CSI
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PCS
SWIFT CREEK MINING COMPLEX

CATHODIC PROTECTION SURVEY
JUNE 2018

www.csi-thomasville.com

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June 2018

Potash Corporation
Swift Creek Mining Plant
Post Office Box 300
White Springs, Florida 32096-0300
ATTN: Mr. Ken Tut
Project Representative

Swift Creek Mining Plant
Effectiveness of Cathodic Protection
Survey Underground Natural Gas System

INTRODUCTION

The annual cathodic protection survey was conducted for Potash Corporation – Swift Creek Mining Plant during the month of June 2018. During this survey, the Swift Creek Mining Plant natural gas system was inspected for the effectiveness of cathodic protection, as applied. The cathodic protection system for the Swift Creek Mining Plant consists essentially of Galvomag Magnesium anodes placed in various locations throughout the natural gas system.

RESULTS AND ANALYSIS

A total of Eight [8] structure readings, Three [3] Galvomag anode readings, Two [2] casing readings and Three [3] gas pipeline readings were taken during this survey. As can be seen by the structure-to-soil potential measurements and the enclosed data sheet, 100% of the gas pipeline readings obtained are indicative of cathodic protection. A structure-to-soil potential of 850 millivolts [-0.850] or more negative direct current is the basis used in this report to confirm cathodic protection.

IR DROP CONSIDERATION

The effectiveness of any cathodic protection system can be determined by taking potential measurements between the structure and a reference electrode. These potential measurements have traditionally been recorded with "average reading" digital voltmeters while the protective current is flowing or applied. These on-potential measurements contain the error produced by the voltage drop in the soil (electrolyte) and the voltage drop in the structure being protected. This error is referred to as *IR* drop. Interpretation of a current applied measurement requires consideration of the significance of voltage drops in the earth and metallic paths.

An instant off-potential measurement is the reading taken instantaneously after the protective current reaches zero. Off-potential measurements eliminate the *IR* drop error, allowing the true *IR* drop free polarized potential of a cathodically protected structure to be determined in the field. *IR* drop error is eliminated since there is no current flowing when the measurement is taken (i.e., I=0).

SURVEY TEST INSTRUMENTATION

The Cathodic Protection Analyzer, developed by Universal Rectifiers, Inc, (Hereinafter referred to as CPA), is a handheld instrument used with a reference electrode to measure the uninterrupted characteristics of the signal generated from a CP source. It can be used to evaluate the coating of a pipeline to ensure that the pipe is fully protected from corrosion. The CPA is designed for use with any pipeline system or structure at risk to corrosion factors. Aging pipes and changing conditions can cause significant problems, such as an increase in applied CP levels and enlarged holidays in coating. In addition, increased environmental concerns also emphasize the need to minimize leaks as much as possible.

The CPA has computer capabilities of filtering interfering signals. The instrument is also capable of measuring several facets of the protection waveform. The software-driven instrument reads the minimum, average, and maximum voltage levels emanating from the pipe, thereby allowing an overview of the entire CPv signature. Digital signal processing makes the accuracy and precision of the CPA possible. It utilizes software to provide the extra speed and flexibility that is becoming increasingly important in the field.

The CPA is operated in conjunction with a Copper – Copper Sulfate [$Cu/CuSO_4$] shielded reference electrode known by its model number SPI, which allows the measurement of the cathodic protection voltage without interrupting the potential source.

RECOMMENDATIONS

Potash Corporation – Swift Creek Mining Plant
Underground Natural Gas System
June 2018

The sacrificial galvanic anode arrangement designed to protect the coated and wrapped steel natural gas system indicates adequate current to afford cathodic protection to the steel distribution system. Structure-to-soil readings obtained from Cathodic Test Points and gas risers on the steel distribution system indicate CP readings above State and Federal minimum standards of -0.850 volts direct current. Two [2] pipeline casings, Three [3] Galvomag anodes and Three [3] CTP gas pipeline contacts were inspected during this survey.

