	LOGICHEM PROCESS	DESIGN BASIS			
	Tel No: +27 (21) 87 36499 Fax No: +27 (21) 87 31717 e-mail: logichem@iafrica.com www.logichem.com				
CLIENT	ConeTech	DOC No:	1256-DB-A	PAGE 1 OF 5	
PROJECT No:	1256E	ISSUED BY	CR	CR	CR
PROJECT	California Rectifier	CHECKED BY	SWP	SWP	SWP
LOCATION	California, USA	DATE	2016.02.16	2016.03.15	2016.04.12
CLIENT APPROVAL (signature & date)		REVISION	A	B	C
		STATUS	Design	Design	Fabrication

1. INTRODUCTION

Logichem has been contracted by ConeTech. to design, fabricate and supply (ex works) an Alcohol Rectification Plant for Conetech, Inc. of Santa Rosa, California.

This document sets out the basis of design for the Alcohol Rectifier Plant, and is submitted to Client for review and approval to confirm Logichem's understanding of Client's requirements and instructions, and allow detailed design and construction to proceed.

2. PLANT OVERVIEW

The capacity of this column justifies selection of a trayed column as opposed to a packed column, which reduces the column height to ± 6 m, resulting in an overall plant height of < 7 m. Since the column will receive only clean feed material, we have selected a fully-welded construction with only 1 set of girth flanges to facilitate erection on site to accommodate the low ceiling clearance. This will further enable fitting the knocked-down plant into a 20' container.


We propose a column of ± 580 mm diameter. The tray design will take account of the desired 50% capacity turndown. We have selected low-level condensing (2.5m) with pumped reflux to limit the structural steel and access platform requirements. We anticipate a footprint of 2m x 2m, to be confirmed after detailed design. The plant will be skid-mounted to minimise on-site work after delivery.

We have included a feed pump, which may not be strictly necessary depending on your existing spirit pumping configuration. However, from a control point of view, it is preferable for our panel to interact with the feed pump via a variable speed drive. No allowance has been made for a strainer in the feed line since the feed is considered to be clean. There are two other pumps for the recovered water and spirit respectively. As requested, we have allowed for Alfa Laval LKH-5 pumps to provide commonality with your current equipment. All pumps will be equipped with Zone 2 compliant motors and automated variable speed drives. All pumps will be sourced in California.

Four types of heat exchangers will be employed:

- 2.1. Vertical shell & tube reboiler similar to that on the Warthog 1
- 2.2. Horizontal shell & tube condensers (Preheater-3 and main condenser)
- 2.3. Gasketed plate and frame heat exchanger for recovered water cooling prior to chilling
- 2.4. Nickel-brazed plate heat exchangers for all other (clean) duties

In line with standard practise in South Africa, we have not allowed for a flame-trap on the condenser vent, or routing the vent to outside the building.

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3. FEED

- 3.1. Feed rate : 500 – 1000 l/h
- 3.2. Feed strength : 60% ABV
- 3.3. Temperature : 5°C
- 3.4. Pressure : flooded suction to plant inlet nozzle

4. PRODUCTS

- 4.1. Product Spirit : 92% ABV at 5°C
- 4.2. Recovered-water : 0.5% ABV (max) at 5°C
- 4.3. No impurities removal

5. OPERATING CONDITIONS

- 5.1. Atmospheric pressure operation


6. UTILITIES

- 6.1. Power : <10 kW
- 6.2. Steam : 670 kg/h, available at 350 kPag
- 6.3. Glycol : 3 m³/h, available at 0°C
- 6.4. Cooling water : 31 m³/h, available at 27°C

Consideration will need to be given to the potential impact start-up and shut-down procedures may have on cooling water and glycol exit temperatures when the very significant heat exchange between spirit product and feed may not be fully functional.

