleeve with 4" diamond seal	#SA-010-000-0600	HO11VA10
	Red valve 4" EPDM sleeve with 2.5" diamond seal	#SA-040-000-0600	HO11VA30
10	Spare parts of complex: Silo bag house		304 DC10
11	Spare parts of complex: Belt conveyor		304BC02
12	Spare parts of complex: Rotary valve		304 RA10
13	Eaton Self Cleaning Strainer	MCS-500	912FR21, 912FR22
	Cleaning disk	40110-DEL	
	Actuator/bearing assembly	40179,ACT,180MAG Delrin HF500	
14	Bleed Stream		
	Bleed Stream Pump	B N 3 5 - 1 2 / A 1 - C 4 - C 4 - F 0 - A - X	304PU17, 307PU01
	Seal	GRDB15080U01.H0C4C4	
	Gasket	DSGM006003500AQ5M6	
	Rebuild kit		
	1.5" Pureflex 459 Vball w/ actuator and positioner		307PP01VA25
	1" Pureflex 459 Vball w/ actuator and positioner		317-357PP19VA20
	1.5" Rupture disk	File SRL, burst pres 150psi@72F	
	2" Rupture disk	File SRL, burst pres 150psi@72F	
	Cooler spray lance	96" OAL	317-357501
	Cooler spray lance	78" OAL	
	Cooler spray lance	42" OAL	
	Cooler spray nozzle	3/4" BD-276H20	317-357501N201,02
	Cooler Spray nozzle	3/4" BD-276H25	
16	Forced Draft Fan		304FA11
	Sleeve bearing		
	Bearing sleeve		
	8" RTL bearing seal kit		
	8" RTL oil ring (2 ea)		
	8" RTL thrust plate kit		
	8" RTL split thrust collar		
	SM80 blocks for fan to motor coupling		
	Fan Inlet damper		304DA04
17	Isolation Dampers		304DA01/DA02
18	Air Compressor		922 CM07

Electrical Spares

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	Part Type
ALPBC0089	MOTOR - BELT CONVEYOR - REVERSING FOR GYPSUM	Spare
ALPFA0516	MOTOR - FAN	Spare
ALPFA0512	MOTOR - FAN, SCRUBBER BOOSTER	Spare
ALPMX0027	MOTOR - MIXER - REAGENT HANDLING TANK DRE100LC4/TF	Spare
ALPMX0017	MOTOR - MIXER - SCRUBBER SUMP #1 DRE160MC4/TF	Spare
ALPMX0019	MOTOR - MIXER - SCRUBBER SUMP #2 DRE160MC4/TF	Spare
ALPMX0021	MOTOR - MIXER - SCRUBBER SUMP #3 DRE160MC4/TF	Spare
ALPMX0023	MOTOR - MIXER - HOLD UP TANK DRE160MC4/TF	Spare
ALPMX0025	MOTOR - MIXER - PUMPHOUSE SUMP DRE100LC4/TF	Spare
ALPMX0029	MOTOR - MIXER - REAGENT AREA SUMP DRE100LC4/TF	Spare
ALPMX0031	MOTOR - MIXER - RECYCLE TANK DRE100LC4/TF	Spare
ALPMX0033	MOTOR - MIXER - BLEED STREAM TANK DRE160MC4/TF	Spare
ALPMC0035	MOTOR - MIXER - DEWATERING TANK DRE100LC4/TF	Spare
ALPPU0240	MOTOR - PUMP - REAGENT	Spare
ALPPU0242	MOTOR - PUMP - REAGENT	Spare
ALPPU0222	MOTOR - PUMP - SLURRY RECIRCULATION #1	Spare
ALPPU0224	MOTOR - PUMP - SLURRY RECIRCULATION #2	Spare
ALPPU0226	MOTOR - PUMP - SLURRY RECIRCULATION #3	Spare
ALPPU0228	MOTOR - PUMP - SLURRY RECIRCULATION #4	Spare
ALPPU0230	MOTOR - PUMP - QUENCH #1	Spare
ALPPU0232	MOTOR - PUMP - QUENCH #2	Spare
ALPPU0234	MOTOR - PUMP - HYDROCYCLONE	Spare
ALPPU0236	MOTOR - PUMP - HOLD UP	Spare
ALPPU0238	MOTOR - PUMP - SCRUBBER AND DEWATERING AREA SUMP	Spare
ALPPU0244	MOTOR - PUMP - REAGENT AREA SUMP	Spare
ALPPU0246	MOTOR - PUMP - DEWATERING	Spare
ALPPU0248	MOTOR - PUMP - RECYCLE	Spare
ALPPU0250	MOTOR - PUMP - BLEED STREAM	Spare
ALPPU0252	MOTOR - PUMP - THICKENER UNDERFLOW	Spare
ALPRA0054	REAGENT ROTARY AIRLOCK	Spare
ALPSP0027	MOTOR - SEPARATOR - CENTRIFUGE	Spare
ALPSP0024	MOTOR - SEPARATOR - THICKENER KF97DRS100M4/TF/V	Spare
ALPPU0254	MOTOR - PUMP - WATER #1	Spare
ALPPU0257	MOTOR - PUMP - WATER #2	Spare
ALPCM0128	MOTOR - COMPRESSOR	Spare

