



Annex H

Hazard and Risk Assessment



PROJECT NUMBER: S04051

HydroDec Development Corporation

**UPGRADING TRANSFORMER OIL
REGENERATION FACILITY TO 25,000 LPD**

HAZOP and Layout Review Minutes

Location: PDF Sydney Board Room
Dates: 16th and 17th February 2005

Attendees:	Name	Company	Position
	David Hornby	Pdf	Facilitator
	Peter Skoljarev	Pdf	Project engineer
	Jim Middleton	Pdf	Senior Process Engineer
	Keith Koomen	Project Solutions Aust.	Manager
	Matthew Koomen	Project Solutions Aust.	Project Coordinator
	Greg Duffy	CSIRO	Research Scientist
	Mark McNamara	HydroDec	Chief Operating Officer
	Ken Maxwell	Dickinson	Sales Director

Circulation : Pdf Project Manager
Pdf Facilitator
All Attendees

PDF APPROVED SIGNATURE DATE

Client APPROVED SIGNATURE DATE

**HYDRODEC DEVELOPMENT CORPORATION
HAZOP**

OVERVIEW

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY OVERVIEW LOG SHEET						Project Number: S04051			
Session:	Overview	P&ID Title:				Project Name: TRANS. OIL PLANT					
Unit:		P&ID No.: S04051-0010, 0011, 0012 & 0013									
Line or Equip. No.:		Prepared By: Peter Skoljarev				Date: 17 February 2005					
Design Intention:											
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS
1	Toxicity	1) High levels of PCB in feed oil (up to 1000ppm) 2) Exposure of personnel to transformer oil 3) Exposure of personnel to ammonia and caustic 4) Exposure of personnel to catalyst (Ni/Mo with Al ₂ O ₃) 5) Exposure of personnel to DMDS (Dimethyl Disulphide) at start up	1&2) Exposure of personnel to PCB and transformer OIL 3) Possible burns 4) Airborne dust hazard 5) Toxic Hazard	1&2) Existing procedures for oil handling (used and finished product) 3) Existing procedures for caustic and ammonia handling 4) Existing procedures for catalyst handling 5) Existing procedures for DMDS handling				5) Set up handling facilities	5) Hydrodec		
2	Services	1) Power, compressed air, Ni, He, water, chilled water, effluent						Outside of scope of HAZOP			
3	Materials of Construction	1) C/Steel and FRP Vessels with S/Steel tube	None								
4	Commissioning & Start Up	1) Pressure Testing	1) Difficulty to test					1) Sufficient isolation on equipment to effectively carry out testing	1) Hydrodec		
5	Shutdown		None								
6	Breakdown	1) Lack of UPS	1) Loss of plant control	1) None				1) Install UPS for DCS and other equipment that requires power to safely shutdown the plant 2) Review requirement for Genset for emergency power 3) Review requirement for redundancy on DCS	1) Dickinson 2) Dickinson 3) Dickinson		

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OVERVIEW

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY OVERVIEW LOG SHEET						Project Number: S04051				
Session:	Overview	P&ID Title:				Project Name: TRANS. OIL PLANT						
Unit:		P&ID No.:		S04051-0010, 0011, 0012 & 0013								
Node Nos.:		Prepared By:		Peter Skoljarev		Date: 17 February 2005						
Line or Equip. No.:												
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
7	Instruments	1) Instrument failure probability	1) Loss of plant control					1) SIL analysis	1) Dickinson			
8	Effluent	1) Gaseous 2) Effluent 3) Catalyst 4) Spent Caustic		1) Have been reviewed as part of HAZOP				Items 2, 3 & 4 outside of scope of HAZOP	2, 3&4) Hydrodec			
9	Noise	1) Plant site is at Young at urban fringe - quiet area	1) Neighbour disturbance					1) Set max noise of 80dBA on equipment	1) Pdf			
10	Fire and Explosion	Refer to HAZOP notes										
11	Safety equipment	1) Refer to existing site procedures 2) New plant requires safety showers and eye wash stations						2) Safety shower & eye wash stations	2) Hydrodec			
12	Quality, consistency and output	Current procedures in place										
13	Efficiency and simplicity		None									

