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Stewart O&M Procedure Dew Point Control Facility Operating Procedures (Revision 4, October 19, 2009)

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1 INTRODUCTION

1.1 Scope

This procedure describes the operation of the Stewart Dew Point Control Site.

This procedure includes a Process Description and consists of Normal Operation, Normal Startup, Emergency Operations, Normal Shutdown, Start-up Following Turnaround or ESD, Truck Loading, and an Alarm-Response Table.

This procedure does not supersede, nor does it relieve responsibility for compliance with, other procedure(s) that may be required. Use these procedures in conjunction with the latest Piping and Instrument Diagrams (P&ID's).

This procedure is a "living" document that must be updated continually to reflect new conditions and equipment changes. Difficulties in using this procedure due to omissions or errors must be corrected as discovered. Suggestions for improvement are welcomed and encouraged.

1.2 Related Procedures

The following procedures are related to operating the Dew Point Control Site

- DPC System Operating Procedures
- Gas Pre/Recompressor Operating Procedures

1.3 Safety Precautions

The minimum personnel protection equipment required for this procedure is:

- Hard hat (non-metallic)
- Safety glasses
- Ear protection
- Fire-retardant clothing
- Sturdy leather non-ventilated work shoes with steel toe and shank

A Material Safety Data Sheet (MSDS) is required for each chemical used at the plant. The MSDS contains important safety information on the handling, exposure and fire precautions for a particular chemical. A review of all applicable MSDS information should be made before implementing this procedure.

All SIP permitting (hot work, lock out/tag out, confined space, etc.) must be strictly enforced. Prior to implementing any of the procedures in this document, verify that all work (company or contractor) is completed on the systems to be operated.

All sources of ignition must be identified and strictly controlled. No cutting, burning, or welding will be done while the site is being started up, shut down, or in emergency operations. At all other times, these activities shall be strictly enforced per company procedures.

Before implementation, a visual inspection must be performed on the system to determine the following:

- All vessels and piping are in proper condition for operation.
- Blinds have been removed.
- All drains have been closed and blocked, and valves are in the proper position for vents, bleeds,

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and sight glasses.

- All control and shutdown loops are functional.
- All pressure safety valves (PSVs) are lined up, and locks and seals have been placed on locked open and car sealed open PSVs.
- All affected personnel are aware of the procedure and management approval has been received to proceed.

During implementation of the operating procedures in this document, all vessel and piping temperatures and pressures should be carefully monitored to ensure that the maximum and minimum design limits are not exceeded.

1.4 Environmental Precautions

Do not drain any liquids or other waste onto the ground. If no closed drain is available, collect the liquid or other waste in an approved container and reference company procedures for correct disposal methods.

1.5 Plant Security Procedure

An operator will patrol and inspect the plant facilities at least once per day for integrity and or the presence of unauthorized persons or objects. Inspections shall include the following areas:

- Plant inlet and outlet valve settings
- Meter Station
- Operator Control Building
- Process Area
- Product Storage Tanks
- Plant Motor Control Center & PLC Building

The fenced site perimeter will also be patrolled at least once per day. This patrol will include the following checks:

- Unauthorized openings and/or excavations under the fence line or objects adjacent to the fence which compromise the protection provided by the fence.
- "No Trespassing" signs Verify all signs are intact and hanging securely in the proper locations. Signs should be located approximately every 200 feet around the entire perimeter.
- "Exit" signs Verify all signs are intact and hanging securely on all man gates.

• Plant Lighting – All plant lighting should be checked to verify lights are all operational. Plant security rounds will be documented on the log sheet including the time and the initials of the operator.

1.6 Plant Access Control

The operator is responsible for overall monitoring for the presence of unauthorized persons at the facility. Controlled access to the plant shall be maintained at all times. The operator will insure that all visitors complete the plant safety orientation and quiz. All visitors will be instructed to sign in at the operator control building and sign back out before leaving. Unscheduled after-hours visitors shall not be permitted into the plant unless they are company employees. The operator must also note in the log book whom they admitted and what his/her business was.

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1.7 Breach of Security Procedure

In the case of a breach of security, the operator shall use their best judgment in approaching the intruder, notifying the Team Leader, or notifying the Sheriff's Department. If the safety of the plant personnel cannot be ensured the Sheriff's Department should be contacted immediately by dialing 911.

2 PROCESS DESCRIPTION

2.1 Overview

Refrigeration Process

Refrigeration plants are the simplest of any gas processing facility options. In the Straight Refrigeration Process the natural gas stream is chilled to about -30°F with a closed loop propane refrigeration system. The condensed liquids are separated in a low temperature separator and stabilized in a Deethanizer column. In most cases, the overhead from the Deethanizer column is compressed, cooled and recycled to the inlet gas stream. The bottoms product comprising the NGL's (C3+ components) are typically trucked. The gases leaving the low temperature separator are cross-exchanged with the inlet gases prior to flowing into the sales gas pipeline. Depending upon the gas composition and pressure, propane recoveries range from 30 to 50 percent

Water removal

In addition to separating oil and some condensate from the wet gas stream, it is necessary to remove most of the associated water. Most of the liquid, free water associated with extracted natural gas is removed by simple separation methods at or near the wellhead. However, the removal of the water vapor that exists in solution in natural gas requires a more complex treatment. This treatment consists of 'dehydrating' the natural gas, which usually involves one of two processes: either absorption, or adsorption. For Our plants we use the adsorption method.

