BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

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BRISBANE WATER

Sandgate Water Reclamation Plant

Phosphorus Reduction Project

Installation, Operation & Maintenance Manual

Tenix Alliance

BCC Contract No. BW.70146-3

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Sandgate Water Reclamation Plant/Phosphorus Reduction Project

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BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

CONTENTS

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

1. Volume 1

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

BRISBANE CITY COUNCIL

BRISBANE WATER

Sandgate Water Reclamation Plant

Phosphorus Reduction Project

Volume 1 – Introduction, System Overview, Functional Specification, Design

Tenix Alliance

BCC Contract No. BW.70146-3

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

1   INTRODUCTION & SYSTEM OVERVIEW

This operation and maintenance manual presents information required for installation, operation, and maintenance of the Acetic Acid Dosing System constructed for the Sandgate Water Reclamation Plant.

The Acetic Acid Dosing System is a low maintenance liquid feed dosing system, designed to provide, when required a continuous supply of chemical from the dosing skid to the plants bioreactors.

This document is intended as a guide to assist Operators in understanding and operating the Acetic Acid Dosing System.

The Plant went under a major augmentation for biological nutrient removal, primarily nitrogen in 2005. Stage 1 of the augmented plant was commissioned in May 2005 and Stage 2 in January 2006. The WRP upgrade included amongst other things, construction of 2 new oxidation ditches to replace the original tricking filters followed by 3 final settling tanks and UV disinfection system. The augmented plant Peak Dry Weather Flow (PDWF) sewage treatment capacity is 25ML/d.

In some circumstances the augmented plant's treated effluent is likely not to comply with the new EPA licence conditions for maximum Total Phosphorous (TP) concentration with assurance, and the mass load limit beyond 1 January 2009.

The development approval for the recently augmented Sandgate Water Reclamation Plant (WRP) states conditions for phosphorus discharge as follows:

Until 31 December 2008:

- 18 mg/L maximum total phosphorus concentration allowed

- 91 250 kg/year annual mass load limit

From 1 January 2009:

- 6 mg/L maximum Total Phosphorus (TP) concentration allowed in the effluent, with

- 18 250 kg per year annual mass load calculated from a 50th percentile TP concentration of 2 mg/L and ultimate catchment average dry weather flow of 25 ML/d

The current process at Sandgate WRP is able to achieve around 77% Phosphorus Removal, bringing influent TP of 13 mg/L down to 3 mg/L.

In order to ensure compliance with the TP concentrations of the treated effluent beyond 1st January 2009, a feasibility report was prepared by Water Distribution in September 2007 that considered few options for TP reduction and concluded that the installation of an enhanced phosphorus removal system using Acetic Acid in the form of direct dosing into the Bioreactors inlet chamber would ensure the TP compliance of beyond 1st January 2009 licence conditions.

2   LOCATION DETAILS AND MAP

Sandgate Water Reclamation Plant (WRP) services the S5 Sewer catchment of the Brisbane City Council's sewer infrastructure.

The Sandgate WRP is located at:
Paperbark Drive, off from Bicentennial Road,
Boondall, Qld 4034, UBD Map reference: 111, Grid reference A10 in version 2002.

BRISBANE CITY COUNCIL
BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

The plant discharges effluent to Cabbage Tree Creek, which in turn flows into Bramble Bay, part of Moreton Bay. Figure 1.0 indicates the location of the Acetic Acid Dosing skid within the treatment plant indicating.
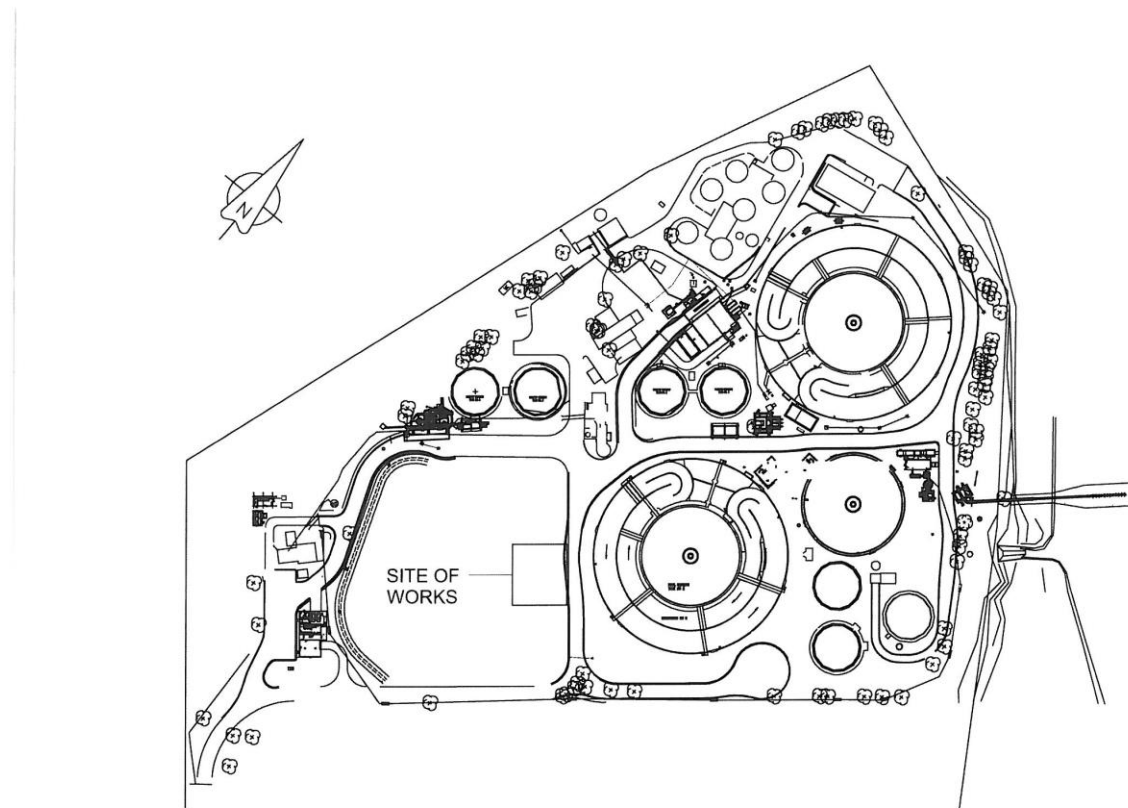
Figure 1.0: Map of Sandgate Water Reclamation Plant indicating the Acetic Acid Dosing Plant Location

3   DESCRIPTION OF EQUIPMENT AND PROCESSES

The new Acetic Acid dosing facility features duty/standby digital dosing pumps controlled by a PLC which is mounted inside the Dosing Plant Control Panel. Both of the pumps draw Acetic Acid from a 25,000L capacity storage tank feeding to a common manifold. A level transmitter and a high level switch on top of the tank monitor the amount of acid in storage and control the filling/dosing pumps as explained in the Functional Specification Appendix in Section 4.1.

The main control components of the Dosing system are:

- Storage Tank Level Transmitter and High Level Switch
- Duty/Standby Dosing Pumps
- Acetic Acid Dosing Control Panel containing a Dosing System PLC
- Actuated valves as shown on the P&I Diagram
- Dilution Water pipework, actuated valve and flow switch
- Plant Citect SCADA system
- Tanker Unloading Indication Panel
- Drainage Sump Pump for storage and truck bunds

A brief description of each process items function is described in the below table.