S = Severity (1 = low, 2 = medium, 3 = high)

L = Likelihood (1 = low, 2 = medium, 3 = high)

R = Risk Ranking = S + L

**HYDRODEC DEVELOPMENT CORPORATION
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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:		1	P&ID Title:		Hydrogenation Section			Project Name: TRANS. OIL PLANT				
Unit:		A										
Node Nos.:		1	P&ID No.:		S04051-0010							
Line or Equip. No.:		PU001, HX001, PU002	Prepared By:		Peter Skoljarev			Date: 16 February 2005				
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) Variable speed drives on pump motors 2) Operator error 3) Failure of control valve on Hydrogen supply line	1) Poor product 2 & 3) Excess hydrogen flow	1) Flow indicator (local) 2 & 3) Pressure relief through oxidiser				1) FI26 and FI27 signal to DCS with FAH and FAL 2) Carry out operator training to address potential errors 3) Automated control of Hydrogen Flow	1) Pdf 2) Hydrodec 3) Pdf			
2	No or Low Flow / Level	1) Failure of VSD on pump (PU001) 2) Failure of VSD on pump (PU002) 3) Operator Error 4) Failure of control valve on Hydrogen supply line 5) Empty supply bottles 6) Leaking HX001	1) Damage to catalyst 2) None 3) See item 1) above 4 & 5) Loose system pressure, off spec oil produced 6) Off spec oil	1) Flow indicator (local) 4 & 5) None 6) QA				1) FI27 signal to DCS with FAH and FAL 4 & 5) PIC 13 to have PAL 6) Annual maintenance check	1) Pdf 4 & 5) Pdf 6) Hydrodec			
3	Reverse Flow	1) Failure of a feed supply line	1) Contamination, Hydrogen, Oil spill etc.	1) Non Return Valves in all supply lines				1) None				
4	High Pressure	See High Flow										
5	Low Pressure / Vacuum	See Low Flow										
6	High Temperature	1) Heater control failure	1) Damaging HT001 and damage to oil					1) HT001 control system to be reviewed 2) Rename all 1501 trips to HT001 3) Review ESD system with learnings from 2000LPD plant	1) Dickinson 2) Pdf 3) Dickinson			

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	1	P&ID Title:	Hydrogenation Section				Project Name: TRANS. OIL PLANT					
Unit:	A											
Node Nos.:	1	P&ID No.:	S04051-0010									
Line or Equip. No.:	PU001, HX001, PU002	Prepared By:	Peter Skoljarev				Date: 16 February 2005					
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
7	Low Temperature	See High Flow										
8	Impurities	1) Metal Contamination in oil 2) Unknown oil supply	1) Poisoning of catalyst 2) Coke heater and cause blockage	1 & 2) QA analysis of supply oil				None				
9	Composition	See impurities										
10	Testing	1) Pressure Testing	1) Delays to plant startup					1) Ensure plant sections can be isolated/pressure tested	1) Hydrodec			
11	Operability / Maintainability	1) Isolation of equipment sections						1) Review existing plant for location of valves	1) Hydrodec			
12	Instruments	See above										
13	Electrical							Review electrical hazardous area zones for plant	Pdf			
14	As Well As		None									

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L = Likelihood (1 = low, 2 = medium, 3 = high)