Glycol Dehydration

An example of absorption dehydration is known as Glycol Dehydration. In this process, a liquid desiccant dehydrator serves to absorb water vapor from the gas stream. Glycol, the principal agent in this process, has a chemical affinity for water. This means that, when in contact with a stream of natural gas that contains water, glycol will serve to 'steal' the water out of the gas stream. Essentially, glycol dehydration involves using a glycol solution, Ethylene glycol (commonly used in the automotive industry for antifreeze), which is brought into contact with the wet gas stream in what is called the 'contactor'. The glycol solution will absorb water from the wet gas. Once absorbed, the glycol particles become heavier and sink to the bottom of the contactor where they are removed. The natural gas, having been stripped of most of its water content, is then transported out of the dehydrator. The glycol solution, bearing all of the water out of the solution. While water has a boiling point of 212°F, glycol does not boil until 400°F. This boiling point differential makes it relatively easy to remove water from the glycol solution, allowing it be reused in the dehydration process. Or plant will attempt a 250°F boiling temperature. At this temperature our glycol should be 80% of the solution before reusing in the process.

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Glycol System Operation

In the operation of all our plants it is very important to track the use of glycol and to control the quality of the product.

Ethylene glycol's high boiling point and attraction for water makes it an ideal <u>desiccant</u> (a substance that removes moisture) for <u>natural gas</u> production. Ethylene glycol is injected into the system and meets the mixture of water vapor and <u>hydrocarbon</u> gases. The glycol absorbs the water. Then the subzero temperature (approximately -30°F) allows for separation for dry gas to exit from the system. The glycol and water mix is heavier than the hydrocarbon liquids and will drop to a recovery point. The glycol and water are separated by boiling off the water, and the glycol cycles back through the tower. Boiling temperature at sea level for water is 212°F and ethylene glycol is 350°F. In Our plants we attempt an 80% glycol mix of 80/20 by boiling the glycol and water mixture to 250°F.

Glycol Injection System Flow

Injection of glycol into the process is pumped at a higher pressure than plant pressure through external piping. Spray nozzles at injection points atomize the 80/20 glycol across the exchanger tube heads to ensure saturation.

The saturated cold glycol mix drops to a boot in the *Separator*. Using plant pressure and an interface level controller the saturated glycol mix is pressured back to the re-boiler through a cold/hot Glycol exchanger. It is heated using a gas fired boiler to 250°F boiling off the water through an atmospheric vent. At this temperature during normal operations the glycol should be a mixture of glycol to water ratio of 80/20 by weight. The 80/20 mixture is circulated from the re-boiler surge tank through the hot/cold exchanger to the high pressure pumps into the process gas stream to absorb water to prevent freezing.

Finished Product

For all intents and purposes we have two finished products. The primary product is refined natural gas that has specific guidelines of quality. (Insert pipeline tariff specs) It is sent directly into a pipeline system (insert purchaser) as a consumer ready product. The secondary product NGL (*Natural Gas Liquids*) is C3 (propane) and heavier material. This material is stored onsite and shipped buy truck to another facility for further processing (fractionation) into consumer usable product.

Waste Material

Basically the plants produce only liquid waste in the form of condensate and machine oil. Occasionally there is glycol carry-over. These wastes are gathered in coalescers, knock out pots and condensers then carried through piping to tanks for shipping by truck to a waste processor.

{The hydrocarbon liquids will be accumulated in storage tanks then loaded on trucks and transported to another facility.} Move up one paragraph

The water will be accumulated in a tank then loaded on a truck and transported to a disposal facility. {The outlet gas from the Site will be delivered to National Fuel Gas.} Move up one paragraph

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2.2 Equipment List

Tag Number	Service
F-001	L.P. Inlet Filter Separator
V-020	1st Stage Suction Scrubber (inlet cmp CG-001)
B-021A	1st Stage Suction Drum
B-021B	1st Stage Suction Drum
B-022A	1st Stage Discharge Drum
B-022B	1st Stage Discharge Drum
AC-025	1st Stage Discharge Cooler
V-030	2nd Stage Suction Scrubber
B-031	2nd Stage Suction Drum
B-032	2nd Stage Discharge Drum
AC-035	2nd Stage Discharge Cooler
V-040	2nd Stage Suction Scrubber
B-041	2nd Stage Suction Drum
B-042	2nd Stage Discharge Drum
AC-045	2nd Stage Discharge Cooler
<mark>F-080</mark>	Fuel Gas Filter
V-050	Compressor Fuel Gas Scrubber
F-100	H.P. Inlet Filter Separator
E-110	Gas/Gas Exchanger
E-130	Chiller
E-370	Refrigerant Reclaimer
V-140	Cold Separator
T-150	Deethanizer Column
AC-190	Liquid Products Cooler
AE-195A	Propane Analyzer (Out of Service)

Equipment List Cont.

