

# OAK RIDGE NATIONAL LABORATORY

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

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June 29, 2009

To: Terry Todd

From: Bob T. Jubin

**Subject: Completion of ORNL AFCI Level 2 Milestone – CETE Investments and Hot Cell Upgrades (FY08) – OR0915020323, MS# M2502032302, “Secure Dissolver Off-gas Rack Authorization for Hot Operations,” due 6/30/2009**

This letter and the attached reference document the successful authorization of the Dissolver Off-gas (DOG) rack in building 7920 at ORNL for hot operations. This authorization satisfies the AFCI Level 2 milestone as part of the CETE Investments and Hot Cell Upgrades work package (OR0915020323) to “Secure dissolver off-gas rack authorization for hot operations” (M2502032302), due 30Jun09.

If you have any questions, please contact me at (865) 574-4934 or Gary Bell at (865) 241-4400.

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Plan of Action and Readiness Review for Level 1 Readiness Assessment

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**Activity Title:** Startup of Off-Gas Trapping for Hot Cell Dissolution

**Scope of Assessment:** Includes installation, testing, and operation of the off-gas rack in the 7920 LAA, as shown on drawing N3E020995A110 (latest revision).

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**7920 Dissolver Off-Gas Treatment Testbed** description:

The head-end processing of the Coupled-End-to-End (CETE) Demonstration includes fuel receipt, fuel disassembly, exposure of fuel (e.g., by segmenting the fuel pins), voloxidation of the fuel to separate tritium, and fuel dissolution. All of these processing steps with the exception of the dissolution step will be accomplished in the Irradiated Fuels Examination Laboratory (IFEL) (Building 3525). The final head-end step will be performed in the Radiochemical Engineering Development Center (Building 7920).

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The primary purpose of the fuel dissolution step is to prepare the solid fuel for subsequent liquid separations steps. This is accomplished by dissolving the fuel solids using nitric acid. During the dissolution process gases are evolved. Oxides of nitrogen are the primary off-gas components generated by the reactions of nitric acid and the fuel oxides however, during the dissolution and sparging of the resulting solution, iodine, C-14 as carbon dioxide, xenon, and krypton gasses are also released to the off-gas stream. The Dissolver Off-gas treatment rack provides a means of trapping these volatile fission products and other gases via various trapping media. Specifically the rack will recover iodine on a solid sorbent bed, scrub NO<sub>x</sub> in a water/acid column, scrub CO<sub>2</sub> in a caustic scrubber column, remove moisture with solid sorbent drier beds and recover Xe and Kr using solid absorbent beds. The primary purpose of this experimental rack and the off-gas rack associated with the voloxidation equipment located at IFEL is to close the material balances around the volatile gases and to provide an understanding of the impacts of specific processing conditions on the fractions of the volatile components released from the various head-end processing steps.

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**Readiness Review Team Leader:** N Blair

**Team members:** B Orrin, M Pierce, D Campbell

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**Prerequisites:** None

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APPLICABLE and IN SCOPE	NOT APPLICABLE (N/A)		COMPLETE
<b>Guiding Principle #1</b> – Line Management is responsible for the protection of employees, the public, and the environment. Line Management includes those contractor and subcontractor employees managing or supervising employees performing work.			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#1 – Line management has established programs to assure the safe accomplishment of work (the startup or restart authority should identify in the plan-of-action those specific infrastructure programs of interest for the startup or restart). Personnel exhibit an awareness of public and worker safety, health, and environmental protection requirements and, through their actions, demonstrate a high-priority commitment to comply with these requirements.	
PROGRAMS identified in Safety Basis			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Nuclear Criticality Safety	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Radiological Protection	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Hazardous Material Protection	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Radioactive and Hazardous Waste Management	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Initial Testing, In-Service Surveillance, and Maintenance	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Conduct of Operations	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fire Protection	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Procedures	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Training	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Human Factors	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Quality Assurance	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Emergency Management	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Facility Safety Analysis	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Configuration Management	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Document Control and Records Management	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Occurrence Notification and Reporting	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Work Control	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Hoisting and Rigging	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Assessment	