R = Risk Ranking = S + L

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051			
Session:	1	P&ID Title:	Hydrogenation Section				Project Name: TRANS. OIL PLANT				
Unit:	A										
Node Nos.:	2	P&ID No.:	S04051-0010								
Line or Equip. No.:	RA001 & RA002	Prepared By:	Peter Skoljarev				Date: 16 February 2005				
Design Intention:											
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS
1	High Flow / Level	See Node 1 on Action Log Sheet 1									
2	No or Low Flow / Level	1) Failure of level control system 2) Filter blockage	1) Hydrogen would be released to VE005 2) Level rise in reactor	1) LIC001 and its associated alarms and ESD <1> 2) LIC001 - LAH and two parallel filters				1) Install independent level switch/device for ESD shutdown 2) None	1) Pdf		
3	Reverse Flow		None								
4	High Pressure	1) Variable speed drives on pump motors 2) Operator error 3) Failure of control valve on Hydrogen supply line 4) Blockage of Guard Bed or Reactor	1) Poor product 2 & 3) Excess Hydrogen flow 4) Production loss	1) Flow indicator (local) 2 & 3) pressure Relief through oxidiser 4) PI02 - PAH and QA				1) FI26 and FI27 signal to DCS with FAH and FAL 2) Carry out operator training to address potential errors 3) Automated control of Hydrogen Flow 4) Relocate PI02 to line between HX001 and HT001. Install PT03A and PT03B and remove DPI03	1) Pdf 2) Hydrodec 3) Pdf 4) Pdf		
5	Low Pressure / Vacuum	See Node 1 on Action Log Sheet 1									
6	High Temperature	See Node 1 on Action Log Sheet 1									
7	Low Temperature	See Node 1 on Action Log Sheet 1									
8	Impurities	See Node 1 on Action Log Sheet 1									
9	Composition	See Node 1 on Action Log Sheet 1									
10	Testing	See Node 1 on Action Log Sheet 1						1) Remove automation and hand switch on DV02 for sampling. Replace diaphragm valve with a ball valve			
11	Operability / Maintainability	1) Reactor discharge filtration, F-04A and B and F-05A and B 2) Sticky control valve (LV01) stem - fail to open						1) Replace four filters with two large filters (40 micron). Basket type strainer 2.1) Provide complete spare for LV01. 2.2) Valve change out arrangement in minimum time, without system depressurisation	1) Pdf 2.1) Hydrodec 2.2) Pdf		
12	Instruments	See above									
13	Electrical	See Node 1 on Action Log Sheet 1									
14	As Well As		None								

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HAZOP**

ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	1	P&ID Title:	Hydrogenation Section				Project Name: TRANS. OIL PLANT					
Unit:	A											
Node Nos.:	3	P&ID No.:	S04051-0011									
Line or Equip. No.:	VE002, VE003 & HX003	Prepared By:	Peter Skoljarev				Date: 16 February 2005					
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) Blocked filters 2) Failure of level control	1) Overflow into HX002 and VE004	1) LIC11 - LAH				1) Replace four filters with two large filters (40 micron) upstream of LV11 and LV12. Basket type strainer 2.1) Provide complete spare for LV11 and LV12 2.2) Valve change out arrangement in minimum time, without system depressurisation 3) Remove bypass on filters, leave in drain NV-27 4) Remove second LIC11 5) Add note on LIC12 on VE003 - interface controller 6) Diaphragms to be added to flanges and capillary on LIC12 7) Remove all MV's (meter valves) 8) Remove NV-29, line to have one drain valve only	1) Pdf 2.1) Hydrodec 2.2) Pdf 3) Pdf 4) Pdf 5) Pdf 6) Pdf 7) Pdf 8) Pdf			
2	No or Low Flow / Level	No flow leads to High Level see item 1										
3	Reverse Flow		None									
4	High Pressure	1) See Node 1 on Action Log Sheet 1 2) LV11 fails open	2) Overpressures VE003	2) PCV30				2) Install independent level switch/device on VE002 for ESD shutdown	1) Pdf			
5	Low Pressure / Vacuum		None									
6	High Temperature	1) Loss of Quench Water flow to VE002	1) Operational difficulty	1) TT12 - TAH				None				
7	Low Temperature		None									
8	Impurities		None									
9	Composition		None									