Instrument Spares

System	Description	Part Type
WGS	False Air Damper Limit Switch	Spare
WGS	Size 1 FVNR Spare Bucket	Spare
WGS	15A MCB	Spare
WGS	30A MCB	Spare
WGS	50A MCB	Spare
CEMS	Sensor Preamp MIR9000H	Spare
CEMS	Heating Controller Unit	Spare
CEMS	Optical Fork W/Cable	Spare
CEMS	Optical Fork W/Cable	Spare
CEMS	IR Source–Wired	Spare
CEMS	Pressure Sensor Board	Spare
CEMS	Stepper Motor Source and Wired Detector	Spare
CEMS	Heating Cartridges and Wired Thermistor	Spare
CEMS	Solid State Relay	Spare
CEMS	Filter For Tube 6mm 15um	Consumable
CEMS	SS Ejector	Consumable
CEMS	Source Block Motor Wiring	Consumable
CEMS	Drive Belt For Chopper Motor	Consumable
CEMS	Grid W/Filter for 92X92 Fan	Consumable
CEMS	HLC PLC 24	Spare
CEMS	Expansion Card Board	Spare
CEMS	Pressure Transducer, 0-100 PSI (w/5-Pin Connector)	Spare
CEMS	Connector, 5-Pin, Pressure Transducer	Spare
CEMS	Power Supply 24VDC, 240W	Spare
CEMS	Flow Switch, 2.500 SCCM/M Set Point	Spare
CEMS	Solenoid Valve - Cal Gas (6011, 2way, NC)	Spare
CEMS	Filter Element (Ceramic) w/O-Rings	Consumable
CEMS	Filter O-Rings (Set of 3) (Without Filter)	Consumable
CEMS	20 um Probe Tip Filter w/3/8" FMPT	Consumable
CEMS	Flange Gasket (Inner)	Consumable
CEMS	Probe Head Gasket	Consumable
CEMS	Mating Flange Gasket	Consumable
CEMS	Checkvalve, 1/4", 3-5 lb	Spare
CEMS	2-Way Valve	Spare
CEMS	Probe Tube Heater	Spare
CEMS	Air Tank Heater, 180/150 % DC, 110 VAC 120w	Spare
CEMS	Replacement Filter, Particulate and Regulator, 5 um	Consumable
CEMS	Replacement Filter, Coalescing, .01 um	Consumable
WGS	Broken Bag Detector	
WGS	Pressure Transmitter	Spare
WGS	Pressure Transmitter	Spare
WGS	Pressure Transmitter	Spare
WGS	Level Switch	Spare
WGS	Level Switch	Spare
WGS	Level Switch	Spare
WGS	Radar Lever Transmitter	Spare

Instrument Spares

System	Description	Part Type
WGS	Flow Meter	Spare
WGS	Level Switch (Solid)	Spare
WGS	pH Analyzer Probe	Spare
WGS	pH Analyzer Light Element	Consumable
WGS	pH Analyzer	
WGS	300MVi	
WGS	Processor 8MB	Spare
WGS	Power Supply	Spare
WGS	7-Slot Rack	Spare
WGS	16 pt DI Module	Spare
WGS	16 pt DO Module	Spare
WGS	16 ch HART AI Module	Spare
WGS	8 ch HART AO Module	Spare
WGS	RTD Module	Spare
WGS	Ethernet Module	Spare
WGS	DeviceNet Module	Spare
WGS	36 Pin Termin.Block	Spare
WGS	20 Pin Termin.Block	Spare