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

Equipment No.	Equipment	Function
PU-0583-001 PU-0583-002	Dosing Pump	Dosing Pumps to transfer Acetic Acid solution to the dosing point.
FSL-0583-001 FSL-0583-002	Internal Flow Monitor (Dosing Pumps)	Provides a means of monitoring the chemical dosing
	Calibration Cylinder	Provides means to calibrate pump dosage rates.
D-0583-001	Pulsation Damper	Reduces the pressure peaks evoked by the oscillating power of the liquid mass and so protects the pipework of the dosing system. Provides a more regular flow on the pressure side and improves the dosing process.
PRV-0583-001 PRV-0583-002	Pressure Relieve Valve	Relieves pressure build up in pipe work.
PI-0583-001	Pressure Gauge	Provides operational feedback to indicate line / pump pressure
FE-0583-001	Maric Flow Control Valve	Set the flow of the carrier / dilution water
PSV-0583-001	Pressure Loading Valve	Maintains minimum backpressure on the pump discharge to Improve accuracy of the dose
NRV-0583-001	Non-Return Valve	Prevents flow in reverse direction (chemical)
NRV-0583-002	Non-Return Valve	Prevents flow in reverse direction (carrier / dilution water)
MX-0583-001	Static Mixer	Ensures homogenous mixing of diluted chemical to the dosing points
FI-0583-001 FI-0583-002	Rotameter	Provides local visual indication of flow rate
FI-0583-003	Rotameter with Low Flow Switch	Monitors dilution flow rate and raises alarm if flow drops below set point
FCV-0583-001 FCV-0583-002	Actuated Diaphragm Valves	Open / closes chemical lines
FCV-0583-003	Actuated Diaphragm Valve	Open / closes dilution water line
LE-0583-001 LI-0583-001	Pressure Transmitter	Provides Storage Tank Level via 4-20mA signal.
LSH-0583-001	High Level Sensors	Provides a high level Storage Tank alarm to prevent over flow when filling the tank.
LI-0583-002		Provides visual indication of current Storage Tank level
TK-0583-001	Bulk Storage Tank	25000lt Chemical Storage.

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

The Acetic Acid Dosing System contains the following panels:

- Dosing Control Panel – This panel provides manual & auto control for the Acetic Acid Skid.

- Truck Unloading Panel – This panel provides control for the Acetic Acid transfer from the road tanker to the storage tanks. High level cut-out is controlled by tank pressure transmitter and level sensor.

Dosing Control Panel	
Switches/ Push-buttons / Potentiometers	**Description**
Dosing Pump PU-0583-001 Run Mode – Manual / Off / Auto	Start, Stop and automatic operation Dosing Pump PU-0583-001
Dosing Pump PU-0583-002 Run Mode – Manual / Off / Auto	Start, Stop and automatic operation Dosing Pump PU-0583-002
Sump Pump M0583-003 Run Mode – Manual / Off / Auto	Start, Stop and automatic operation Sump Pump M0583-003
Latch Stop	Latching Red Mushroom Button: Emergency Stopping for Acetic Acid Dosing Skid
Indicators	**Description**
Dosing Pump PU-0583-001 Run	Green LED: Pump Run indicator
Dosing Pump PU-0583-002 Run	Green LED: Pump Run indicator
Sump Pump M0583-003 Run	Green LED: Pump Run indicator
Dosing Pump PU-0583-001 Fault	Red LED: Pump Fault indicator
Dosing Pump PU-0583-002 Fault	Red LED: Pump Fault indicator

Truck Unloading Panel System

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

Switches/ Push-buttons	Description
Unloading System Emergency Stop	Latching Red Mushroom Button: Emergency Stopping
High Level Alarm Acknowledge	Blue Push Button to Acknowledge the Alarm was activated. Turns off Strobe Light / Audible Alarm.
Indicators	**Description**
Power On	Green LED: Power is applied to the panel
TK 0583-001 High Level	Red LED: High Level Tank Indicator
Storage Tank Level	LED Panel Meter: Digital Display for percentage and volume in tank
Strobe Light / Audible Alarm	Red Strobe / Audible Alarm Active if Upper Volume limit of tank exceeded

Also forming part of the Truck Unloading System	
Power Outlet	1ph 10amp Outlet: RCD Protected for Transfer Pump Supply
Power Outlet	5pin 3ph 32amp Outlet: RCD Protected for Transfer Pump Supply

The features and full operational instructions of the Acetic Acid Systems Dosing Control Panel and Truck Unloading Panel are in the i.Power Solutions Functional Specification document in Section 4.1.

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

4   OPERATIONAL MODES

The Acetic Acid Dosing System operates in a duty/stand-by arrangement with four control modes.

- Off (not selectable at OWS)
- Local Manual (not selectable at OWS)
- Remote Manual
- Remote Automatic

Full details of these control modes are noted in the Functional Specification located in Section 4.1.

1.1. Section 4 - Operational Modes

BRISBANE CITY COUNCIL   BCC Contract No. BW.70146-3
Brisbane Water
Sandgate Water Reclamation Plant/Phosphorus Reduction Project

4.1 Functional Specification

0104594 -Sandgate WWTP Acetic Acid Dosing Facility

Functional Specification

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc			Author: Alan Brumec		
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S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 2 of 31		Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 3 of 31		Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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TABLE OF CONTENTS

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 4 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 5 of 31	Author: John Edwards

Rev	Description	By	Approved	Date
A	For Release	AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.	RV		01/09/09

Printed: 10/09/09

List Of Tables

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 6 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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1. GLOSSARY OF TERMS

Term	Description
Citect	The SCADA software package used to control the equipment.
DOL	**Direct On Line electrical motor starter**
LOI	**Local Operator Interface**
OWS	**O**perator **W**ork **S**tation
NIC	**N**etwork **I**nterface **C**ard. A generic term describing the 10/100 UTP Ethernet cards used to network equipment (PCs, PLCs, printers, routers, etc).
PLC	**P**rogrammable **L**ogic **C**ontroller. A **PLC** is designed specifically to control industrial processes under industrial conditions.
PCS	**P**lant **C**ontrol **S**ystem
SCADA	**S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition. A generic term for a centralized control system typically consisting of **PLC**s and control terminals.
TCP/IP	**T**ransmission **C**ontrol **P**rotocol / **I**nternet **P**rotocol. A common way of describing a suite of protocols used by devices configured with an **NIC**.
VSD	**V**ariable **S**peed **D**rive

Table 1: Glossary of Terms

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 7 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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2. INTRODUCTION

This document describes the functional operation of an Acetic Acid Dosing System for Sandgate Water Reclamation Plant Phosphorus Reduction. The chemical used for this process shall be Acetic Acid that will be supplied and installed as a package plant.

This document is based on the Brisbane Water Acetic Acid Dosing Facility Functional Specification and P&I Drawings.

The document addresses the standard specifications for various equipment types to ensure compliance with existing PLC systems. The document also describes the functionality required to be provided by the Plant Control System.

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 8 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

2.1. References

2.1.1. P&ID Drawings

486/5/5-0051-004   Acetic Acid Dosing Piping & Instrumentation Diagram

	S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 9 of 31	Author: John Edwards	
Rev	**Description**	**By**	**Approved**	**Date**
A	For Release	AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.	RV		01/09/09

Printed: 10/09/09

3. PROCESS OVERVIEW

Phosphorus reduction is to be implemented with an acetic acid dosing package plant, which is going to operate as one of the slaves under the control of the Sandgate Water Reclamation Plant's master control system.

