SPEC (J447/8)
60 MM CRYO PLANT (SC6) W/ REFRIG (SR20C)
CAUSE & EFFECT

OK PE # 4327, TX PE # F-7531

LEGEND:
X = EVENT
O = SEE NOTES OR COMMENTS FOR CONDITIONAL ACTION
S = SPECIAL VALUE FOR THIS PROJECT

ACTIONS BASED ON ATTENDED OPERATION

CAUSE		P&ID	SET POINT		DISPLAY ON LOCAL OPERATOR SCREEN	SOUND ALARM HORN / TURN ON ALARM BEACON	CLOSE UNIT GAS INLET / SOV-XXX / OWNER	REGEN GAS COMPRESSOR - STOP / C-141 / 447-221	REGEN GAS COMPRESSOR LUBE OIL PUMP - STOP / P-141 / 447-221	REGEN GAS COMPRESSOR OIL COOLER - STOP / A-141 / 447-221		DEHYDRATION SWITCHING CONTROL - STOP / V-443/444 / 447-222	REGEN GAS COOLER FAN - STOP / A-341A/B / 447-223	REGEN GAS HEATER - SHUTDOWN / H-741 / 447-223	REGEN GAS HEATER INLET BLOCK - CLOSE / SOV-741A / 447-223
ESD-1	LOCAL ESD ON PANEL		N/A		X	X	X	X	X	X		X	X	X	X
ESD-2	REMOTE SHUTDOWN		N/A		X	X	X	X	X	X		X	X	X	X
	LOSS OF RESIDUE COMPRESSORS (BY OTHERS)		N/A		X	X									
LAHH-441A	F-441 INLET FILTER/COALESCER UPPER LEVEL HIGH HIGH	447-221	NA		X	X	X	X	X	X		X		X	
LAHH-441B	F-441 INLET FILTER/COALESCER LOWER LEVEL HIGH HIGH	447-221	NA		X	X	X	X	X	X		X		X	
PDAHH-441	F-441 INLET FILTER/COALESCER DIFFERENTIAL PRESSURE HIGH HIGH	447-221	12 PSID		X	X	X	X	X	X		X		X	
PDAHH-448	F-448 MOL SIEVE DUST FILTER DIFFERENTIAL PRESSURE HIGH HIGH	447-221	12 PSID		X	X	X	X	X	X		X		X	
PDAHH-447	F-447 MOL SIEVE DUST FILTER DIFFERENTIAL PRESSURE HIGH HIGH	447-221	12 PSID		X	X	X	X	X	X		X		X	
PALL-141	C-141 REGEN GAS COMPRESSOR LUBE OIL PRESSURE LOW LOW	447-221	10 PSI ↓		X	X		X							
PAL-141	C-141 REGEN GAS COMPRESSOR LUBE OIL PRESSURE PERMISSIVE TO RUN	447-221	12 PSI ↑					O		**PERMISSIVE TO RUN**					
FALL-141A	C-141 REGEN GAS COMPRESSOR FLOW RATE LOW LOW	447-221	4.1 MMSCFD		X	X		X	X	X			X	X	
PAHH-141	C-141 REGEN GAS COMPRESSOR SUCTION PRESSURE HIGH HIGH	447-221	985 PSIG		X	X		X	X	X		X	X	X	
XA-141A	C-141 REGEN GAS COMPRESSOR SHUTDOWN	447-221	NA		X	X			X	X	**NOTE 4**			X	
TAHH-442	V-442 MOL SIEVE DEHYDRATOR OUTLET TEMP HIGH HIGH	447-222	140 F		X	X	X	X	X	X		X		X	X
VAHH-341A/B	A-341 REGEN GAS COOLER VIBRATION HIGH HIGH	447-223	NA		X	X							X		
TAHH-341B	A-341 REGEN GAS COOLER OUTLET TEMP HIGH HIGH	447-223	150 F		X	X		X	X	X		X		X	
LAHH-447	V-447 REGEN GAS SCRUBBER LEVEL HIGH HIGH	447-223	NA		X	X	X	X	X	X		X		X	
XA-741A	H-741 REGEN GAS HEATER STACK TEMP HIGH HIGH	447-223	720 F	S	X	X		X	X	X				X	X
ZSO-741A	SDV-741A REGEN GAS SDV OPEN	447-223	NA					X	X	X					
ZSO-44XB/C/D	XV-44XD OPEN AND EITHER XV-44XB OR XV-44XC OPEN. X=2 OR 3	447-222	NA					X	X	X					
PDAHH-206B	E-206 DEMTHANIZER REFLUX CONDENSER INLET STRAINER DP HIGH HIGH	447-231	10 PSID		X	X	X	X	X	X		X		X	
TALL-201B	E-201 RESIDUE GAS OUTLET TEMP LOW LOW	447-231	20 F		X	X									
PAHH-501B	T-501 DEMETHANIZER PRESSURE HIGH HIGH	447-232	360 PSIG		X	X	X								
TALL-501A	T-501 DEMETHANIZER PRODUCT TEMPERATURE LOW LOW	447-232	(-) 20 F		X	X									
PDAHH-501	T-501 DEMETHANIZER DIFFERENTIAL PRESSURE HIGH HIGH	447-232	10 PSID		X	X		X	X	X		X		X	
TAHH-101A	EC-101 EXPANDER COMPRESSOR OUTLET TEMPERATURE HIGH HIGH	447-233	200 F		X	X									
SAHH-101	EC-101 EXPANDER COMPRESSOR OVER SPEED	447-233	LATER	S	X	X									
PDAHH-101B	EC-101 EXPANDER INLET SCREEN DIFFERENTIAL PRESSURE HIGH HIGH	447-233	10 PSID		X	X									
LAHH-402	V-402 COLD SEPARATOR LEVEL HIGH HIGH	447-234	NA		X	X	X								
TALL-402A	V-402 COLD SEPARATOR TEMPERATURE LOW LOW	447-234	(-) 50 F		X	X									
TAHH-101X	H-101 SEAL GAS HEATER TEMPERATURE HIGH HIGH	447-233	150 F		X	X									
TAHH-101H	H-101 SEAL GAS HEATER SURFACE TEMPERATURE HIGH HIGH	447-233	140 F		X	X									