At this time, the Natural Gas Distribution System for Potash Corporation's Swift Creek Mining Plant complex indicates cathodic protection levels exceeding State and Federal minimum guidelines for applied cathodic protection I trust the above information to be satisfactory and in sufficient detail, however, should you require additional information, please contact me.

Sincerely,

Mitchell Whitfield
C.P. Tester

CATHODIC TEST POINTS

CATHODIC TEST POINTS

Potash Corporation – Swift Creek Mining Plant
Underground Natural Gas System
June 2018

CTP - #1

Black Anode Wire	-1.365 Vdc
Black Gas Pipeline Wire	-1.191 Vdc
White Casing Pipe Wire	-0.610 Vdc

CTP - #2

Black Anode Wire	-1.227 Vdc
Black Gas Pipeline Wire	-1.082 Vdc
White Casing Pipe Wire	-0.599 Vdc

CTP - #3

Black Anode Wire	-1.388 Vdc
Green Gas Pipeline Wire	-1.276 Vdc

STRUCTURE-TO-SOIL POTENTIALS
GAS PIPE CASINGS

STRUCTURE-TO-SOIL POTENTIAL - GAS PIPE CASINGS

Potash Corporation – Swift Creek Mining Plant
Underground Natural Gas System
June 2018

Test Location	Energized Potentials Volts
Railroad Casing - #1	-0.384
Railroad Casing - #2	-0.477
Highway Casing - #3	-0.492

STRUCTURE - TO - SOIL POTENTIAL DATA

STRUCTURE – TO – SOIL POTENTIAL DATA

Potash Corporation – Swift Creek Mining Plant
Underground Natural Gas System
June 2018

Test Location	Energized Potentials Volts
Gas Metering Station - Inlet	-1.086
Gas Metering Station – Outlet	-1.009
4" Gas Riser @ Plant	-1.344
2" Gas Riser @ Boiler Room	-1.213

City Services, Inc. (CSI)
User Task Status Report

Run by: Bobby Boyd
Run on: 3/26/2015

Whitfield, Mitch

TASK NAME

0141 - Visual Inspection For Atmospheric Corrosion

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Qualified Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Visual Inspection of Atmospheric Coating (7.1, 0141) - 2646	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Insufficient Cathodic Protection - 2212	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Atmospheric Corrosion (7.1, 0141) - 2223	2/16/2018	2/16/2021	EV

0151 - Visual Inspection of Buried Pipe and Components When Exposed

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Qualified Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Inspect for External Corrosion on Buried or Submerged Pipe (5.2) - 2643	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Performance	EWN-PE-Inspect the Condition of External Coating on Buried or Submerged Pipe (5.3, 0151) - 2644	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Inoperability of a Pipeline Component - 2211	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Corrosion Control Fundamentals (5.3, 9.2, 1021, 0031, 0091) - 2355	1/25/2018	1/25/2021	EV

0161 - Visual Inspection for Internal Corrosion Qualified

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Inspect Internal Pipe Surfaces (12, 0161) - 2370	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Internal Corrosion (12) - 2213	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-Inspect Internal Pipe Surface (12) - 2685	1/25/2018	1/25/2021	EV

0191 - Measure Atmospheric Corrosion Qualified

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Measure Corroded Area (8.3, 0191) - 2582	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Insufficient Cathodic Protection - 2212	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Corrosion Control Fundamentals (5.3, 9.2, 1021, 0031, 0091) - 2355	1/25/2018	1/25/2021	EV

0201 - Visual Inspection of Installed Pipe and Components for Mechanical Damage Qualified

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Inspect for Physical Damage on Buried or Submerged pipe (0211) - 2642	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Inoperability of a Pipeline Component - 2211	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-AOC Pipeline Damage (L) - 2753	1/29/2018	1/29/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-Inspect for Physical Damage on Buried or Submerged Pipe (5.1) - 8695	1/25/2018	1/25/2021	EV

0211 - Measure and Characterize Mechanical Damage on Installed Pipe and Components Qualified

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Inspect for Physical Damage on Buried or Submerged pipe (0211) - 2642	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-AOC Pipeline Damage (L) - 2753	1/29/2018	1/29/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-Inspect for Physical Damage on Buried or Submerged Pipe (5.1) - 8695	1/25/2018	1/25/2021	EV