Acetic acid dosing package plant shall be installed near the inlet works and will dose into each feed chamber of the flowsplitter No.2 to the bioreactors 1 & 2.

The Process and Instrumentation Diagrams outlining the process are included in Appendix A.

The existing Citect SCADA system shall provide the plant mimics, operator control, alarms and trends for the day to day operation of the acetic acid dosing package plant. All process instrumentation, Variable Speed Drive data, and setpoints will be trended by the Citect SCADA system, and will be able to be displayed on the predefined Trend Pages, or selected on the Operator configurable Trend Pages. Plant alarms will also be logged to the Alarm Log by the Citect SCADA system.

3.1. Control System Overview

The existing control system for Sandgate WRP consists of a number of Siemens S7-300 series PLC's and Citect SCADA.

The new acetic acid dosing plant will be supplied with small control panel including fully programmed PLC to control dosing. PLC will have Ethernet communication capability to communicate to other PLC and SCADA system.

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 10 of 31	Author: John Edwards	
Rev	**Description**	**By**	**Approved**	**Date**
A	For Release	AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.	RV		01/09/09

Printed: 10/09/09

Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 25 of 46

4. FUNCTIONAL STANDARDS

4.1. Equipment Control Modes

All controlled equipment shall generally have four control modes:

      a. Off (not selectable at OWS)
      b. Local Manual (not selectable at OWS)
      c. Remote Manual
      d. Remote Automatic

If the equipment is selected by the operator for Local Manual Control at the equipment site, then this status shall be indicated on the OWS. The operator shall be able to start and stop (or open and close) the equipment independently of the SCADA system while in this mode. The remote mode of control for equipment shall be operator selectable from the OWS. The operator shall select from Manual, and Automatic modes – the operations of these modes are defined below.

4.1.1. Sequence Control

Plant Sequences are groups of equipment that run together under automatic control, according to a defined series of steps, loops, times, and interlocks. The normal operation of these sequences will be that they are constantly in running mode, but the facility exists for the operator to start and stop the operation of the sequence. Each sequence shall have "Start" and "Stop" buttons for controlling the sequence, and a Running/Stopped feedback to show the status of the sequence.

4.1.2. Equipment Availability

Controlled equipment is defined as being available if the equipment is not in the Off Mode (by selection of "Local/Off/Remote" selector switch to "Off") and it is not in a Fault state.

Process instrument is defined as being available if its signal is valid, and it is not in a critical Fault state.

4.1.3. Off Mode

This mode may be selected at the equipment site by selection the "Local/Off/Remote" selector switch to "Off". When equipment is placed in the Off Mode, the equipment shall not be able to be operated either manually or automatically by the control system, and no alarms shall be generated for this equipment.

This mode shall generally be used for maintenance purposes.

4.1.4. Local Manual Mode

The operator may select this mode by operating the "Local/Off/Remote" selector switch at the equipment site to "Local". The selection of this mode shall be indicated on the OWS. The operator shall be able to start and stop (or open and close) the equipment at the equipment site independently of the SCADA system while in this mode.

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 11 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 26 of 46

For pumps, motors and other drives, if equipment is running in Remote Manual or Automatic mode, and Local Manual mode is selected, then the equipment shall stop/close. For valves, if the valve is operating in Remote Manual or Automatic mode, and Local Manual mode is selected, then the valve shall remain in its current position.

4.1.5. Remote Manual Control Mode

For equipment to be controlled remotely, then the operator must select "Remote" at the "Local/Off/Remote" selector switch at the equipment site. The Remote Manual Mode may be selected by the operator at the OWS by selecting the "Manual" button. When equipment is placed in the Manual Mode, the equipment shall be remotely controlled manually from operator selectable Start and Stop (or Open and Close) buttons on OWS. No remote automatic control shall occur while the equipment is in this mode.

The remote manual control of the equipment shall only be possible if the following conditions are met:

a. **Manual Interlock Condition** – the equipment may only be started if the defined manual interlock conditions are met.
b. **Fault Condition** – The equipment may only be started if the fault condition is not active.

If the equipment fails to start or stop (or open or close) within a specific time of the operator command, then the equipment shall be put into a Fault state, and an alarm shall be raised on the OWS.

If equipment is running in Remote Automatic Mode, and Remote Manual Mode is selected, then the equipment shall continue to run and it shall adjust its speed or position (if applicable) to the Manual Setpoint set on the OWS.

4.1.6. Remote Automatic Control Mode

For equipment to be controlled remotely, then the operator must select "Remote" at the "Local/Off/Remote" selector switch at the equipment site. The Remote Automatic Mode may be selected by the operator at the OWS by selecting the "Automatic" button. This mode is the "normal" mode of control for all plant. When equipment is placed in the Automatic Mode, the control of the equipment shall be defined by a series of conditions, set points, and delay times as follows:

a. **Automatic Start/Open Condition** –this condition is logical expression controlled by the equipment's automatic sequence, that when true starts/opens the equipment
b. **Automatic Interlock Condition** – the equipment may only be started if the defined automatic interlock conditions are met.
c. **Fault Condition** – The equipment may only be started if the fault condition is not active.

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 12 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

If the equipment fails to start or stop (or open or close) within a specific time of the automatic commands, then the equipment shall be put into a Fault state, and an alarm shall be raised on the OWS.

All setpoints and times required for the logical equations for automatic sequence control shall be adjustable remotely from the OWS. The operator input for these set points shall be forced to be within a safe operating range defined for each set point.

If equipment is running in Remote Manual Mode, and Remote Automatic Mode is selected, then the equipment shall run according to the automatic conditions defined above, and it shall adjust its speed or position (if applicable) to the Automatic Setpoint.

4.1.7. Duty/Standby Control

Pumps may be in the Duty/Standby Control configuration if the process requirement is able to be provided by only one pump operating. Start and Stop conditions are defined for the operation of the Duty Pump.

If the Duty Pump is unavailable (Faulted, Disabled, or Manual Stop), then the Standby Pump is to operate in place of the Duty Pump. Pump Duty is operator-selectable remotely from the OWS as Duty, Standby, and Alternate. In Alternate mode, for equipment that stops and starts, the duty will change every time both items of equipment are stopped, and for equipment that runs continuously, the duty will change when the duty equipment has been running continuously for 24 hours..

If the Duty equipment fails then duty shall failover to the Standby equipment and it shall become the new Duty equipment.

4.2. Equipment Types

4.2.1. Process Digital Inputs

The Process Digital Input is for binary instrumentation such as level, flow, or pressure switches. The switching contact for the input shall be configured so the input is active ("1") in the desirable condition. This shall ensure that the system will be able to fail safe upon instrument failure, broken wire, or loss of power supply.

4.2.1.1. Alarms

If the process digital input is an alarm, an active ("1") signal to the SCADA system shall raise an alarm on the OWS and will require acknowledgement by the operator.

	S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 13 of 31	Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

4.2.1.2. Data logging

If the process digital input is to be alarmed, then the Active, Inactive, and Acknowledge transitions shall be logged to the alarm log on Citect. The Active, and Inactive transitions of all digital inputs shall be logged within the Historian Package.