7. CONSTRAINTS

- 7.1. Ideally dimensions such that disassembled plant fits into single 20' container for shipping
- 7.2. Final erected height not to exceed 7m
- 7.3. Plant structural design to take into account location seismic specification

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8. PLANT UNITS

8.1. Metric units are to be used in instrumentation: l/h, kPa, °C, kW

9. MATERIALS OF CONSTRUCTION


- 9.1. All process contact parts will be in 316L (as per client approval 22/03/2016).
- 9.2. Components in the recovered water flow path will be of sanitary construction.
- 9.3. Plant supporting frames will be AISI 304, subject to confirmation once the seismic requirements have been established.
- 9.4. Control panel be in AISI 304
- 9.5. Cooling water will be AISI 304, un-lagged.
- 9.6. Glycol lines will be AISI 304, lagged (as per client request).
- 9.7. Reboiler shell will be carbon steel boiler plate according to ASME VIII or BS5500, lagged.
- 9.8. Condenser end-box flanges will be carbon steel (painted).
- 9.9. Steam line will be carbon steel, lagged (as per client request).
- 9.10. Steam condensate lines will be AISI 304.
- 9.11. The Rectifier Column and Reboiler will be fully lagged (as per client request).

10. CONTROL & AUTOMATION

The following automation has been **included**:

- 10.1. Feed flow rate control
- 10.2. Column base level control
- 10.3. Reflux drum level control
- 10.4. Steam flow control
- 10.5. Monitoring of alcohol profile in stripping section
- 10.6. Monitoring of column base temperature
- 10.7. Monitoring of condenser vent temperature

The following parameters are **manually set** and monitored by the operator:

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- 10.8. Monitoring spirit strength by sampling and adjusting spirit draw rate as necessary.
- 10.9. Adjusting steam flow controller set-point to maintain the alcohol profile as necessary.
- 10.10. Adjusting cooling water and glycol supply valves with reference to respective temperature gauges as necessary.

Note that we have **excluded** the following:

- 10.11. On-line measurement of spirit strength and automated spirit draw – this is quite expensive and not a simple control loop to configure due to the process lag between spirit draw rate and response in strength; it is normally only considered when spirit strength maintenance is obligatory
- 10.12. Flow measurement of recovered water – it is not a control variable, but rather results from other controlled variable; flow indication can be incorporated if justifiable

11. ELECTRICS AND CONTROL

- 11.1. The control panel housing the pump motor switch gear and variable speed drives would also incorporate a PLC-based control system and 6" touch-screen HMI. It would need to be located in a safe area.
- 11.2. Cabling between our panel and the plant has been excluded (unknown location), as well as any plant lighting and earthing requirements.
- 11.3. All 3-phase components compliant with 480V, 60 Hz

12. OPERATING AND MAINTENANCE


Operating and maintenance instruction manuals will be provided. We have allowed 5 days for commissioning and operator training by one of our engineers.

13. HAZARDOUS AREA ZONING

All electrical equipment within the plant battery limit will be Zone 2 (Class 1, Div 2) compliant.

14. CLIENT SPECIFICATIONS


- 14.1. All process contact parts to be 316L stainless steel.
- 14.2. Pipe fittings to be tri-clover as far as possible.
- 14.3. All pumps to be Alfa Laval LKH-5 pumps.
- 14.4. Glycol and steam lines to be lagged.
- 14.5. Anchoring requirements of the skid to be specified by the client. This will be in

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14.6. All battery limit points to be tri-clover fittings.

15. ACCEPTANCE CRITERIA

Leak-free performance of the functions described above, provided feed and utilities are provided within the stated specifications.

		LOGICHEM
CLIENT APPROVAL		
A	<input checked="" type="checkbox"/>	PROCEED NO COMMENTS
B	<input type="checkbox"/>	PROCEED BUT INCORPORATE COMMENTS
C	<input type="checkbox"/>	DO NOT PROCEED INCORPORATE COMMENTS AND RE-SUBMIT
NAME <u>Ben Haas</u>	SIGNATURE <u><i>Ben Haas</i></u>	DATE <u>4.15.16</u>