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET					Project Number: S04051				
Session:	1	P&ID Title:	Hydrogenation Section			Project Name: TRANS. OIL PLANT					
Unit:	A										
Node Nos.:	3	P&ID No.:	S04051-0011								
Line or Equip. No.:	VE002, VE003 & HX003	Prepared By:	Peter Skoljarev			Date: 16 February 2005					
Design Intention:											
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS
10	Testing	See Node 1 on Action Log Sheet 1									
11	Operability / Maintainability	See Node 1 on Action Log Sheet 1						1) Remove HX003 2) Replace TT16 with T116 3) Add PP on discharge line from VE003 4) Remove water supply line to HX003	1) Pdf 2) Pdf 3) Pdf 4) Pdf		
12	Instruments							1) Online ammonia gas analysis	1) Dickinson		
13	Electrical		None								
14	As Well As		None								

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:		1	P&ID Title:		Hydrogenation Section			Project Name: TRANS. OIL PLANT				
Unit:		A										
Node Nos.:		4	P&ID No.:		S04051-0011							
Line or Equip. No.:		HX002 & VE004	Prepared By:		Peter Skoljarev			Date: 16 February 2005				
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) Failure of LIC13	1) Operational difficulty and damage to compressors	1) DPIT04				1) Add high and low level switch and alarm on VE004	1) Pdf			
2	No or Low Flow / Level	See above										
3	Reverse Flow		None									
4	High Pressure		None									
5	Low Pressure / Vacuum		None									
6	High Temperature		None									
7	Low Temperature		None									
8	Impurities		None									
9	Composition		None									
10	Testing	See Node 1 on Action Log Sheet 1										
11	Operability / Maintainability							1) Remove bypass around filter F11 2) Add in second isolation valve, drain NV31 in between two valves	1) Pdf 2) Pdf			
12	Instruments	See above										
13	Electrical		None									
14	As Well As		None									

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	1	P&ID Title:	Hydrogenation Section				Project Name: TRANS. OIL PLANT					
Unit:	A											
Node Nos.:	5	P&ID No.:	S04051-0011									
Line or Equip. No.:	VE001, CO001, HX005,	Prepared By:	Peter Skoljarev				Date: 16 February 2005					
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) Purge valve failing 2) High Level in SC001	1) High temperature in Oxidiser 2) Refer to Node 4	None				1) Add PAL to PIC13 (added previously)	1) Pdf			
2	No or Low Flow / Level	1) Compressor C0001 failure	1) No recycled gas flow	1) Low flow alarm on FT11				1) Backup instrument required on FT11	1) Pdf			
3	Reverse Flow		None									
4	High Pressure	1) Blockage in system	1) Reduced or no flow	1) PSV11								
5	Low Pressure / Vacuum		None									
6	High Temperature		None									
7	Low Temperature		None									
8	Impurities		None									
9	Composition		None									
10	Testing	See Node 1 on Action Log Sheet 1										

**HYDRODEC DEVELOPMENT CORPORATION
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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	1	P&ID Title:	Hydrogenation Section				Project Name: TRANS. OIL PLANT					
Unit:	A											
Node Nos.:	5	P&ID No.:	S04051-0011									
Line or Equip. No.:	VE001, CO001, HX005,	Prepared By:	Peter Skoljarev				Date: 16 February 2005					
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
11	Operability / Maintainability							1) Relocate FT11 to recycle gas heater 2) Alternative instruments for mass flow 3) Rename 1501 to HT001 on FIC11 interlock 4) Remove PCV41 5) Remove bypass line around PV13 6) Remove SV-02 7) Swap NV41 and BV14 8) Relocate BV16 and NV42 to discharge of HX006 9) Remove F12 10) Sample point to be removed DV04, NV14	1) Pdf 2) Pdf 3) Pdf 4) Pdf 5) Pdf 6) Pdf 7) Pdf 8) Pdf 9) Pdf 10) Pdf			
12	Instruments	See above										
13	Electrical							Compressor likely to be zone 1 area	Dickinson			
14	As Well As		None									

