SALT RSS-NIR
MID-TERM REVIEW
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QUALITY ASSURANCE & SAFETY

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Process Quality

- SSEC quality processes to be used for NIR
- Described in PMP (SALT-3501BP0001)
- Processes designed to be compliant with ISO9001

Document #	Topic
1008-0002	Document Control
1008-0004	Change Control
1008-0005	Training
1008-0006	Test Equipment Calibration
1008-0007	Project Life Cycle Process (Design Control)
1008-0012	Complaint Handling
1008-0014	Project Safety
1008-0017	Quality Records
1008-0021	Software Development
1008-0024	Project Management Plan

Configuration Management

- Document Control
  - SSEC procedure 1008-0002
  - Uses SALT document numbering convention (e.g. SALT-3501BP0001)
  - Project specific document templates developed
  - Documents viewable thru SSEC document & RSS-NIR websites

- Change Control (ECN procedure)
  - SSEC procedure 1008-0004
  - Used for updating released documents or designs
  - Requires same functions approve updates
  - Assesses impact of change on cost, schedule, design, documents, etc.

Configuration Management (cont.)

- Hardware
  - Controlled thru document & change control processes
  - List of configuration items traceable to model/serial identifiers
  - Parts lists to be maintained for all assemblies in doc control system

- Software
  - Content traceability (to release version)
  - Control of releases
  - Identification of software in use

Safety

- SSEC procedure 1008-0014
- FMEA-based Hazard Analysis
  - Assesses, scores & identifies mitigation to potential risks
  - Human safety, major equipment, environmental & regulatory risks
  - Started early in development
    - Incorporate safety mitigations early in design process
    - Get design staff thinking about safety early in project
  - Mitigations
    - Design changes
    - Training
    - Inspections
    - Operations, PM & service procedures

Safety (cont.)

- Hazard Analysis draft
  - Reviewed w/ engineering staff & lead scientist

ITEM	POTENTIAL HAZARD	FAILURE CAUSE	INITIAL RISK Sev	Prob	Det	RPN	Failure Class	MITIGATION	RESIDUAL RISK Sev	Prob	Det	RPN	EVIDENCE	REQUIREMENTS	STATUS	COMMENTS
NEAR INFRARED SPECTROGRAPH (NIR)																
1.1	CHEMICAL - Incompatability	Heat transfer fluid used in glycol cooling loop incompatible with instrument	2	6	2	24	S	Verify cooling loop mix and additives are compatible with all materials that they comes in contact with.	1	6	1	6	Verify compatibility of cooling loop fluid		Open - evidence	
1.2		Lenses and index matching fluids	4	6	1	24	Q	Verify that all of the index matching fluids are compatible with the lenses and other materials that they come in contact with.	1	6	1	6	Verify compatibility of index matching fluid		Open - evidence	
1.3		Hygroscopic Lens materials	3	6	1	18	Q	Verify that all hygroscopic lenses are buffered from the atmosphere by dry index matching fluids, other lenses or purged dry air.	1	6	1	6	Verify hygroscopic lenses are protected		Open - evidence	
1.4		Cryotiger gas is incompatible with optics or other NIR materials	3	6	1	18	Q	Verify the cryotiger gas is compatible with the instrument materials it will contact	1	6	1	6	Verify compatibility of cryotiger gas		Open - evidence	How complicated & costly is this to implement?
1.5		Heat transfer fluid in pre-dewar cooling loop is compatible with instrument	3	6	1	18	Q	Verify the heat transfer fluid is compatible with the instrument materials it will contact	1	6	1	6	Verify compatibility of heat transfer fluid		Open - evidence	
1.6	CHEMICAL - Toxicity	Heat transfer fluid used in cooling loops toxic to users	3	3	2	18	S	Verify the material is non-toxic or handling procedures are in place	3	2	2	12	Verify heat transfer fluid is non-toxic		Open - evidence	If the material is non-toxic the residual risk is 1, 3, 2. If handling procedures are used, then the residual risk is 3, 2, 2.
1.7		Cryotiger cooling gas leak	3	3	2	18	S	Verify the cryotiger cooling gas does not present a hazard in case of a leak.	1	3	2	6	Verify handling procedures for cryotiger gas		Open - evidence	
1.8		Purge gas asphyxiation	4	4	2	32	S	Verify the purge gas is dry air, and not N2. If any N2 is used, O2 monitoring must be used when working in the enclosure.	1	4	2	8	Add O2 monitoring for N2 purge gas		Open - evidence	If air is used the residual risk is 1, 4, 2. If N2 is used with an oxygen monitor, then the residual risk is 4, 2, 1.
1.9		Index matching fluid leaks from bladder	3	3	2	18	S	Verify the material is non-toxic or handling procedures are in place	3	2	2	12	Verify index matching fluid id non-toxic		Open - evidence	If the material is non-toxic the residual risk is 1, 3, 2. If handling procedures are used, then the residual risk is 3, 2, 2.
1.10		Dry CO_2 cleaning of optics	4	4	2	32	S	O2 monitoring must be used when cleaning the optics w/ dry CO2.	4	2	1	8	See 1.8	See 1.8	CLOSED	Probably would need to be completed every 2 years.
1.11		Lens coupling fluid potentially toxic	3	3	2	18	S	The proposed lens coupling fluid is nonflammable	0	0	0	0	Eliminated		ELIMINATED	Cargille Laser Liquid (cat # 20109) is proposed.
2.1	ELECTRICAL - Shock	Exposed connections / terminals	4	4	2	32	S	Proper termination of all wires, and guards where there are live connections >36 VAC or VDC.	4	1	2	8	Inspect for guards on connections > 36 V		Open - evidence	
2.2		Cable failure	4	2	3	24	S	Proper cable selection with respect to voltage, current, temperature, and bend radius.	4	1	3	12	Verify cables rated for use and load		Open - evidence	
2.3		Underrated cables	4	2	3	24	S	See 2.2	4	1	3	12	See 2.2	See 2.2	CLOSED	
2.4		Inadequate ground	4	3	3	36	S	Design, installation verification	4	2	1	8	Verify the NIR, tracker, facility & other equipment are adequately grounded together at installation & PM		Open - evidence	Detectable through electrical measurements
2.5		Ground for tracker & NIR at different potentials	4	3	3	36	S	Verify the NIR, tracker, facility & other equipment are adequately grounded together at installation & PM	4	2	1	8	See 2.4	See 2.4	CLOSED	Detectable through electrical measurements

Design Control

- SSEC procedure 1008-0007 (project life cycle process)
- Defines development process thru system commissioning
- Design Reviews planned
  - Preliminary Design Review - *completed*
  - Critical Design Review
  - Test Readiness Review
  - Pre-Ship Review
  - Pre-Installation Readiness Review
  - Commissioning Review
- Goals/deliverables defined for each design review
  - See PMP for a listing of each design review's deliverables