4.2.2. Process Analog Inputs

The Process Analog Input is for analog instrumentation such as level, flow, or pressure meters or transmitters that provide an analog signal to the Plant Control System. The analog signal shall be scaled as 4mA is 0% and 20mA is 100% of the calibrated range. An exception for this may be made for loop powered devices that require more power at 0% than at 100% (e.g. radar level transmitters).

The analog processing and control code shall ensure that the system will be able to fail safe upon instrument failure, broken wire, or loss of power supply.

4.2.2.1. Alarms

The following alarms may be configured, and if active shall be raised on the OWS and will require acknowledgement by the operator.
   a. High Alarm
   b. High-High Alarm
   c. Low Alarm
   d. Low-Low Alarm
   e. Invalid Alarm

4.2.2.2. Data logging

If alarms are configured for the analog input, then the Active, Inactive, and Acknowledge transitions shall be logged to the alarm log on Citect. The following analog data shall be trended on the OWS and logged by the Historian Package:

   a. Process Value
   b. High Alarm Setpoint
   c. High-High Alarm Setpoint
   d. Low Alarm Setpoint
   e. Low-Low Alarm Setpoint

4.2.3. Drives

Drives are pumps, mixers, or other electric motors that shall be started by a Direct-On-Line starter and run at a fixed speed.

The DOL drive shall have the following control inputs and outputs:
   a. Control Supply Available
   b. Field Circuit Ready

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 14 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

  c. Control Mode Remote
  d. Control Mode Local
  e. Reset
  f. Running
  g. Thermal Overload
  h. Thermistor Fault
  i. External Trips (application specific, such as Seal Failure or Low Flow Fault)
  j. Run Digital Output
  k. Fault Reset Digital Output

The status of the starter shall be indicated as either Stopped or Running. The mode of the starter shall be indicated as Disabled, Faulted, Manual, or Automatic. The drive state shall be limited to the following states:

Drive State	Status	Mode
0	Stopped	Off
1	Stopped	Faulted
2	Stopped	Manual
3	Running	Manual
4	Stopped	Automatic
5	Running	Automatic

The drive shall be controlled according to the standard specification for Equipment Control.

4.2.3.1. Statistics

The following statistics shall be calculated, displayed on the OWS, logged on the OWS and the Historian Package, and made available for inclusion into reports:

  a. Total Number of Starts
  b. Total Run Hours
  c. Yesterdays Total Number of Starts
  d. Yesterdays Total Run Hours

4.2.3.2. Alarms

The following alarms shall be raised on the OWS and will require acknowledgement by the operator.

  a. Drive Fail to Start/Stop
  b. Control Supply Not Available
  c. Field Circuit Not Ready
  d. Thermal Overload

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 15 of 31		Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

<div align="right">Printed: 10/09/09</div>

e. Thermistor Fault

f. External Trips (application specific, such as Seal Failure or Low Flow Fault)

4.2.3.3. Data logging

The configured alarms' Active, Inactive, and Acknowledge transitions shall be logged to the alarm log on Citect.

4.2.3.4. Load Shedding

The load shedding algorithm has a numeric output called the *Load-Shed Setpoint* to control the re-start of the equipment after a power failure, or during lower power availability. Each drive has a *Load-Shed Number* assigned. When the *Load-Shed Setpoint* is higher than the drive's *Load-Shed Number*, then the drive is permitted to operate.

4.2.4. Controlled Valves

Controlled Valves are valves that shall be positioned as either opened or closed. A controlled valve shall have the following control inputs and outputs:

a. Opened Digital Input

b. Closed Digital Input

c. Open Digital Output

d. Close Digital Output

The status of the valve shall be indicated as either Closed or Opened. The mode of the valve shall be indicated as Disabled, Faulted, Manual, or Automatic. The valve state shall be limited to the following states:

Drive State	Status	Mode
0	Closed	Off
1	Closed	Faulted
2	Closed	Manual
3	Opened	Manual
4	Closed	Automatic
5	Opened	Automatic

The controlled valve shall be controlled according to the standard specification for Equipment Control.

4.2.4.1. Statistics

The following statistics shall be calculated, displayed on the OWS, logged on the OWS and the Historian Package, and made available for inclusion into reports:

a. Total Number of Openings

b. Total Open Hours

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 16 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
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Printed: 10/09/09

4.2.4.2. Alarms

The following alarms shall be raised on the OWS and will require acknowledgement by the operator.

    a. Valve Fail to Open Fault
    b. Valve Fail to Close Fault

4.2.4.3. Data logging

The configured alarms' Active, Inactive, and Acknowledge transitions shall be logged to the alarm log on Citect.

	S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 17 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

5. DOSING SYSTEMS

5.1. Acetic Acid Storage Tank Level Controls and Monitoring

5.1.1. Equipment

5.1.1.1. Process instrumentation

Tag	PLC IO Tag	Description	Range	Type
LIT0583-001	LIT0583-001aiAATankLevel	Acetic Acid Storage Tank Level Transmitter	0–100 %	LT
LSH0583-001	LSH0583-001diSTHL	Acetic Acid Storage Tank Level Switch High	0 / 1	DI
LSH0583-004	LSH0583-004diSDBundHL	Acetic Acid Storage/Dosing Bund Level Switch High	0 / 1	DI

5.1.1.1.1. Acetic Acid Storage Tank Level Sensor (LIT0583-001)

This level sensor measures the level of acetic acid in storage tank TK0583-001. This device operates as a Standard Process Analog Input, and shall be controlled as outlined in the functional standards. The process value of this device is scaled from 0 to 100 %.

A low level alarm (LAL0583-001) is generated when the process value is below Low Level Setpoint (Level Trans Acetic Acid Low – Delivery Required). A low low level alarm (LALL0583-001)is generated when the process value is below Low Low Level Setpoint (Level Trans Low Low – Acetic Acid Dosing Shutdown). Low Low Level is interlocking dosing pumps and associated equipment to prevent dry run of dosing pumps. Acetic Acid Level Sensor also generates an alarm on signal loss.

5.1.1.1.2. Acetic Acid Storage Tank Level Switch High (LSH0583-001)

This switch indicates high level in acetic acid storage tank. This device operates as a Standard Process Digital Input, and shall be controlled as outlined in the functional standards. If the Level Switch High is activated, the Acetic Acid Storage Tank Level Switch High Acetic Acid Delivery Shutdown Alarm shall be generated. This alarm will activate an audible alarm and cut electricity to the local GPO powering the Acetic Acid Delivery Truck Transfer Pump on the Fill Point Local Indicator Panel. This is a latched alarm and can be reset only with alarm acknowledge button 011-S1 on the unloading panel. High level is also indicated by signal light 011-H1.

5.1.1.1.3. Acetic Acid Storage Bund Level Switch High (LSH0583-004)

This switch indicates high level in acetic acid storage bund. This device operates as a Standard Process Digital Input, and shall be controlled as outlined in the functional standards. If the Level Switch High is activated, the Acetic Acid Storage Bund Level Switch High Alarm shall be generated.

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 18 of 31	Author: John Edwards

Rev	Description	By	Approved	Date
A	For Release	AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.	RV		01/09/09

Printed: 10/09/09

Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 33 of 46

5.1.1.2. Controlled Equipment

Acetic Acid Storage does not have any controlled equipment.