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	2	P&ID Title:		LMV Pressure Separations		Project Name: TRANS. OIL PLANT						
Unit:	A											
Node Nos.:	6	P&ID No.:		S04051-0012								
Line or Equip. No.:	VE005 and HX004	Prepared By:		Peter Skoljarev		Date: 17 February 2005						
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) High pressure from upstream	1) Liquid in PCV25	1) Oversize design of VE005 and level control LIC21				1) Add demister pad to VE005 2) Diaphragms to be added to DP Cell 3) PCV25 to be installed in vertical orientation 4) Nozzle to have turndown on inlets to VE005 5) Provide spare nozzle for level switch on VE005	1) Pdf 2) Pdf 3) Pdf 4) Pdf 5) Pdf			
2	No or Low Flow / Level	1) Failure of LV21	1) Operational upset	1) Vent line off SE001				1) Rationalise filters from four to two 2) Remove NV37 3) Remove bypass line around filters	1) Pdf 2) Pdf 3) Pdf			
3	Reverse Flow		None									
4	High Pressure	1) PCV25 failure	1) High Pressure in VE005	1) PSV21				1) Add PAH and PAL on PT24	1) Pdf			
5	Low Pressure / Vacuum	1) PCV25 fails open	1) High level in VE005	1) LIC21 - LAH				1) Add PAH and PAL on PT24	1) Pdf			
6	High Temperature	1) Insufficient cooling on reactor effluent line	1) Volatiles carry over into VE008					1) Heat Exchanger prior to VE005 to be reviewed Note : Action point 1 leads to improved environmental performance 2) TAL and TAH on TI25	1) CSIRO 2) Pdf			
7	Low Temperature		None									
8	Impurities		None									
9	Composition		None									
10	Testing		None									
11	Operability / Maintainability							1) Remove drain/catch pot on VE005	1) Pdf			
12	Instruments		None									

**HYDRODEC DEVELOPMENT CORPORATION
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Process Design & Fabrication Pty Ltd		ACTION LOG SHEET						Project Number: S04051				
Session:	2	P&ID Title:	LMV Pressure Separations				Project Name: TRANS. OIL PLANT					
Unit:	A	P&ID No.:	S04051-0012									
Node Nos.:	6	Prepared By:	Peter Skoljarev				Date: 17 February 2005					
Line or Equip. No.:		VE005 and HX004										
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
13	Electrical		None									
14	As Well As		None									

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	2	P&ID Title:		LMV Pressure Separations		Project Name: TRANS. OIL PLANT						
Unit:	A											
Node Nos.:	7	P&ID No.:		S04051-0012								
Line or Equip. No.:	DM001, VE009 and SE001	Prepared By:		Peter Skoljarev		Date: 17 February 2005						
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) PU005 failure	1) High Level in SE001 and loss of production due to plant shutdown	1) LIC23				1) Install vane pump with VSD 2) Remove note 3 3) Review additional nozzle for gravity drain on SE001	1) Pdf 2) Pdf 3) Pdf			
2	No or Low Flow / Level		See above									
3	Reverse Flow		None									
4	High Pressure		None									
5	Low Pressure / Vacuum		None									
6	High Temperature		None									
7	Low Temperature		None									
8	Impurities		None									
9	Composition		None									
10	Testing		None									
11	Operability / Maintainability	2) Interface level control in SE001	2) Water in product oil or insufficient washing	2) None				1) Change nitrogen sparge to air (possibly remove if intermediate water tank installed) 2) Put in break tank between wash water and water injection. Develop method of controlling interface 3) Provide nitrogen purge point on top of SE001 4) Provide Nitrogen blanketing for SE001 (inc conservation vent) 5) Sealed top on SE001 6) Intermediate water tank to be vented	1) Pdf 2) Pdf 3) Pdf 4) Pdf 5) Pdf 6) Pdf			
12	Instruments		None									
13	Electrical		None									
14	As Well As		None									