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<b>Guiding Principle #2</b> – Clear and unambiguous lines of authority and responsibility for ensuring ES&H are established and maintained at all organizational levels.			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#2 – Functions, assignments, responsibilities, and reporting relationships (including those between the line operating organization and ES&H support organizations) are clearly defined, understood, and effectively implemented with line management responsibility for control of safety.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. The responsible organization, point of contact, and required personnel have been described and identified.	
		<p>Verify the Facility Use Agreement is current and supports the planned activities.</p> <p>FUA-NUC-7920/7930-R1, <i>Facility Use Agreement: Radiochemical Engineering Development Center (REDC) Buildings 7920 and 7930</i>, effective date 12/14/2007</p> <p>Section 5.7, "General Boundary Definitions" contains Table 2 Boundary Definitions: <b>Hot Cells</b> – NNFD is responsible for all cell penetrating and physically linked, wiring, pipes, and tubing, etc. up to the first isolation point inside the Hot Cells. "Isolation Points" are defined as:</p> <ul style="list-style-type: none"> <li>• Electrical – first non-process specific switch or junction box</li> <li>• Mechanical – first non-process specific mechanical connection</li> <li>• Air and liquid lines/pipes – first non-process specific valve, such as at general facility header for chilled water</li> </ul> <p>The R&amp;D divisions are responsible for:</p> <ul style="list-style-type: none"> <li>• Feed/receipt systems that provide process-specific input/output</li> <li>• All processing, controls and instrument equipment supporting Hot Cell work activities except for facility systems such as power, ventilation, fire suppression, process water, etc.</li> </ul>	Complete
		<p>Verify the Research Safety Summary identifies responsible organizations for work performance</p> <p>RSS number 7017.1, <i>AFCI Dissolver Off-Gas Rack Operations</i> Principal Investigator: Bob Jubin RSS Division: Nuclear Science &amp; Technology Division RSS approved: 01/14/2009</p> <p><u>Participants:</u> Porter Bailey, Rodney Brewer, Jason Cook, Mike Cooke, Sergio Dukes, Bennie Goodman, Joe Guy, Leroy Hicks, Bob Jubin, Michele Landis, Stephen Lyles, Dairin Malkemus, Steve Meyers, Marty Milburn, Charles Nevius, John Norman, Steve Owens, Jim Parfitt, Curtis Porter, Dan Ramey, Allen Smith, Shawn Smith, Andy Souders, Ed Turnington, Roger Underwood, Roger Weaver, Gary West, Ken Wilson, Timothy Zawisza</p>	Complete
		<p>Verify the organization charts are up to date.</p> <ul style="list-style-type: none"> <li>• NNFD organization charts, issued 02/10/2009</li> </ul>	Complete
		<p>Verify the operating procedures identify responsible organizations for work performance</p> <p><b>PRIMARY PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• NNFD-7920-OP-157, <i>Building 7920 Dissolver Off-Gas Rack Operation</i> (effective 02/27/2009)</li> </ul> <p><b>SUPPLEMENTAL PROCEDURES</b></p> <ul style="list-style-type: none"> <li>• NNFD-7920-OP-159, <i>T-555 Dissolver Operations</i></li> <li>• NNFD-7920-OP-137, <i>Cub 5 Right Rack Equipment Setup and Checkout</i></li> <li>• NMP-GS-01, <i>Gas Particulate Sampling in the LAA</i></li> </ul>	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	2. Necessary utilities, Maintenance, and other support services have been identified, expectations for support established, and are ready to support startup/restart.	

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<b>Guiding Principle #3</b> – Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#3 – The selection, training and qualification programs for operations and operations support personnel have been established, documented, and implemented. The selection process and applicable position-specific training for managers assures competence commensurate with responsibilities. (The training and qualification program encompasses the range of duties and activities required to be performed.)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#4 – Level of knowledge of managers, operations, and operations support personnel is adequate based on reviews of examinations and examination results and selected interviews of managers, operating and operations support personnel.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#5 – Modifications to the facility have been reviewed for potential impacts on training and qualification. Training has been performed to incorporate all aspects of these changes.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. A matrix of operators, supervisors, and support personnel necessary to support the operation or activity has been developed and approved that delineates number of personnel required and the training requirements for each job category.	
		Review standing order to ensure it is approved and delineates appropriate number of personnel required. <ul style="list-style-type: none"> <li>• SO NNFD-7920-2009-001 Rev 0 (issued 01-20-2009)                             <ul style="list-style-type: none"> <li>○ Defines the following minimum staff operating compliment for Dissolver Off-Gas Rack Operations (in accordance with NNFD-7920-OP-157):                                     <ul style="list-style-type: none"> <li>▪ (1) Operations Supervisor</li> <li>▪ (1) Operations Technician</li> <li>▪ (1) Dissolver Off-Gas Subject Matter Expert (SME)</li> <li>▪ (1) Radiological Control Technician (RCT) in accordance with RWP REDC-19010</li> </ul> </li> </ul> </li> </ul>	Complete
		Review training matrix to ensure matrix is approved and delineates appropriate number of personnel required. <ul style="list-style-type: none"> <li>• Dissolver Off Gas Rack Training Matrix (approved 02-19-2009)</li> <li>• Training Matrix identifies multiple personnel in each of the above-identified minimum staffing positions:                             <ul style="list-style-type: none"> <li>○ Operations Supervisor (4 identified)</li> <li>○ Operations Technician (2 per shift identified)</li> <li>○ Dissolver Off-Gas SME (5 identified)</li> <li>○ RCT (6 identified)</li> </ul> </li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Personnel listed in the matrix have been trained and qualified to the latest version of applicable procedures.	
		Verify the training matrix indicates training is complete. Review training records. <ul style="list-style-type: none"> <li>• Dissolver Off Gas Training Matrix (approved 02/19/2009) identifies the following procedures:                             <ul style="list-style-type: none"> <li>○ NNFD-7920-OP-157, <i>Building 7920 Dissolver Off-Gas Rack Operation</i></li> <li>○ NNFD-7920-OP-159, <i>T-555 Dissolver Operations</i></li> <li>○ NMP-GS-01, <i>Gas Particulate Sampling in the LAA</i></li> </ul> </li> </ul>	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	3. Personnel listed in the matrix have been trained and qualified to the latest version of applicable NCSAs.	