Tag Number	Service
AE-195B	Propane Sampler (Out of Service)
S-175	Deethanizer Heater Coil Bundle
V-160	Deethanizer Reboiler (Fired)
H-165	Deethanizer Reboiler Burner
V-170	Deethanizer Reboiler Fuel Pot
T-600	Natural Gas Liquids Storage Tank
T-605	Natural Gas Liquids Storage Tank
T-610	Natural Gas Liquids Storage Tank
P-600A	Natural Gas Liquids Pump
P-600B	Natural Gas Liquids Pump
M-700	Truck Loading Meter
V-200	Fuel Scrubber
V-210	Vent Scrubber
P-220A	Vent Scrubber Pump
P-220B	Vent Scrubber Pump
S-240	Vent Stack

Lube Oil/Drain Tank
Produced Liquid Tank
1st Stage Suction Scrubber (C3 comp CG-200)
1st Stage Suction Bottle
1st Stage Discharge Bottle
2nd Stage Suction Scrubber
2nd Stage Suction Bottle
2nd Stage Discharge Bottle
Compressor Fuel Gas Scrubber
Propane Compressor Discharge Scrubber
Propane Condenser
Propane Receiver
Propane Economizer
Glycol Reboiler/Surge (Fired)
Glycol/Glycol Exchanger
Purge Panel
Rotor Tech Pump
Rotor Tech Pump
Glycol Filter
Glycol Charcoal Filter
Liquid Storage Tank
Waste Gas K.O. Vessel
VOC Flare
Drip Pot
Fiberglass Tank 2100 Gal

2.3 Process Controllers

0.3.1 Plant Controls

This is a list of the facility control valves:

Tag #	Service	Valve Position After Instrument Gas Failure
L <i>V-</i> 001	L.P. Inlet Filter Separator	Closed
PCV-020	Feed Compressor Suction Pressure	Closed
L <i>V</i> -020	Feed Compressor 1 st Stage Suction Scrubber	Closed
L <i>V</i> -030	Feed Compressor 2 nd Stage Suction Scrubber	Closed
L <i>V</i> -040	Feed Compressor 2 nd Stage Suction Scrubber	Closed
L <i>V</i> -100A	H.P. Inlet Filter Separator	Closed
L <i>V</i> -100B	H.P. Inlet Filter Separator	Closed
SDV-100	H.P. Inlet Filter Separator liquids to tank	Closed
SDV-100A	Inlet Feed Gas to Process	Closed
SDV-100B	Inlet Feed Gas to Residue Bypass	Open
PV-110	Residue Gas Upstream Back-Pressure	Open
PCV-110	Residue Gas Downstream to Pipeline	Open
PV-130	Chiller Blanket Gas Supply	Open
LV-130	Chiller	Closed

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LV-140A	Cold Separator -Glycol Boot	Closed
LV-140B	Cold Separator - NGL to Deethanizer	Closed
XV-140	Cold Separator	Closed
PV-150	Deethanizer Column	Open
TV-150	Deethanizer Column	Open
LV-150	Deethanizer Column	Closed
TCV-165	Deethanizer Reboiler Burner	Closed
SDV-170	Deethanizer Reboiler Fuel Pot	Closed
SDV-600A	Natural Gas Liquids Storage Tank	Closed
SDV-600B	Natural Gas Liquids Storage Tank	Closed
SDV-605A	Natural Gas Liquids Storage Tank	Closed
SDV-605B	Natural Gas Liquids Storage Tank	Closed
SDV-610A	Natural Gas Liquids Storage Tank	Closed
SDV-610B	Natural Gas Liquids Storage Tank	Closed
ESV-600A	NGL Truck Loading Liquid	Closed
ESV-600B	NGL Truck Loading Vapor Return	Closed
SDV-200	Fuel Gas Scrubber	Closed
LV-200	Fuel Gas Scrubber	Closed
PCV-11A1	Refrig Compressor Suction Pressure	Closed
LV-11A1	Refrigeration Comp. 1st Stage Suction Scrubber	Closed
LCV-10J3	Refrigeration Comp. 2nd Stage Suction Scrubber	Closed
LV-330	Propane Compressor Discharge Scrubber	Closed
LCV-360	Propane Receiver	Closed

Control Valve List Cont.

Tag #	Service	Valve Position After Instrument Gas Failure
PV-360	Propane Receiver	Open
SDV-3000	Fuel Gas to Glycol Reboiler Burner	Closed
SDV-550	Glycol EG Return to Reboiler	Closed
PV-550	Glycol Pump Discharge Pressure	Open
TCV-3000	Glycol Reboiler Temperature	Closed
SDV-100A	Waste Gas to the VOC Flare	Closed
SDV-100B	Waste Gas to Atmosphere	Open
SDV-112A	Plant Inlet ESD Valve	Closed
SDV-112B	Plant Outlet ESD Valve	Closed

2.4 Requirements for Delivery to Pipeline

In order to deliver the Stewart gas to National Fuel Gas, there are certain gas composition specifications that must be met.

The hydrocarbon dew point shall not exceed 15deg. F and the water vapor can be no more than 7lbs/mmcf of the gas stream.

For a detailed explanation see the attached gas quality specifications from National Fuel Gas.

Water 7 lbs/MCF

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- Hydrocarbon dewpoint <15 deg F up to 1000 psia
- C02 <2% by volume
- Oxygen <1% by volume
- 4% max inerts
- > BTU 967 BTU/CF
- Temperature <120 deg

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3 NORMAL OPERATIONS

3.1 Operating the Dew Point Control Site

The majority of site operation will be performed by local/manual control with some local/automatic control devices on specific equipment.