5.1.2. SCADA Adjustable Parameters

PLC Tag	Description	EU	Default Value
LIT0583-001.acLowSP	Acetic Acid Tank Level Low Setpoint	%	25.00
LIT0583-001.acLoLoSP	Acetic Acid Tank Level Low Low Setpoint	%	10.00
AADOSING.acAABulkConcentration	Acetic Acid Bulk Concentration	%w/w	60.00
AADOSING.acAABulkSpecificGravity	Acetic Acid Bulk Specific Gravity	-	1.049

5.1.3. Interlocks

Interlocked Equipment	Action	Interlock
Acetic Acid Truck Transfer Pump	Power cut to truck unloading outlet	Acetic Acid Storage Tank High Level Switch (LSH0583-001)

5.1.4. Alarms

PLC Tag	Name / Area	Description
LIT0583-001.dsLowAlarm	Acetic Acid Tank	Acetic Acid Storage Tank Level Low – Delivery Required
LIT0583-001.dsLoLoAlarm	Acetic Acid Tank	Acetic Acid Storage Tank Level Low Low – Acetic Acid Dosing Shutdown
LIT0583-001.dsInvalidAlarm	Acetic Acid Tank	Acetic Acid Storage Tank Level Transmitter Signal Invalid
LSH0583-001.dsAlarm	Acetic Acid Tank	Acetic Acid Storage Tank Level Switch High – Acetic Acid Delivery Shutdown
LSH0583-004.dsAlarm	Acetic Acid Storage/Dosing Bund	Acetic Acid Storage/Dosing Bund Level Switch High

5.2. Acetic Acid Dosing System

5.2.1. Equipment

5.2.1.1. Process instrumentation

Tag	PLC IO Tag	Description	Range	Type
FSL0583-003	FSL0583-003diDilH2OFLo	Low Flow Switch on Dilution Water Pipe	0 / 1	DI
ZSO0583-001	ZSO0583-001diDosVlv1Opn	Acetic Acid Feed Dosing Pump No.1 Anti-siphon Valve Open Limit Switch	0 / 1	DI
ZSC0583-001	ZSC0583-001diDosVlv1Clsd	Acetic Acid Feed Dosing Pump No.1 Anti-siphon Valve Close Limit Switch	0 / 1	DI
ZSO0583-002	ZSO0583-002diDosVlv2Opn	Acetic Acid Feed Dosing Pump No.2 Anti-siphon Valve Open Limit Switch	0 / 1	DI
ZSC0583-002	ZSC0583-002diDosVlv2Clsd	Acetic Acid Feed Dosing Pump No.2 Anti-siphon Valve Close Limit Switch	0 / 1	DI
ZSO0583-003	ZSO0583-003diDilVlvOpn	Acetic Acid Dilution Water Valve Open Limit Switch	0 / 1	DI
ZSC0583-003	ZSC0583-003diDilVlvClsd	Acetic Acid Dilution Water Valve Close Limit Switch	0 / 1	DI

5.2.1.1.1. Low Flow Switch on Dilution Water Pipe (FSL0583-003)

This switch indicates low flow in dilution water pipe. This device operates as a Standard Process Digital Input, and shall be controlled as outlined in the functional standards. Low Flow Monitoring Switch is installed to ensure that there is a dilution water flow before and while acetic acid dosing is active. If low flow switch is activated while valve FCV0583-003 is opened then latched acetic acid shutdown alarm is activated. This low flow switch is also interlocking dosing pumps and related equipment.

5.2.1.2. Controlled Equipment

Tag	Equipment Description
PU0583-001	Acetic Acid Dosing Pump No. 1
PU0583-002	Acetic Acid Dosing Pump No. 2
FCV0583-001	Acetic Acid Dosing Valve No. 1
FCV0583-002	Acetic Acid Dosing Valve No. 2
FCV0583-003	Acetic Acid Dilution Water Valve

5.2.1.2.1. Acetic Acid Dosing Pumps (PU0583-001, PU0583-002)

There are two acetic acid dosing pumps installed. Their function is to deliver acetic acid to the mixing point with the dilution water and further into the Feed chambers No. 1&2 of the Flowsplitter No. 2. These two pumps are operating in duty/standby arrangement. Each pump will be able to

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 20 of 31	Author: John Edwards

Rev	Description	By	Approved	Date
A	For Release	AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.	RV		01/09/09

Printed: 10/09/09

Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 35 of 46

operate in local or remote modes. This is selectable from three position switch on the control panel. In local mode the pumps will start and stop via their hard-wired logic (internal speed reference). In remote mode pumps will start and stop as controlled from PLC (speed reference from PLC). Each pump requires run command (0/1) and speed set-point (4-20mA) which is to be proportional to dose rate required. Each pump gives back actual speed (4-20mA), stroke complete (0/1) and error signal (0/1). These two pumps have its own control logic which is controlling and monitoring their operation. Because pumps do not give back any direct running signal, actual speed and stroke complete are going to be used for the running indication. For each pump there will be a selection if the pump p   On local panel there is a status (running, error) indication for each pump.

5.2.1.2.2.   Acetic Acid Feed Dosing Pumps Anti-siphon Valves (FCV0583-001, FCV0583-002)

Each acetic acid dosing pump has an anti-siphon valve. These valve are preventing siphoning and are active in all control modes. These devices operate as a Standard Control Valves, and are controlled as outlined in the functional standards. Each valve generates additional alarm in case of position switch fault (both position switches active).

5.2.1.2.3.   Acetic Acid Dilution Water Valve (FCV0583-003)

Acetic acid dilution water valve is controlling dilution water flow. This device operates as a Standard Control Valve, and is controlled as outlined in the functional standards. Valve generates additional alarm in case of position switch fault (both position switches active).

5.2.2.   Automatic Control

Operation of Acetic Acid dosing system can be Enabled / Disabled by the operator at the SCADA and applies to all dosing system components (in auto mode).

Any cause of a shutdown on the Acetic Acid dosing system will generate Acetic Acid Dosing System Shutdown alarm (except disabling of the system by the operator) This alarm is latched.

Acetic acid dosing start appears when system is enabled and flow FIT58102 is above start dosing set-point and flow is healthy and communication is OK. Acetic acid dosing stop appears when system is disabled or system shutdown alarm is present or flow FIT58102 drops bellow start dosing set-point – 10% or flow is not healthy or communication is not OK.

On the acetic acid dosing start-up dilution water valve FCV0583-003 will open. After this valve is open flow has to be detected in dilution water pipe for a set period of time (*AADOSING .acAADilutOKStartDelay_SP),* before dosing pumps are allowed to start. On shut-down the dilution water will run for a set period of time (*AADOSING.acAADilutStopDelay_SP)* after dosing pumps stop.

When acetic acid dilution water valve opens flow switch is monitored for a set period of time (AADOSING.acAADilH2OLFStopTimer_SP). If no flow is detected after that time acetic acid shutdown alarm is raised.

	S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 21 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**		**Date**
A	For Release		AB			05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV			01/09/09

Printed: 10/09/09

The anti-siphon valve for the acetic acid dosing pump is energised to open on pump run command and de-energised to close on pump stop command. This is to prevent siphoning and is active in all control modes. Pump is interlocked with corresponding anti-siphon valve not open position.

In remote auto mode a duty / standby operation of the two dosing pumps will be controlled by PLC. The duty pump rotation will rotate every time that the active duty pump stops. It will also rotate whenever there will be a request to start the standby pump by the operator via the SCADA station. In addition to this the duty selection will change each day to ensure that the pumps experience the same wear and tear. An hour run meter will be installed for each pump to allow such monitoring. In the event that duty pump or corresponding anti-siphon valve goes faulty standby pump starts immediately. The default duty pump on power up will be pump No. 1.