CAUSE	DEMETHANIZER REFLUX FLOW VALVE - DRIVE TO 0% / FCV-501 / 447-232	DEMETHANIZER REFLUX FLOW VALVE - CLOSE / SOV-501 / 447-232	EC-101 SEAL GAS HEATER - SHUTDOWN / H-101 / 447-233	EC-101 TURBO EXPANDER - SHUTDOWN / EC-101 / 447-233	EC-101 JT VALVE - CLOSE / SOV-402B / 447-233	V-402 COLD SEP LIQUID LVL CNTRL VLV - CLOSE / SOV-402 / 447-234	V-402 COLD SEP LIQUID FLOW CNTRL VLV - CLOSE / SOV-402A / 447-234	METHANOL INJECTION PUMP - STOP / P-609 / 447-234	A-301 EXP/COMPR/AFTER CLR FAN A/B - STOP / A-301 X / 447-234	V-404 PROD. SURGE TK INLET BLOCK - CLOSE / SOV-404A / 447-235	V-404 PROD. SURGE TK OUTLET BLOCK - CLOSE / SOV-404C / 447-235	V-404 PROD. CHARGE PUMP RECYCLE VLV CLOSE / SOV-404 / 447-235	PRODUCT CHARGE PUMP - STOP / P-601 / 447-236	PRODUCT CHARGER PUMP - STOP / P-602 / 447-236	REFRIGERANT CONDENSER COOLER FAN X - STOP / A-361X / 448-246	E-203 CHILLER SHELL SIDE INLET BLOCK - CLOSE / SOV-203 / 448-247	V-462 REFRIG ECONOMIZER OUTLET BLOCK - CLOSE / SOV-462 / 448-247	REFRIGERANT COMPRESSOR - STOP / C-161 / 448-248	REFRIGERANT COMPRESSOR - STOP / C-162 / 448-248	HMO HEATER SHUTDOWN / H-781 / 447-291	PCV-481A FUEL GAS SHUTOFF / SOV-481A / 447-296
ESD-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ESD-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LOSS OF RESIDUE COMPRESSORS (BY OTHERS)	X	X		X	X	X	X														
LAHH-441A	X	X		X	X	X	X														
LAHH-441B	X	X		X	X	X	X														
PDAHH-441	X	X		X	X	X	X														
PDAHH-448	X	X		X	X	X	X														
PDAHH-447	X	X		X	X	X	X														
PALL-141																					
PAL-141																					
FALL-141A																					
PAHH-141																					
XA-141A																					
TAHH-442	X	X		X	X	X	X														
VAHH-341A/B																					
TAHH-341B																					
LAHH-447																					
XA-741A																					
ZSO-741A																					
ZSO-44XB/C/D																					
PDAHH-206B	X	X		X	X	X	X														
TALL-201B	X	X		X	X	X	X														
PAHH-501B	X	X		X	X	X	X														
TALL-501A	X	X		X	X	X	X			X											
PDAHH-501	X	X		X	X	X	X														
TAHH-101A				X																	
SAHH-101				X																	
PDAHH-101B				X																	
LAHH-402	X	X		X	X																
TALL-402A				X																	
TAHH-101X			X																		
TAHH-101H			X																		