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<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. Required personnel levels of knowledge are adequate as demonstrated through simulations, evolutions, drills, interviews, etc., as applicable.	
		Verify the training matrix indicates training is complete. Review training records. <ul style="list-style-type: none"> <li>• Dissolver Off-Gas Rack Training Matrix (approved 02/19/2009) identifies the following demonstrations:                             <ul style="list-style-type: none"> <li>○ OJT/JPM for NNFD-7920-OP-157</li> <li>○ OJT/JPM for NNFD-7920-OP-159</li> <li>○ OJT/JPM for NMP-GS-01</li> </ul> </li> </ul>	Complete
		Conduct interviews with staff to evaluate the level of knowledge. <ul style="list-style-type: none"> <li>• Interviews conducted on 03/20/2009 and 03/23/2009 with the following operations personnel:                             <ul style="list-style-type: none"> <li>○ Roger Weaver (03/20/2009 &amp; 03/23/2009)</li> <li>○ Bennie Goodman (03/20/2009)</li> <li>○ Joe Guy (03/20/2009)</li> <li>○ Charlie Nevius (03/20/2009)</li> <li>○ Marty Milburn (03/23/2009)</li> <li>○ John Norman (03/23/2009)</li> <li>○ Shawn Smith (03/23/2009)</li> </ul> </li> <li>• Interview conducted on 04/06/2009 with the following RCT:                             <ul style="list-style-type: none"> <li>○ Steve Lyles [See OBS-03]</li> </ul> </li> </ul>	Complete OBS-03 closed 06/23/2009
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Training records have been updated or are available to show that the required personnel have completed and are current, in required training.	
		Verify the training matrix indicates training is complete. Review training records. <ul style="list-style-type: none"> <li>• Dissolver Off-Gas Training Matrix (approved 02/19/2009)</li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Training has been completed for applicable personnel on safety basis limits, TSR limiting conditions of operations, and surveillance procedures.	
		Verify the training matrix indicates training is complete. Review training records. <ul style="list-style-type: none"> <li>• Dissolver Off-Gas Training Matrix (approved 02/19/2009)</li> </ul>	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	7. Control manipulations have been identified and performed.	
<b>Guiding Principle #4</b> – Resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting employees, the public, and the environment is a priority whenever activities are planned and performed.			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#6 – There are sufficient numbers of qualified personnel to conduct and support operations. adequate facilities and equipment are available to ensure operational support services (e.g., operations, training, maintenance, waste management, environmental protection, industrial safety and hygiene, radiological protection and health physics, emergency preparedness, fire protection, quality assurance, criticality safety, and engineering) are adequate for operations.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	1. Safeguards and Security issues have been identified and addressed with the proper organization.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	2. Laboratory tests are complete, as applicable.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	3. Emergency Preparedness impacts have been addressed (including the need for Emergency Response drills).	