3.2 Daily Inspection Schedule

Item	Task	Normal Ranges
	Check site for any unsafe/hazardous conditions such as leaking gas or eq	uipment failure
1	Heat trace circuits (Check Heat Trace)	Operating (winter)
2	L.P. Inlet Filter Separator (LG-001)	1/2 sight glass
3	L.P. Inlet Filter Separator (DPI-001)	<5 psid
4	1st Stage Suction Scrubber (LG-020A)	1/4 sight glass
5	2nd Stage Suction Scrubber (LG-030A)	1/4 sight glass
6	2nd Stage Suction Scrubber (LG-040A)	1/4 sight glass
7	H.P. Inlet Filter Separator D/P (PDT-100)	<5 psid
8	H.P. Inlet Filter Separator Pressure (PIT-100)	600 – 650 psig
9	H.P. Inlet Separator Filter (LI-100A)	1/4 sight glass
10	H.P. Inlet Separator Filter (LI-100B)	1/4 sight glass
11	Gas/Gas Exchanger (PDIT-110)	0 – 10 psid
12	Chiller (PDIT-130)	0 – 10 psid
13	Glycol Flow Rate to Gas/Gas Exchanger (FIT-110)	1.0 – 1.3 gpm
14	Chiller (LG-130) Maintain C2 level above tube bundle	25% – 50% level
15	Cold Separator Liquid Level (LI-140B)	40% - 50% level
16	Cold Separator Glycol Level (LI-140A) (Glycol Boot)	30% - 50% level
17	Cold Separator Pressure (PI-140)	600 – 650 psig
18	Deethanizer Column Liquid Level (LI-150)	30% - 60%
19	Deethanizer Column Pressure (PI-150)	180 – 190 psig
20	Deethanizer Column Bottom Temperature (TI-150A)	120 – 135 ºF
21	Liquid Product Cooler Inlet (TI-190A)	120 – 135 ºF
22	Liquid Product Cooler Outlet (TI-190B)	50 – 110 °F
23	Deethanizer Reboiler Temperature (TI-160A)	180 – 185 °F
24	Deethanizer Reboiler Level (LG-160)	50% - 75% level
25	Deethanizer Reboiler Fuel Pot Pressure (PI-170)	80 – 100 psig
26	Deethanizer Reboiler Fuel Pot Level (LG-170)	No level
27	Natural Gas Liquids Storage Tank LI-600 level	<70% (85%max)
28	Natural Gas Liquids Storage Tank LI-605 level	<70% (85%max)
29	Natural Gas Liquids Storage Tank LI-610 level	<70% (85%max)
30	Natural Gas Liquids Storage Tank PI-600B pressure	150 – 190 psig
31	Natural Gas Liquids Storage Tank PI-605B pressure	150 – 190 psig
32	Natural Gas Liquids Storage Tank PI-610B pressure	150 – 190 psig
Item	Task	Normal Range
33	Fuel Gas Scrubber Level (LI-200)	0% – 25% level
34	Fuel Gas Scrubber Pressure (PI-200B)	120 – 130 psig

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35	Vent Scrubber Level (LI-270)	No Level
36	Lube Oil/Drain Tank Level (Need Sight Glass Installed)	10% - 70% level
37	Produced Liquid Tank Level (Need Sight Glass Installed)	10% - 70% level
38	Refrigeration Compressor 1st Stage Suction Scrubber	10% - 25% level
39	Refrigeration Compressor 1st Stage Suction Scrubber	10 – 15 psig
40	Refrigeration Compressor 2nd Stage Suction Scrubber	10% - 25% level
41	Refrigeration Compressor 2nd Stage Suction Scrubber	140 – 230 psig
42	Propane Compressor Discharge Scrubber (PIT-330)	120 – 230 psig
43	Propane Compressor Discharge Scrubber ((TI-330)	100 – 150ºF
44	Propane Compressor Discharge Scrubber (LI-330)	20% - 30% level
45	Propane Condenser Pressure (PI-340)	140 – 225 psig
46	Propane Condenser Outlet Temperature (TI-340B) (PFD 65 °F)	60 – 90°F
47	Propane Receiver Pressure (PIT-350)	140 – 230 psig
48	Propane Receiver Temperature (TI-350)	60 – 90°F
49	Propane Receiver Level (LI-350)	5% – 25% level
50	Propane Economizer Pressure (PIT-360)	40 – 60 psig
51	Propane Economizer Temperature (TI-360)	10 – 50°F
52	Propane Economizer Level (LI-360)	30% – 60% level
53	Glycol Reboiler Temperature (TIT-3000)	240 – 260°F
54	Glycol Reboiler Level (LG-3000)	30% – 60% level
55	Liquid Storage Tank (LG-690A)	25% – 80% level
56	Waste Gas KO Vessel (LG-1001)	10% – 30% level
57	Refrigeration Compressor Buffer Liquid Collection Pot – Rod # 1	0% – 25% level
58	Refrigeration Compressor Buffer Liquid Collection Pot – Rod # 2	0% – 25% level
59	Refrigeration Compressor Buffer Liquid Pot Collection – Rod # 3	0% – 25% level
60	Refrigeration Compressor Buffer Liquid Pot Collection – Rod # 4	0% – 25% level

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3.3 Range of Normal Operating Conditions