5.2.3. Flow Set-point

When the pump is in remote manual mode of operation the operator can directly enter the pumps dosing rate in L/hour and the PLC will output an analog signal to run the pump at that rate. The pump is started and stopped by the operator. For each pump speed set-point and speed feedback are checked for deviation. Alarm is generated if deviation is grater than set-point.

When the pump is in remote auto mode the dosing pump flow set-point will be provided from either:
- a schedule providing dose set point for each hour of each day of the week [mg/L],
- fixed dose entered manually by the operator [mg/L].

Acetic acid feed dosing flow set point is calculated with the following alghorithm:

Acetic_Feed_Flow_SP [L/h] = Acetic_Feed_Dose_SP [mg/L] x FS2_Feed_Flow [L/s] (existing flowmeter FIT85102 called the Plant Feed Flowmeter signal on raw screened sewage line) / Acetic_Bulk_SG [-] / Acetic_Bulk_Conc [%] x 3.6 / 1000

For each pump flow at minimum speed and flow at maximum speed data points will be entered into the PLC to determine the speed of each pump. These data points will be adjustable from SCADA.

5.2.4. Operator Selection

PLC Tag	Selection Description	EU	Default Value
AADOSING.dcAADEnableDisable	Acetic Acid Dosing System Enable (1) / Disable (0)	0 / 1	0
AADOSING.dcScheduledFixed	Acetic Acid Dose Set-point Mode: Scheduled (1) / Fixed (0)	0 / 1	0
AADOSING.dcDoseRateCtrlAutoManual	Acetic Acid Dose Rate Controller Mode: Auto (1) / Manual (0)	0 / 1	0

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 22 of 31		Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 37 of 46

5.2.5. SCADA Adjustable Parameters

PLC Tag	Description	EU	Default Value
AADOSING.acAADilutStopDelay_SP	Acetic Acid Dilution Water Stop Delay Set point	s	180
AADOSING.acAADilH2OLFStopTimer_SP	Acetic Acid Dilution Water Low Flow Time Delay Set point	s	5
AADOSING.acAADilutOKStartDelay_SP	Acetic Acid Dilution Water Flow OK Dosing Pump Start Delay Set point	s	10
AADOSING. acManualSP	Manual Dose Flow Set point	L/h	
AADOSING. acAutoFixedDoseRateSP	Fixed Dose Rate Set point in Auto Mode	mg/L	37.49
AADOSING. acAADStartFIT58102SP	Acetic Acid Dosing Start Flow SP	L/s	
AADOSING.acAAFlowDeviationSP	Acetic Acid Feed Dosing Flow Deviation SP	%	10.0
AADOSING_SCHEDULE.acSu_0	Feed Dose SP - Sunday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acSu_1	Feed Dose SP - Sunday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acSu_22	Feed Dose SP - Sunday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acSu_23	Feed Dose SP - Sunday from 23 to 0	mg/L	37.49
AADOSING_SCHEDULE.acMo_0	Feed Dose SP - Monday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acMo_1	Feed Dose SP - Monday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acMo_22	Feed Dose SP - Monday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acMo_23	Feed Dose SP - Monday from 23 to 0	mg/L	37.49
AADOSING_SCHEDULE.acTu_0	Feed Dose SP - Tuesday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acTu_1	Feed Dose SP - Tuesday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acTu_22	Feed Dose SP - Tuesday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acTu_23	Feed Dose SP - Tuesday from 23 to 0	mg/L	37.49
AADOSING_SCHEDULE.acWe_0	Feed Dose SP - Wednesday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acWe_1	Feed Dose SP - Wednesday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acWe_22	Feed Dose SP - Wednesday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acWe_23	Feed Dose SP - Wednesday from 23 to 0	mg/L	37.49
AADOSING_SCHEDULE.acTh_0	Feed Dose SP - Thursday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acTh_1	Feed Dose SP - Thursday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acTh_22	Feed Dose SP - Thursday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acTh_23	Feed Dose SP - Thursday from 23 to 0	mg/L	37.49
AADOSING_SCHEDULE.acFr_0	Feed Dose SP - Friday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acFr_1	Feed Dose SP - Friday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acFr_22	Feed Dose SP - Friday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acFr_23	Feed Dose SP - Friday from 23 to 0	mg/L	37.49
AADOSING_SCHEDULE.acSa_0	Feed Dose SP - Saturday from 0 to 1	mg/L	37.49
AADOSING_SCHEDULE.acSa_1	Feed Dose SP - Saturday from 1 to 2	mg/L	37.49
:		mg/L	37.49
AADOSING_SCHEDULE.acSa_22	Feed Dose SP - Saturday from 22 to 23	mg/L	37.49
AADOSING_SCHEDULE.acSa_23	Feed Dose SP - Saturday from 23 to 0	mg/L	37.49
AADOSING.acFlowAtMinSpeed1	Flow At Minimum Speed Data Point	L/h/%	0.0
AADOSING.acFlowAtMaxSpeed1	Flow At Maximum Speed Data Point	L/h/%	30.0
AADOSING.acFlowAtMinSpeed2	Flow At Minimum Speed Data Point	L/h/%	0.0
AADOSING.acFlowAtMaxSpeed2	Flow At Maximum Speed Data Point	L/h/%	30.0

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc	Page 23 of 31	Author: John Edwards

Rev	Description	By	Approved	Date
A	For Release	AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.	RV		01/09/09

Printed: 10/09/09

Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 38 of 46

5.2.6. SCADA Data

PLC Tag	Description	EU	Default Value
AADOSING.dsSystemRunReq	Acetic Acid Dosing System Should Run	0 / 1	0
AADOSING.asAutoSP	Acetic Acid Automatic Calculated Dose Flow Setpoint	L/h	-
AADOSING.asDoseFlowSP	Acetic Acid Dose Flow Reference – active dose flow setpoint	L/h	-
AADOSING.asAutoScheduleDoseRateSP	Scheduled Dose Rate in Auto Mode	mg/L	-
AADOSING.asActualDoseRateSP	Actual Dose Rate in Auto Mode	mg/L	-
AADOSING.asAAVolume	Acetic Acid Feed Dosing Volume	L	-
AADOSING.asAAVloumeYDay	Acetic Acid Feed Dosing Volume Yesterday	L	-

5.2.7. Interlocks

Interlocked Equipment	Action	Interlock
Dosing Pumps PU0583-001 & PU0583-002, Anti-siphon Valves FCV0583-001& FCV0583-002	Stop pumps and related equipment (Interlock removed after set period of time after flow OK)	FSL0583-003 Low Flow Alarm on Dilution Water Pipe
Dosing Pumps PU0583-001 & PU0583-002, Anti-siphon Valves FCV0583-001& FCV0583-002	Stop pumps and related equipment (Interlock removed after set period of time after flow OK)	ZSO0583-003 Not Active
Dosing Pumps PU0583-001 & PU0583-002	Stop pumps and related equipment	Acetic Acid Storage Tank Low Low Level Alarm
Dosing Pump PU0583-001	Stop the pump	ZSO0583-001 Not Active
Dosing Pump PU0583-002	Stop the pump	ZSO0583-002 Not Active
Dosing Pumps PU0583-001 & PU0583-002	Stop pumps and related equipment (Interlock removed after set period of time after flow OK)	Flowsplitter No.2 Feed Flow Not Present or Communication Fault

5.2.8. Communication

PLC Tag	Description	Type
AADRecv.asPlantFlowRate	Plant Feed Flow [L/s]	Read

FIT85102 Flow value is originally available in BR1 (Bioreactor 1) PLC. BR1 PLC already has a maximum number of connections configured, so another connection can not be configured for that PLC, however FIT85102 flow value is already transferred to Sludge PLC, where it exists in DB81.DBD54 and its healthy signal exists in DB81.DBX12.1. Sludge PLC still has 2 connections available to configure. So a new connection will be configured in Sludge PLC and communication functions and data blocks will be added to an existing Sludge PLC. For this FC91 ("AADSendCtrl"), FC96 ("AADRecvCtrl"), DB91 ("AADSend") and DB96 ("AADRecv") blocks will be added to the sludge PLC program and existing FC90 ("PLCCommsdata") and FC70 ("PLCComms") will be modified (FC90 - additional networks will be added to transfer data from DB81 to DB91; FC70 – networks will be added to call FC91 and FC92).