NOTES:
1. AN ALARM WILL SOUND WHENEVER A MOTOR OR UNIT STOPS WITHOUT AN OPERATOR'S COMMAND
2. STOP PRODUCT PUMPS WHEN LINED UP STORAGE TANKS HAS LOW LOW LEVEL.
3. IF ALL REFRIGERATION COMPRESSORS ARE STOPPED DE-ENERGIZE SOV-203, SOV-462, AND CLOSE LCV-203
4. P-141 & A-141 RUN FOR 30 SECONDS AFTER C-141 SHUTDOWN
5. FALL-602 IS BYPASSED FOR 90 SECONDS AFTER STARTING EITHER PUMP
6. AT LEAST ONE A-361 FAN MUST BE RUNNING WHEN A COMPRESSOR C-161/2 IS STARTED

S Indicates calculated number

PRINT DISTRIBUTION RECORD

REV	FA	A	SHOP	FIELD	CUST.		Q.C.	P.E.

REVISIONS

REV	DESCRIPTION	BY	DATE	APP	DATE
A	ISSUED FOR REVIEW	GDG	5/26/2016		

CONFIDENTIAL

UOP Russell LLC.
PROJECT J447/448
Tulsa, Oklahoma

CAUSE & EFFECT
SHEET 1 OF 2

60 MMSCFD CRYO PLANT

DRAWN BY	RLC	CHK'D BY	TRCO	APPVD. BY	SCALE	DWG. NO.
DATE	3/12/2014	DATE		DATE	NONE	447-C&E-1

SPEC (J447/8)
60 MM CRYO PLANT (SC6) W/ REFRIG (SR20C)
CAUSE & EFFECT

OK PE # 4327, TX PE # F-7531

LEGEND:
X = EVENT
O = SEE NOTES OR COMMENTS FOR CONDITIONAL ACTION
S = SPECIAL VALUE FOR THIS PROJECT

ACTIONS BASED ON ATTENDED OPERATION

EFFECT

	CAUSE	P&ID	SET POINT		DISPLAY ON LOCAL OPERATOR SCREEN	SOUND ALARM HORN / TURN ON ALARM BEACON	CLOSE UNIT GAS INLET	REGEN GAS COMPRESSOR - STOP	REGEN GAS COMPRESSOR LUBE OIL PUMP - STOP	REGEN GAS COMPRESSOR OIL COOLER - STOP	DEHYDRATION SWITCHING CONTROL - STOP	REGEN GAS COOLER FAN - STOP	REGEN GAS HEATER - SHUTDOWN	REGEN GAS HEATER INLET BLOCK - CLOSE	DEMETHANIZER REFLUX FLOW VALVE - DRIVE TO 0%	DEMETHANIZER REFLUX FLOW VALVE - CLOSE	EC-101 SEAL GAS HEATER - SHUTDOWN	EC-101 TURBO EXPANDER - SHUTDOWN	EC-101 JT VALVE - CLOSE	V-402 COLD SEP LIQUID LVL CNTRL VLV - CLOSE	V-402 COLD SEP LIQUID FLOW CNTRL VLV - CLOSE	METHANOL INJECTION PUMP - STOP	A-301 EXP/COMPR/AFTER CLR FAN A/B - STOP	V-404 PROD. SURGE TK INLET BLOCK - CLOSE	V-404 PROD. SURGE TK OUTLET BLOCK - CLOSE	V-404 PROD. CHARGE PUMP RECYCLE VLV CLOSE	PRODUCT CHARGE PUMP - STOP	PRODUCT CHARGER PUMP - STOP		REFRIGERANT CONDENSER COOLER FAN X - STOP	E-203 CHILLER SHELL SIDE INLET BLOCK - CLOSE	V-462 REFRIG ECONOMIZER OUTLET BLOCK - CLOSE		REFRIGERANT COMPRESSOR - STOP	REFRIGERANT COMPRESSOR - STOP		HMO HEATER SHUTDOWN	PCV-481A FUEL GAS SHUTOFF
				TAG			SOV-XXX	C-141	P-141	A-141	V-443/444	A-341A/B	H-741	SOV-741A	FCV-501	SOV-501	H-101	EC-101	SOV-402B	SOV-402	SOV-402A	P-609	A-301 X	SOV-404A	SOV-404C	SOV-404	P-601	P-602		A-361X	SOV-203	SOV-462		C-161	C-162		H-781	SOV-481A
				P&ID			OWNER	447-221	447-221	447-221	447-222	447-223	447-223	447-223	447-232	447-232	447-233	447-233	447-233	447-234	447-234	447-234	447-234	447-235	447-235	447-235	447-236	447-236		448-246	448-247	448-247		448-248	448-248		447-291	447-296