Range of Normal Operating Conditions			
	Sanvica	Normal Pango	
	Site Inlet Pressure		
	L D Inlet Filter Separator Liquid Lovel	40 - 200 psig	
	L.P. Inlet Filter Separator Liquid Level	1/4 OF Signit glass	
	L.P. Inlet Filter Separator Liquid Level	< 5 psiu Middle of eight globe	
	H.P. Iniel Filler Separator Liquid Level	Middle of sight glass	
	H.P. Inlet Filter Separator D/D	Middle of signit glass	
PD1-100	H.P. Inlet Filter Separator Dressure		
PTI-100	H.P. Inlet Separator Filter	600 - 650 psig	
	H.P. Iniel Separator Filter	1/4 sight glass	
		1/4 signt glass	
PDIT-110	Gas/Gas Exchanger		
PDI1-130			
	Gas/Gas Residue	50 – 80 deg °F	
FII-110	Glycol Flow Rate to Gas/ Gas Exchanger	1.0 – 1.3 gpm	
LG-130	Chiller	30% – 50 %	
LI-140A	Cold Separator Hydrocarbon Level	30% - 50%	
LI-140B	Cold Separator Glycol Level	30% – 50%	
PI-140	Cold Separator Pressure	600 – 650 psig	
LI-150	Deethanizer Column Liquid Level	30% - 60%	
PI-150	Deethanizer Column Pressure	180 – 190 psig	
TI-150A	Deethanizer Column Bottom Temperature	120 – 135 ºF	
TI-190A	Liquid Product Cooler Inlet	120 – 135 ⁰F	
TI-190B	Liquid Product Cooler Outlet	50 – 110 °F	
TI-160A	A Deethanizer Reboiler Temperature 180 – 185 °F		
LG-160	Deethanizer Reboiler Level	50% - 75% level	
PI-170	Deethanizer Reboiler Fuel Pot Pressure 80 – 100 psig		
LG-170	Deethanizer Reboiler Fuel Pot Pressure No level		
LI-600	Natural Gas Liquids Storage Tank <70% (85%max)		
LI-605	Natural Gas Liquids Storage Tank <70% (85%max)		
LI-610	Natural Gas Liquids Storage Tank	<70% (85%max)	
PI-600B	Natural Gas Liquids Storage Tank	150 – 190 psig	
PI-605B	Natural Gas Liquids Storage Tank	150 – 190 psig	
PI-610B	Natural Gas Liquids Storage Tank	150 – 190 psig	
LI-200	Fuel Gas Scrubber Level	0% – 25% level	
PI-200B	Fuel Gas Scrubber Pressure	120 – 130 psig	
LI-270	Vent Scrubber Level No Level		
	Lube Oil/Drain Tank Level (Sight Glass) 10% - 60% level		
LI-690	690 Produced Liquid Tank Level (Sight Glass) 10% - 60% level		
	Reingeration Compressor 1st Stage Suction Scrubber	10% - 25% level	
	Retrigeration Compressor 1st Stage Suction Scrubber 10 – 25 psig Definition Compressor 1st Stage Suction Scrubber 100 – 25 psig		
	Reingeration Compressor Zhu Stage Suction Scrubber		
Tag No.	Service	Normal Range	
	Retrigeration Compressor 2nd Stage Suction Scrubber	140 – 230 psig	
PIT-330	Propane Compressor Discharge Scrubber	120 – 230 psig	

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TI-330	Propane Compressor Discharge Scrubber	100 – 150°F
LI-330	Propane Compressor Discharge Scrubber	20% - 30% level
PI-340	Propane Condenser Pressure	140 – 225 psig
TI-340B	Propane Condenser Outlet Temperature (PFD 65 °F)	60 – 90°F
PIT-350	Propane Receiver Pressure	140 – 230 psig
TI-350	Propane Receiver Temperature	60 – 90°F
LI-350	Propane Receiver Level (5% – 20% level
PIT-360	Propane Economizer Pressure	40 – 60 psig
TI-360	Propane Economizer Temperature	10 – 50⁰F
LI-360	Propane Economizer Level	30% – 60% level
TIT-3000	Glycol Reboiler Temperature	240 – 260°F
LG-3000	Glycol Reboiler Level	30% – 60% level
LG-690A	Liquid Storage Tank	25% – 80% level
LG-1001	Waste Gas KO Vessel	10% – 30% level
FI-102-1	Rod # 1 Nitrogen Flow	.23 – 2.223 scfm
FI-110-1	Rod # 1 Total Flow to VOC Flare	.57 – 5.557 scfm
FI-102-2	Rod # 2 Nitrogen Flow	.23 – 2.223 scfm
FI-110-2	Rod # 2 Total Flow to VOC Flare	.57 – 5.557 scfm
FI-102-3	Rod # 3 Nitrogen Flow	.23 – 2.223 scfm
FI-110-3	Rod # 3 Total Flow to VOC Flare	.57 – 5.557 scfm
FI-102-4	Rod # 4 Nitrogen Flow	.23 – 2.223 scfm
FI-110-4	Rod # 4 Total Flow to VOC Flare	.57 – 5.557 scfm
LI-109-1	Refrigeration Comp Buffer Liquid Collection Pot - Cyl 1	0% – 25% level
LI-109-2	Refrigeration Comp Buffer Liquid Collection Pot - Cyl 3	0% – 25% level
LI-109-3	Refrigeration Comp Buffer Liquid Pot Collection - Cyl 2	0% – 25% level
LI-109-4	Refrigeration Comp Buffer Liquid Pot Collection - Cyl 4	0% – 25% level

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4 NORMAL STARTUP

This procedure assumes that process has been purged and packed and the instrumentation is in service.