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 24 of 31		Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

Program modifications on Sludge PLC program can be done while PLC is running, but **PLC stop will be required to download a new connection to Sludge PLC**, which means that system will stop during download.

5.2.9. Alarms

PLC Tag	Name / Area	Description
FSL0583-003.dsAlarm	Acetic Acid Dilution Water	Acetic Acid Dilution Water Flow Switch Low – Acetic Acid Shutdown
AADOSING.daFCV0583_001_Open Closed	Acetic Acid Dosing	Anti-siphon Valve No.1 Both Position Switches Active
AADOSING.daFCV0583_002_Open Closed	Acetic Acid Dosing	Anti-siphon Valve No.2 Both Position Switches Active
AADOSING.daFCV0583_003_Open Closed	Acetic Acid Dilution Water	Dilution Water Valve Both Position Switches Active

5.2.10. Reports

PLC Tag	Description	EU	Report
AADOSING.asAAVloumeYDay	Acetic Acid Feed Dosing Volume Yesterday	L	Daily

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 25 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

5.3.   Truck Unloading and Storage Bund Drainage System

5.3.1.   Equipment

5.3.1.1.   Process instrumentation

Tag	PLC IO Tag	Description	Range	Type
LSH0583-003	LSH0583-003diESBundHL	Emergency Storage Bund High Level Switch	0 / 1	DI
LSL0583-003	LSL0583-003diESBundLL	Emergency Storage Bund Low Level Switch	0 / 1	DI
FSH1020-200	FSH1020-200diActivated	High Flow Switch on Emergency Shower	0 / 1	DI

5.3.1.1.1.   Emergency Storage Bund High Level Switch (LSH0583-003)

This switch indicates high level in emergency storage bund. This device operates as a Standard Process Digital Input, and shall be controlled as outlined in the functional standards. If the level switch high is activated, the pump PU0583-003 starts. If high level switch is active for more than set period of time then latched alarm is activated.

5.3.1.1.2.   Emergency Storage Bund Low Level Switch (LSL0583-003)

This switch indicates low level in emergency storage bund. This device operates as a Standard Process Digital Input, and shall be controlled as outlined in the functional standards. If the Level switch low is activated, the pump PU0583-003 stops.

5.3.1.1.3.   High Flow Switch on Emergency Shower (FSH1020-200)

This switch indicates that emergency shower has been activated. This device operates as a Standard Process Digital Input, and shall be controlled as outlined in the functional standards.

5.3.1.2.   Controlled Equipment

Tag	Equipment Description
PU0583-003	Sump Pump
013-K1	Unloading Panel Truck Power Supply Relay

5.3.1.2.1.   Sump Pump (PU0583-003)

Sump pump is installed in the emergency storage bund, to pump the storm water to the plant inlet. This device operates as a DOL Drive, and shall be controlled as outlined in the functional standards. On the local panel there is a running indication for the pump.

5.3.1.2.2.   Unloading Panel Truck Power Supply Relay (013-K1)

Truck power supply relay is cutting off power supply to truck unloading in case of emergency. This device operates as a DOL Drive with the exception that there is no remote local off mode for it. It shall be controlled as outlined in the functional standards.

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 26 of 31		Author: John Edwards	
Rev	Description		By	Approved	Date
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

Printed: 10/09/09

5.3.2. Automatic Control

Sump pump PU0583-003 is controlled by two level switches integral to the sump in emergency storage bund. If level switch LSH0583-003 is activated pump starts and it runs until low level switch LSL0583-003 is activated. Low Level switch LSL0583-002 will stop the sump pump if low level switch LSL0583-003 should fail.

Truck power supply is active in case that there is no emergency stop active in the system, there is no high level switch LSH0583-001 active and that level LIT0581-001 is below high alarm set-point. If above conditions are not met power is switched off with (EMS and LSH0583-001 being latched).

5.3.3. Interlocks

Interlocked Equipment	Action	Interlock
PU0583-003	Stop the pump	LSL0583-003 low level switch active
013-K1	Switch off power supply for the truck	LSH0583-001 high level switch alarm
013-K1	Switch off power supply for the truck	LSH0583-001 high level Alarm not Acknowledged

5.3.4. Alarms

PLC Tag	Name / Area	Description
LSH0583-002.dsAlarm	Acetic Acid Unloading	Emergency Storage Bund High Level Switch Active - Possible Sump Pump Malfunctioning

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 27 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 42 of 46

6. SCADA

The existing Citect SCADA system will be programmed and configured by Brisbane Water to provide all controls, alarms and monitoring functions via plant operator room PC.

6.1. Screens

The Citect SCADA system will have a dedicated page displaying tank, pumps, valves and instrumentation as per the P&ID diagram. All devices shall be configured as per the current Citect standard include project, including all standard popup screens required for each equipment.

6.2. Trends

The following trends shall be made available for the operators as standard trend pages.

6.2.1. Tank Level Trend Screen

#	Trend	PLC Tag	Sample Rate	Units
1	Storage Tank Level	LIT0583-001.asValue	5 s	%

6.2.2. Acetic Acid Dosing Trend Screen

#	Trend	PLC Tag	Sample Rate	Units
1	P1 Flow Paced Dosing Rate	PU0583-001.asActualDoseRate	5 sec	L/h
2	P2 Flow Paced Dosing Rate	PU0583-002.asActualDoseRate	5 sec	L/h
3	Flow Dosing Set Point	AADOSING.asDoseFlowSP	5 sec	L/h
4	Raw Screened Sewage Flow used for flow pacing	Existing variable in Bioreactor 1 (FIT85102)	5 sec	L/s
5	Acetic Acid Dose Set Point	AADOSING.asActualDoseRateSP	5 sec	mg/L
6	Dilution Water Flow Switch	FCV0583-003.dsOpened	5 sec	0/1

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A	For Release	AB		05/01/09
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7. APPENDICES

Appendix A.   P&I Drawing

Rev	Description	By	Approved	Date
A	For Release	AB		05/01/09
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Printed: 10/09/09