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	2	P&ID Title:		LMV Pressure Separations		Project Name: TRANS. OIL PLANT						
Unit:	A											
Node Nos.:	8	P&ID No.:		S04051-0012								
Line or Equip. No.:	VE006	Prepared By:		Peter Skoljarev		Date: 17 February 2005						
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) See item 1 on node 4 2) Operator error	2) Overflow of VE006	2) Operator log sheet				2.1) Install sight panel into side of VE006 2.2) Install interface detector and provide alarm 2.3) Install manual oil drain on VE006	2.1) Pdf 2.2) Pdf 2.3) Pdf			
2	No or Low Flow / Level		None									
3	Reverse Flow	1) VE006 at lower pressure then VE008	1) Suck caustic back into VE006	1) None				1) Conservation vent serving VE006 and SE001	1) Pdf			
4	High Pressure	1) Gas generation from oil in VE006 2) High pressure from VE004	1&2) Potential explosive mixture in top of tank	1&2) VE006 currently vented to oxidiser				1&2) Connect vent of SE001 to VE006 and use common conservation vent. 3) The design pressure to be above VE008	1&2) Pdf 3) Pdf			
5	Low Pressure / Vacuum		None									
6	High Temperature	1) VE006 potentially hot	1) Operator safety (potential burn hazard)	1) None				1) PP on VE006	1) Pdf			
7	Low Temperature		None									
8	Impurities		None									
9	Composition		None									
10	Testing		None									
11	Operability / Maintainability	1) Pump out of water on VE006						1) Install manual pump on VE006	1) Pdf			
12	Instruments		None									
13	Electrical		None									
14	As Well As		None									

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ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:		2	P&ID Title:		Catalytic Oxidiser			Project Name: TRANS. OIL PLANT				
Unit:		A										
Node Nos.:		9	P&ID No.:		S04051-0013							
Line or Equip. No.:		VE007, VE008, RA003	Prepared By:		Peter Skoljarev			Date: 17 February 2005				
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
1	High Flow / Level	1) Upstream disturbance	1) Overpressure of VE008	1) None				1) Install a weighted PRV and vent to roof 2) Replace LAH31 to an LIC with LAH and LAL this to send signal to UV05 3) Remove LS02 and signal to UV05 4) Remove UV06	1) Pdf 2) Pdf 3) Pdf 4) Pdf			
2	No or Low Flow / Level	See above										
3	Reverse Flow		None									
4	High Pressure	See High flow										
5	Low Pressure / Vacuum		None									
6	High Temperature	1) High Flow	1) Damaged catalyst, loss of production and emissions to atm	1) None				1.1) Add TAH on TT31 and TT32 Note: Refer to previous HAZOP action items that reduce the risk of venting to catalytic oxidiser 1.2) Catalytic oxidiser to be sourced complete with fan and air heater 1.3) Refractory lining to be investigated	1.1) Pdf 1.2) Pdf 1.3) Hydrodec			
7	Low Temperature	1) Air heater failure	1) Emissions, explosion and fire risk	1) Controls and alarms on air heater				1) None				
8	Impurities		None									
9	Composition		None									
10	Testing		None									

**HYDRODEC DEVELOPMENT CORPORATION
HAZOP**

ACTION LOG SHEET

Process Design & Fabrication Pty Ltd		HAZARDS AND OPERABILITY STUDY ACTION LOG SHEET						Project Number: S04051				
Session:	2	P&ID Title:	Catalytic Oxidiser				Project Name: TRANS. OIL PLANT					
Unit:	A											
Node Nos.:	9	P&ID No.:	S04051-0013									
Line or Equip. No.:	VE007, VE008, RA003	Prepared By:	Peter Skoljarev				Date: 17 February 2005					
Design Intention:												
ITEM	GUIDE WORD	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	S	L	R	RECOMMENDATIONS / COMMENTS	ACTION	DONE	STATUS	
11	Operability / Maintainability							1) Install site glass panel into side of VE008 2) Caustic scrubber vessels to be flanged 3) Remove water seal VE007 4) Remove cylinder and BV-83	1) Pdf 2) Pdf 3) Pdf 4) Pdf			
12	Instruments		None									
13	Electrical		None									
14	As Well As		none									