0591 - Leak Test at Operating Pressure Qualified

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Report of Gas Odor/Liquid Release - 2216	1/24/2018	1/24/2021	EV

0991 - Coating Application and Repair• Brushed or Rolled Qualified

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Prepare Surface for Coating Using Hand and Power Tools (13.1) - 2543	2/7/2018	2/7/2021	EV
ENERGY worldnet, Inc. - Performance	EWN-PE-Apply Atmospheric Coating Using Hand Application Methods (7.5) - 2580	1/25/2018	1/25/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Insufficient Cathodic Protection - 2212	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Atmospheric Corrosion (7.1, 0141) - 2223	2/16/2018	2/16/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-Apply and Repair External	2/23/2018	2/23/2021	EV

ENERGY worldnet, Inc. - Written	EWN-WE-Apply Atmospheric Coating Using Hand Application Methods (7.5) - 8723	2/23/2018	2/23/2021	EV

1241 - Outside Gas Leak Investigation

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. - Performance	EWN-PE-Leak Survey (1241, 1261) - 2283	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Performance	EWN-PE-Perform/Observe Leak Survey/Patrol - 2455	2/20/2018	2/20/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Flammable Gas Atmosphere - 2209	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Report of Gas	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Leak Survey and Patrols (52.1, 52.2, 1241, 1261) - 2282	2/23/2018	2/23/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Reporting Field Gas Leaks - 2325	2/23/2018	2/23/2021	Qualified

1261 - Walking Gas Leakage Survey

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. -	EWN-PE-Leak Survey (1241, 1261) -	1/25/2018	1/25/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Flammable Gas Atmosphere - 2209	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-Leak Survey and Patrols (52.1, 52.2, 1241, 1261) - 2282	2/23/2018	2/23/2021	Qualified

1291 - Locate Underground Pipelines

Qualification Type	Evaluations	Evaluation Date	Expiration Date	Verified
ENERGY worldnet, Inc. -	EWN-PE-Locate Line (14.1, 1291) -	1/25/2018	1/25/2021	EV
ENERGY worldnet, Inc. - Performance	EWN-PE-Reporting Protocols (15.2, 1311) - 2553	1/25/2018	1/25/2021	EV
ENERGY worldnet, Inc. - Performance	EWN-PE-Use of Probing Equipment (16.1) - 2554	1/25/2018	1/25/2021	EV

ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Failure to Follow Procedures - 2207	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-CBT-AOC Report of Gas Odor/Liquid Release - 2216	1/24/2018	1/24/2021	EV
ENERGY worldnet, Inc. - Written	EWN-WE-Locate Pipeline (14.1) -	2/23/2018	2/23/2018	Qualified

CITY SERVICES, INC.
2017 Drug Test Statistical Summary

City Services, Inc.
Post Office Box 3217
Thomasville, Georgia 31799

Contact Person: Jerry Allen
Title: Office Manager
Telephone: (229) 226 – 6569

Total number of employees in organization: 10

Number of employees in test pool:

Full-time:	8
Temporary:	0
Part-time:	1
Others:	0

Summarized is the number of test, number of employees tested, and positive results for each category listed.

Type of Test	Tests	Tested	Positive Results	Positive For:
Pre-employment	1	1	0	N/A
Random	3	3	0	N/A
Reasonable Cause	0	0	0	N/A
Post Accident	0	0	0	N/A
Post-Rehab	0	0	0	N/A

Indicate positive results by number as follows:
Marijuana - 1, Cocaine - 2, Opiates - 3, Amphetamines - 4, Phencyclidine - 5.
Indicate test by number as follows:
Random-1, Post Accident-2, Reasonable Cause-3, Post-Rehab-4, Pre-employment-5

Age	Sex	Test	Substance Found
___	___	___	_____
___	___	___	_____
___	___	___	_____

Report Prepared By: Jerry Allen
Period Covered: 1/1/2017 – 12/31/2017

Date Submitted: July 2, 2018
Distributed To: PCS Phosphates