Appendix B.   PLC IO List

PLC Tag	Address	Type	Comment
013K1diUnloadingKON	I 4.0	BOOL	Unloading Panel Truck Pump Outlets Contactor Closed
013K2diSumpPumpKON	I 4.1	BOOL	PU0583-003 Sump Pump Contactor Closed
013K3diDosePumpKON	I 4.2	BOOL	PU0583-001/002 Acetic Acid Dosing Pumps Contactor Closed
LSH0583-001diSTHL	I 4.3	BOOL	Unloading Panel LSH0583-001Acetic Acid Storage Tank High Level Alarm
010SxdiUnloadingE-Stop	I 4.4	BOOL	Unloading Panel E-Stop Button Activated
011K1diUnloadAlarmAckn	I 4.5	BOOL	Unloading Panel TK0583-001 High Level Alarm Acknowledged
LSL0583-003diESBundLL	I 4.6	BOOL	LSL0583-003 Emergency Storage Bund Low Level
LSH0583-003diESBundHL	I 4.7	BOOL	LSH0583-003 Emergency Storage Bund High Level
LSH0583-004diSDBundHL	I 5.0	BOOL	LSH0583-004 Storage/Dosing Bund High Level
FSL0583-003diDilH2OFLo	I 5.1	BOOL	FAL0583-003 Dilution Water Flow Detect
PU0583-001diDosPmp1SC	I 5.2	BOOL	PU0583-001 Acetic Acid Dosing Pump No.1 Stroke Complete
PU0583-001diDosPmp1Err	I 5.3	BOOL	PU0583-001 Acetic Acid Dosing Pump No.1 Error/Fault
PU0583-002diDosPmp2SC	I 5.4	BOOL	PU0583-002 Acetic Acid Dosing Pump No.2 Stroke Complete
PU0583-002diDosPmp2Err	I 5.5	BOOL	PU0583-002 Acetic Acid Dosing Pump No.2 Error/Fault
013SxdiDoseCtrlE-Stop	I 5.6	BOOL	Dosing Control Panel E-Stop Button Activated / Valve Solenoid Power
PU0583-003diCurrentDet	I 5.7	BOOL	PU0583-003 Sump Pump Running / Current Detect
ZSO0583-001diDosVlv1Opn	I 6.0	BOOL	ZSO0583-001 FCV0583-001 Dosing Valve No.1 Open
ZSC0583-001diDosVlv1Clsd	I 6.1	BOOL	ZSC0583-001 FCV0583-001 Dosing Valve No.1 Closed
ZSO0583-002diDosVlv2Opn	I 6.2	BOOL	ZSO0583-002 FCV0583-002 Dosing Valve No.2 Open
ZSC0583-002diDosVlv2Clsd	I 6.3	BOOL	ZSC0583-002 FCV0583-002 Dosing Valve No.2 Closed
ZSO0583-003diDilVlvOpn	I 6.4	BOOL	ZSO0583-003 FCV0583-003 Dilution Valve Open
ZSC0583-003diDilVlvClsd	I 6.5	BOOL	ZSC0583-003 FCV0583-003 Dilution Valve Closed
FSH1020-200diActivated	I 6.6	BOOL	FSH1020-200 Safety Shower Activated
I6.7	I 6.7	BOOL	Spare
I7.0	I 7.0	BOOL	Spare
I7.1	I 7.1	BOOL	Spare
PU0583-001diRemote	I 7.2	BOOL	PU0583-001 Acetic Acid Dosing Pump No.1 Auto Mode
PU0583-001diLocal	I 7.3	BOOL	PU0583-001 Acetic Acid Dosing Pump No.1 Manual Mode
PU0583-002diRemote	I 7.4	BOOL	PU0583-002 Acetic Acid Dosing Pump No.2 Auto Mode
PU0583-002diLocal	I 7.5	BOOL	PU0583-002 Acetic Acid Dosing Pump No.2 Manual Mode
PU0583-003diRemote	I 7.6	BOOL	PU0583-003 Acetic Acid Dosing Pump No.3 Auto Mode
PU0583-003diLocal	I 7.7	BOOL	PU0583-003 Acetic Acid Dosing Pump No.3 Manual Mode
LIT0583-001aiAATankLevel	PIW 304	INT	TK0583-001 Acetic Acid Storage Tank Level Monitor
PU0583-001aiDosingRate	PIW 306	INT	PU0583-001 Acetic Acid Dosing Pump No.1 Monitor Dosing Rate
PU0583-002aiDosingRate	PIW 308	INT	PU0583-002 Acetic Acid Dosing Pump No.2 Monitor Dosing Rate
PIW310	PIW 310	INT	Spare
PIW312	PIW 312	INT	Spare
PIW314	PIW 314	INT	Spare
PIW316	PIW 316	INT	Spare

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 30 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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			Customer: Brisbane Water

PIW318	PIW 318	INT	Spare
020K1doUnloadPanelEnable	Q 8.0	BOOL	Unloading Panel Truck Pump Contactor Power Enable
PU0583-003doRunCommand	Q 8.1	BOOL	PU0583-003 Sump Pump Auto Run Relay Command
PU0583-001doRunCommand	Q 8.2	BOOL	PU0583-001 Acetic Acid Dosing Pump No.1 Auto Run Relay Com
PU0583-002doRunCommand	Q 8.3	BOOL	PU0583-002 Acetic Acid Dosing Pump No.2 Auto Run Relay Com
FCV0583-001doOpen	Q 8.4	BOOL	FCV0583-001 Acetic Acid Dosing Valve No.1 Open Command
FCV0583-002doOpen	Q 8.5	BOOL	FCV0583-002 Acetic Acid Dosing Valve No.2 Open Command
FCV0583-003doOpen	Q 8.6	BOOL	FCV0583-003 Dilution Water Valve Open Command
Q8.7	Q 8.7	BOOL	Spare
PU0583-001doRunIndic	Q 9.0	BOOL	PU0583-001 Dosing Pump No.1 Run Indicator
PU0583-001doFaultIndic	Q 9.1	BOOL	PU0583-001 Dosing Pump No.1 Fault Indicator
PU0583-002doRunIndic	Q 9.2	BOOL	PU0583-002 Dosing Pump No.2 Run Indicator
PU0583-002doFaultIndic	Q 9.3	BOOL	PU0583-002 Dosing Pump No.2 Fault Indicator
Q9.4	Q 9.4	BOOL	Spare
Q9.5	Q 9.5	BOOL	Spare
Q9.6	Q 9.6	BOOL	Spare
Q9.7	Q 9.7	BOOL	Spare
PU0583-001aoSetDosRate	PQW 320	INT	PU0583-001 Acetic Acid Dosing Pump No.1 Set Dosing Rate
PU0583-002aoSetDosRate	PQW 322	INT	PU0583-002 Acetic Acid Dosing Pump No.2 Set Dosing Rate
PQW324	PQW 324	WORD	Spare
PQW326	PQW 326	WORD	Spare
PQW328	PQW 328	WORD	Spare
PQW330	PQW 330	WORD	Spare
PQW332	PQW 332	WORD	Spare
PQW334	PQW 334	WORD	Spare

S:\PROJECTS\WIP PROJECTS\5131060 Tenix-Sandgate Acetic Acid\13. Manuals\Sandgate Acetic Acid Manual stuff\A. iPower Solutions Functional Specification\iPower functional discricption-Acetic Acid Dosing-Update.doc		Page 31 of 31		Author: John Edwards	
Rev	**Description**		**By**	**Approved**	**Date**
A	For Release		AB		05/01/09
B	Comments added and updated as per Tenix marked up RevA.		RV		01/09/09

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Q-Pulse Id: TMS1588   Active: 15/04/2016   Page 46 of 46