4.1 **Pre-Startup Checklist**

Pre-Startup Checklist			
Cton	Description	Action	
Step	Description	Action	
1	Hazards	Check site for any unsafe/hazardous conditions such as leaking gas or equipment failures and rectify before start- up.	
2	Complete instrument setpoint checks	Compare instrument setpoints against the instrument setpoint list and make sure they are set correctly.	
3	Complete valve position checks	Compare valve positions against the pre-startup valve position checklist and make sure they are in the proper position.	
4	Manually shut in liquid controllers	 Close manual block valves on liquid level controllers: Cold separator glycol boot level LIC-140A by closing V-703 Cold separator product level LIC-140B by closing V-701 Stabilizer bottoms level LIC-150 by closing V-813 	
5	Close inlet gas valve	Close block valve on inlet filter outlet, V-104	

4.2 Site Start-up

Start-up	Start-up			
Step	Description	Action		
1	Pre Start Checklist	Complete Pre Start Checklist in section 4.1		
2	Establish flow to site	 Verify the gathering system pressure at FIT-010 at plant inlet Verify Facility Inlet 6" Manual block valve V-100 is in the closed position. Verify Facility Outlet 4" Manual block valve V-503 is in the closed position. Verify that the pneumatic ESD system is reset. Note: There is a 10 minute over-ride that can be activated from the HMI graphic screen that will allow you to open the LY-112 solenoid valve to re-pressurize the pneumatic ESD system. The LY-112 solenoid valve has a 3/64" restriction orifice to restrict the amount of flow. Press the ESD reset button located on the front of the PLC cabinet or HMI screen. Equalize the Facility inlet pressure across the 6" Manual block valve V-100 then fully open. Set up fuel gas to go through Fuel Gas Scrubber 		

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Start-up	Start-up			
Sten	Description	Action		
Step	Description	 S-175 by opening V-101 at LP inlet filter and V-403 behind HP outlet filter Equalize the Facility outlet pressure across the 4" Manual block valve then fully open. 		
4	Place Deethanizer Reboiler unit in service (H-165)	 Verify Deethanizer Reboiler level LG-160 is at least 50% Note: In cold ambient conditions level may be slightly less prior to start-up Reset Kimray fuel gas reset by pushing small lever on side up Close the pilot and main burner manual ball valves V-904 & V-905 Caution: Verify LEL is 0% in fire box before proceeding. Do not stand in front of the lighting port, flame arrestor element or firetube during ignition, stand to the side, and up-wind, if possible of the lighting port and end plate of the firetube. Press the auto igniter and slowly open the pilot gas supply and listen for ignition. If the pilot does not ignite, close the pilot gas supply valve. Wait 5 minutes to allow the heater to draft. Re-check for 0% LEL before re-lighting the pilot. Once the pilot has been lit slowly open the main burner valve. The flame should be centered in the firetube. The burner should be regulated for continuous firing when possible. Allow heater to come up to 180 degrees. Observe temperature controller for proper operation. 		
5	Place Glycol EG unit in service (EBC-3000)	 Verify glycol Reboiler level LG-3000 shows at least 50% Reset Kimray fuel gas reset by pushing small lever on side up Close the pilot and main burner manual ball valves V-1710 & V-1711 Remove 2" burner pipe cap Caution: Verify LEL is 0% inside the fire box before proeceeding. Do not stand in front of the lighting port, flame arrestor element or firetube during ignition, stand to the side, and up-wind, if possible of the lighting port and end plate of the firetube. Light igniter and insert it into 2" burner pipe Open the pilot gas valve V-1711 to light pilot Replace 2" burner by slowly opening the main burner manual block valve V-1710 Allow Reboiler temperature to reach 250 deg °F at TIT-3000 		
6	Starting Feed Inlet Gas	Walk around unit and inspect for oil or coolant leaks		

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Start-up			
Step	Description	Action	
	Compressor (CG-001)	Action Send personnel to meter station to standby to blow drip Crack open 8"suction valve V-104 to pressurize to 10 - 50 psig. Note: If compressor pressure exceeds 50 psig, reduce to 10 - 50 psig before proceeding. Close compressor 8" suction valve V-104 Open 2" Startup by-pass valve V-201 Open 2" Manual blow down valve V-202 to lower the pressure down to 10 to 40 psig. Turn selector switch to Auto position Press reset on Murphy Controller Toggle compressor HMI panel switch to idle mode Press Run/Stop button on Murphy Controller Note: Unit will pre-lube engine and compressor. Engine will roll and enter purge cycle. Ignition turns on. Fuel turns on. Engine should start. If unit fails to start within 60 seconds, turn selector switch back to off/reset, wait five minutes and then try to restart. Check pressure gauges and panel display for proper operation Allow jacket water to reach 140 deg and cylinder temperature to reach 130 deg. Close 2" startup bypass valve V-201 Slowly open the 8" suction block valve V-104 Have personnel at meter station blow drip as needed Note: There is a suction pressure controller which controls the maximum suction pressure to prevent overloading of the unit.	
7	Establish glycol flow	 Verify plant discharge flowrate is at least 3.5mm/d Start one Glycol Pump Monitor the pump discharge pressure PC-550 set @ 700 psig Note: Set 50 psig above the process feed pressure 	
8	Starting Refrigeration System (CG-002) Starting Refrigeration System (CG-002) Cont.	 Walk around unit and inspect for oil or coolant leaks Close compressor suction valve V-1300 Open 2" Startup by-pass valve V-1301 (8" Line coming soon) Open 2" Manual blowdown valve V-1308 to lower the suction pressure down to < 20 psig Press and hold the pre-lube button Reset the Altronic Annuciator panel Press and hold the Start button Verify startup and allow jacket water to reach 140 deg and cylinder temperature to reach 130 deg. Close 2" Startup by-pass valve V-1301 Slowly open the suction block valve V-1300 to pull 	