VAHH-301X	A-301 EXPANDER/COMPRESSOR/AFTERCOOLER VIBRATION HIGH HIGH	447-234	NA		X	X																	X															
TAHH-301	A-301 EXPANDER/COMPRESSOR/AFTERCOOLER OUTLET TEMP HIGH HIGH	447-234	150 F		X	X												X																				
LAHH-404	V-404 PRODUCT SURGE TANK LEVEL HIGH HIGH	447-235	NA		X	X	X								X	X		X	X	X	X			X														
LALL-404	V-404 PRODUCT SURGE TANK LEVEL LOW LOW	447-235	NA		X	X																			X		X	X										
PAHH-601	P-601 PRODUCT CHARGE PUMP SEAL FAILURE	447-236	15 PSIG		X	X																					X											
PAHH-602	P-602 PRODUCT CHARGE PUMP SEAL FAILURE	447-236	15 PSIG		X	X																						X										
FALL-602	P-601/2 PRODUCT CHARGE PUMP FLOW LOW LOW	447-236	113 GPM		X	X																					X	X	NOTE 5									
FAHH-602	P-601/2 PRODUCT CHARGE PUMP FLOW HIGH HIGH	447-236	FIELD		X	X																					X	X										
ZSO-404C	SDV-404C PRODUCT SURGE TANK OUTLET VALVE OPEN	447-235	NA																								X	X										
VAHH-361X	A-361 REFRIGERANT CONDENSER FAN X (APPLIES TO A-361 A, B, C)	448-246	NA		X	X																								X								
LAHH-461	V-461 REFRIGERANT SUCTION SCRUBBER LEVEL HIGH HIGH	448-247	NA		X	X																												X	X			
LAHH-462	V-462 REFRIGERANT ECONOMIZER LEVEL HIGH HIGH	448-247	NA		X	X																										X		X	X			
XA-161	C-161 REFRIG COMPR STOPPED	448-248	N/A		X	X																									O	O	NOTE 3					
XA-162	C-162 REFRIG COMPR STOPPED	448-248	N/A		X	X																									O	O	NOTE 3					
XA-361A/B/C	A-361A/B/C COND FAN RUNNING	448-246	NA																															X	X	NOTE 6		
FALL-781	H-781 HMO HEATER OUTLET FLOW LOW LOW	447-291	116 GPM	S	X	X																															X	
XA-781A	H-781 HMO HEATER STACK TEMP HIGH HIGH	447-291	NA		X	X																															X	
PAHH-481A	V-481 FUEL GAS SCRUBBER PRESSURE HIGH HIGH	447-296	150 PSIG		X	X								X																							X	X
LAHH-481	V-481 FUEL GAS SCRUBBER LEVEL HIGH HIGH	447-296	NA		X	X								X																							X	X
LAHH-492	V-492 COLD DRAIN TANK	447-298	NA		X	X	X	X	X	X	X		X		X	X	X	X	X	X	X									X	X	X		X	X		X	X
PALL-991	INSTRUMENT AIR PRESSURE LOW LOW (BY OTHERS)		75 PSIG		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X		X	X

NOTES:
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REV	DESCRIPTION	BY	DATE	APP	DATE
A	ISSUED FOR REVIEW	GDG	5/26/2016		

REVISIONS

CONFIDENTIAL

UOP Russell LLC
PROJECT J447/448
Tulsa, Oklahoma

CAUSE & EFFECT
SHEET 2 OF 2

60 MMSCFD CRYO PLANT

DRAWN BY RLC	CHK'D BY TRCO	APPVD. BY	SCALE	DWG. NO.
DATE 3/12/2014	DATE	DATE	NONE	447-C&E-2