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Start-up			
Step	Description	Action	
		the pressure down on the gas Chiller. Monitor the temperatures and operation Note: The propane condenser cooler fans have VFD controls that control the discharge pressure. Note: There is a suction pressure controller which controls the maximum suction pressure to prevent overloading of the unit.	
9	Put liquid level controllers in service	 Once a liquid level is visible in the sight glass open the following level controller block valves: Cold separator glycol boot level, LIC-140A via V-703 Cold separator product level, LIC -140B via V-701 Stabilizer bottoms level, LIC-150 via V-813 	

5 **EMERGENCY OPERATIONS**

5.1 Un-controlled fire or release

Uncontrolled fire or release Response			
Step	Description	Action	
1	Notification	Notify Supervision and/or Manager	
2	Activate Site ESD	If conditions permit, activate ESD Note: The pneumatic ESD system is activated when the pressure is lost in the system due a hand pull station being activated or a fusible link on the compressors is melted out due a fire being present. The pneumatic ESD system can also be activated by pulling the ESD pull hand switch located on the PLC cabinet door.	
3	ERP	Initiate Emergency Response Plan	
4	Isolate Wellhead Gas Flow	If conditions permit, close plant inlet manual block valve V-100	
5	Isolate Delivery Gas Flow	If conditions permit, close pipeline injection site manual block valve V-503	
6	Deny Access	Make a reasonable attempt to keep people from entering the affected area	

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Stewart Facility ESD System Diagram



6 Normal Shutdown

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6.1 Normal Site Shut-down

Site Shu	t-down	
Step	Description	Action
1	Shut In Well Site	 Notify Atlas well tender that we will be shutting down the facility so they can block in their wellsite
2	Shutdown Refrigeration Compressor (CG-002)	 Return potentiometer completely counter clockwise for idle or place auto speed switch to off position. Shutdown driver by turning the switch on the
		 caterpillar monitor panel to stop or by pushing the stop button on compressor monitor panel. Move bypass valve to bypass position.
		 Vent unit to normal suction pressure. Shut suction valve on systems without suction
		 After post lube complete, shut off power on caterpillar and compressor monitor panels.
3	Shutdown Glycol Reboiler System (EBC-3000)	 Shut-down glycol circulation pump Close main burner fuel supply valve Close pilot fuel gas supply valve
4	Shutdown Deethanizer Reboiler (H-165)	 Close main burner fuel supply valve Close pilot fuel gas supply valve
5	Shutdown Inlet Feed Gas Compressor (CG-001)	 Bring unit back to idle with governor setting. Shutdown by pushing unit fuel valve up to closed position. Move bypass valve to bypass position.
		 Vent unit to normal suction pressure. Shut suction valve on systems without suction auto pressure control.
		Shut off power for compressor monitor panels.

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7 STARTUP FOLLOWING TURNAROUND OR ESD

7.1 Complete Valve Position Checklist

7.2 Refer to Section 4.2, Site Startup

8 Truck Loading

Note: LMM personnel must supervise all truck loadingTruck driver must not leave the truck unattended while loading

Step	Action
All Truck	Drivers must receive "Truck Loading" and "Visitor Orientation" training prior to GL from the storage tanks.
The NGL prior to the Truck pull	Truck Loading area shall be verified that no gas is present by sniffing the area e Truck pulling into the loading area. "No exceptions" The same goes for the ing out of the loading area.
At no time keys will b running of	e shall a NGL truck be started or running when the trailer is being loaded. The be removed from the vehicle's ignition system to prevent the vehicle from r being started during the loading period.
Every attended necessary	empt should be made to avoid situations requiring a truck to back up. If it is , there must be a spotter behind the truck in constant view with the driver.
1	Log tank levels prior to loading
2	Verify that the trailer inspection and re-testing date is current
3	Verify the area where the truck will drive is clear of any gas as evidenced by a 0% LEL reading on a calibrated gas detector.
4	Spot Truck at loading site
5	The Truck keys are to be removed from the ignition and placed in plain view
6	Set parking brakes and chock wheels
7	Connect ground clamp
8	Place liquid load valves from tank/tanks at halfway opened position
9	Connect liquid loading hose
10	Connect vapor return hose
11	Open liquid loading valve on load hose
12	Open truck liquid loading valve or valves
13	Allow tank pressure to push liquid into tanker until storage tank and truck tanker pressures equalize
14	Monitor truck liquid level and when 50% level is achieved, pull liquid sample (if sample is due)
15	Finish loading truck tanker using the electric driven loading pump
16	Monitor truck liquid level and when max level is achieved, shutdown the truck loading pump
17	Close truck loading valves
18	Close vapor return hose valve and disconnect hose
19	Close liquid load hose valve and disconnect hose
20	Disconnect ground clamp
21	Remove wheel chocks
22	Sniff the NGL loading area to insure that gas is not present

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Step	Action
23	The Truck keys can be given to the driver once the area has been deemed safe to start the vehicle.
24	Escort truck to exit gate
25	Log tank levels after loading

9.0

9.1 Relief Valves

Stewart Facility - Pressure Safety Valves		
Tag Number	Service	Set Pressure (psig)
PSV-001A	Plant Inlet Pipeline	250
PSV-001	L.P. Inlet Filter Separator	1440
PSV-025	Feed Comp 1st Stage Discharge	<mark>645</mark>
PSV-035	Feed Comp 2nd Stage Discharge	1292
PSV-045	Feed Comp 2nd Stage Discharge	<mark>1292</mark>
PSV-050B	Fuel Gas Scrubber	60
PSV-050A	Starter Gas	165
PSV-046	Feed Compressor Discharge	1000
PSV-100	H.P. Inlet Filter Separator	1000
PSV-110A	Gas/Gas Exchanger Inlet Side	1000
PSV-110B	Gas/Gas Exchanger Residue Side	1000
PSV-130A	Chiller - Tube Side	1000
PSV-130B	Chiller – Shell Side	210
PSV-140	Cold Separator	1000
PSV-150	Deethanizer Column	250
PSV-190	Liquid Product Cooler	250
PSV-160	Deethanizer Heater Coil Bundle	250
PVV-160A	Deethanizer Reboiler Shell Side	4 Ounces /in² Pressure
PVV-160B	Deethanizer Reboiler Shell Side	4 Ounces / in ² Pressure

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PSV-165	Deethanizer Reboiler Fuel Pot	275
PSV-112	Nitrogen Pneumatic ESD System	150
PSV-100A	VOC Flare	15
PSV-100B	VOC Flare	15
PSV-1001	Waste Gas KO Vessel	<mark>150</mark>
PSV-100C	<mark>K.O. Pot</mark>	<mark>125</mark>
PSV-690	Liquid Storage Tank	50
PSV-600-1	Natural Gas Liquid Storage Tank	250
PSV-600-2	Natural Gas Liquid Storage Tank	250
PSV-605-1	Natural Gas Liquid Storage Tank	250
PSV-605-2	Natural Gas Liquid Storage Tank	250
PSV-610-1	Natural Gas Liquid Storage Tank	250
PSV-610-2	Natural Gas Liquid Storage Tank	250
PSV-601A	NGL Pump Suction Piping	<mark>?</mark>
PSV-601B	NGL Pump Suction Piping	<mark>?</mark>
PSV-601C	NGL Pump Discharge Piping	<mark>?</mark>
PSV-601D	NGL Pump Discharge Piping	<mark>?</mark>
PSV-601E	NGL Pump Discharge Piping	<mark>?</mark>
PSV-600A	NGL Pump Discharge	45 psid
PSV-600B	NGL Pump Discharge	45 psid
PSV-700	NGL Truck Loading Meter	450
PSV-200	Fuel Scrubber	285
PSE-210	Vent Scrubber (Rupture Disk)	150
PSV-220A	Vent Scrubber Pump	125
PSV-220B	Vent Scrubber Pump	125
	Luke Oil Dreis Teals	0
	Lube Oil Drain Tank	<mark>?</mark>
PVV-	Produced Liquid Tank	? ?
PVV- PSV-5A1	Produced Liquid Tank Refrigeration Suction	275
PVV- PSV-5A1 PSV-5A2	Produced Liquid Tank Refrigeration Suction Refrigeration 1st Stage Discharge	? 275 275
PVV- PSV-5A1 PSV-5A2 PSV-5A3	Lube Oil Drain Tank Produced Liquid Tank Refrigeration Suction Refrigeration 1st Stage Discharge Refrigeration 2nd Stage Discharge	? 275 275 635

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PSV-11A3	Fuel Gas Scrubber	270
PSV-XX5	Starter Gas –	165
PSV-330	Propane Compressor Discharge Scrubber	300
PSE-340	Propane Condenser (Rupture Disk)	300
PSV-350	Propane Receiver	300
PSV-360	Propane Economizer	265
PSV-4015	Lean EG to Chiller/Gas/Gas	1000
PSV-4000	Glycol Pump Discharge	1440
PSV-4010	Glycol Pump Discharge	1440
PSV-3000	Glycol Reboiler	2
PSV-3001	Glycol Reboiler Fuel Gas Supply	125

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10 Alarm Response Table (Work in Progress) Reference Cause & Effects

Tag Number	Normal Operating Limits	Deviation Description	Possible Causes	Consequences of Deviation	System Response to Correct the Deviation	Steps Taken By Operator to Correct or Avoid the Deviation
PHH 001A	60 -100 psig	High Site Inlet Pressure	Pressure control device failure at well site	Lost Production	PSV-001A Set @ 250 psig	Contact Producer about pressure control device at well site
LSH-001	Middle of sight glass	High liquid level in inlet separator	Dump Valve not opening float not actuating	Liquid carryover to 1st Stage Suction Scrubber	Process shutdown	Check liquid float/ dump-valve assembly for proper operation
TSLL-3000	350-380 deg. F	Glycol Reboiler Low Temp	Burner not running	Lost Production	Process shutdown	Check Glycol burner management system for proper operation
	>-20deg F	Cold Separator Dump Line Temperature Low	Hot Gas Bypass Valve not opening	Lost Production	Process Shutdown	Trouble-shoot hot gas bypass temperature control loop
	>5psig	Gas/Gas Exchanger Differential Pressure High	Hydrate Freeze in tubes side	Lost Production	Process Shutdown	Correct/Monitor methanol injection rate
	<70%	NGL Storage Tank 1 High Level	Not trucking liquids out of site	Lost production	Process shutdown	Schedule truck to haul liquids
	<185psig	NGL Storage Tank 1 High Pressure	Vapor recovery eductor malfunction Cold Separator liquid dump control stuck open	Lost production	Process shutdown	Check operation of vapor recovery eductor. Check operation of Cold Separator liquid dump controls
	<70%	NGL Storage Tank 2 High Level	Not trucking liquids out of site	Lost production	Process shutdown	Schedule truck to haul liquids

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	>50%	Cold Separator high high liquid level	Failure of level control system	Lost production	Process shutdown	Troubleshoot level control system
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