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<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. Interfaces between organizations, functions, procedures, and equipment have been evaluated and are adequate to ensure safety.	
		Conduct interviews with operations personnel, RCTs <ul style="list-style-type: none"> <li>• Interviews conducted on 03/20/2009 and 03/23/2009 with the following operations personnel:                             <ul style="list-style-type: none"> <li>○ Roger Weaver (03/20/2009 &amp; 03/23/2009)</li> <li>○ Bennie Goodman (03/20/2009)</li> <li>○ Joe Guy (03/20/2009)</li> <li>○ Charlie Nevius (03/20/2009)</li> <li>○ Marty Milburn (03/23/2009)</li> <li>○ John Norman (03/23/2009)</li> <li>○ Shawn Smith (03/23/2009)</li> </ul> </li> <li>• Interview conducted on 04/06/2009 with the following RCT:                             <ul style="list-style-type: none"> <li>○ Steve Lyles</li> </ul> </li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Quality Assurance requirements for operation or activity have been met.	
		Fabrication packages approved: <ul style="list-style-type: none"> <li>• 1<sup>st</sup> Iodine column (NQR reviewed/approved 12/16/2008)</li> <li>• 1<sup>st</sup> Krypton column (NQR reviewed/approved 12/15/2008)</li> <li>• Scrubber reservoir and Catch pot (NQR reviewed/approved 12/15/2008)</li> <li>• 2<sup>nd</sup> Iodine column (NQR reviewed/approved 01/09/2009)</li> <li>• 2<sup>nd</sup> Krypton column (NQR reviewed/approved 01/16/2009)</li> </ul>	Complete
		ORNL QA documentation complete for the following: <ul style="list-style-type: none"> <li>• dP gauges (11/21/2008)</li> <li>• expansion tank 1 check valve CV-301 [2.10.08] (10/3/2008)</li> <li>• expansion tank 2 check valve CV-302 [3.10.08] (10/3/2008)</li> <li>• off-gas line check valve CV-303 (8/4/2008)</li> <li>• gas supply pressure relief valve PSV-301 (01/28/2008)</li> <li>• expansion tank pressure relief valve PSV-302 [1] (10/10/2008)</li> <li>• expansion tank pressure relief valve PSV-302 [3] (10/10/2008)</li> <li>• HEPA filter in LAA [IE-2302] (11/10/2008)</li> <li>• HEPA filter in Cubicle 6 [IE-2304] (11/10/2008)</li> <li>• HEPA filter on quick disconnect (used at startup to vent system) – no testing documentation available – See OBS-01</li> <li>• expansion tank 1 [PRI-0001103] [Serial # 582925] (9/5/2008)</li> <li>• expansion tank 2 [PRI-0001104] [Serial # 587793] (9/5/2008)</li> </ul>	Complete OBS-01 closed 06/23/2009
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Raw materials or consumables (e.g., wipes, gloves, etc.) are available and adequate for the operation or activity.	
		List of materials required for the activity was developed using procedures, RWP, and JHEs. Verification that these materials are available in the facility was performed on 3/30/2009. <ul style="list-style-type: none"> <li>• Adequate supply of 500 cc vacuum reservoirs and 50 cc sample cylinders (equipped with male quick disconnects) (number needed will be determined by NSTD SME personnel) [NNFD-7920-OP-157]                             <ul style="list-style-type: none"> <li>○ Per Dan Ramey and Bob Jubin, an adequate supply exists (~50 sample cylinders currently located in the mass spec lab in 4501)</li> </ul> </li> <li>• Administrative Control Tag (ACT) to turn off auxiliary air supply for Cubicle 5 [NNFD-7920-OP-159]                             <ul style="list-style-type: none"> <li>○ Per Roger Weaver, these are kept in the control room, with the ACT log</li> </ul> </li> <li>• Adequate supply of rubber gloves for use during sampling activities [RWP REDC-19010]                             <ul style="list-style-type: none"> <li>○ Per Roger Weaver, these will be carried to the LAA as needed</li> </ul> </li> </ul>	Complete

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<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. Field modifications/construction work is complete.	
		Work Package <b>MM561017</b> , GNEP Rack Electrical <ul style="list-style-type: none"> <li>• Includes the following documents                             <ul style="list-style-type: none"> <li>○ BOP Modification Package: GNEP RACK ELECT, "Replace existing Panel PP-2" (approved 1/11/2008) by Greg Waldrop</li> <li>○ USQD/REDC/08-002, Rev 1, "Addition of New 480 V Power Panel and Weld Receptacle in Limited Access Area (LAA)" (approved 2/11/2008)</li> </ul> </li> </ul>	Complete
		Work Package <b>MM715459</b> , BOPM-REDC-08-10, Install GNEP Data Acquisition Cables <ul style="list-style-type: none"> <li>• Includes the following documents:                             <ul style="list-style-type: none"> <li>○ BOP Modification Package: BOPM-REDC-08-10, "New Communication Cables Between Control Room and Limited Access Area" (approved 11/10/2008) by Gerald Sullivan</li> <li>○ USQD/REDC/08-126, "New Communications Cables Between Control Room and Limited Access Area" (approved 11/10/2008)</li> </ul> </li> </ul>	Complete
		Work Package <b>MM773193</b> , Install CETE Dissolver Off-Gas Rack in 7920's LAA <ul style="list-style-type: none"> <li>• Includes the following documents:                             <ul style="list-style-type: none"> <li>○ BOP Modification Package: BOPM-REDC-08-11, "Chiller Installation (RCW Loop to Cub 5 H557 Condenser)" (approved 11/10/2008) by Doug Keener</li> <li>○ USQD/REDC/07-092, "T-555 Dissolver Off-Gas Trapping System and Mixer-Settler Off-Gas Sampling System" (approved 10/22/2008)</li> </ul> </li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. Work packages necessary for the operation or activity completion or review have been identified and all pre-start maintenance work has been completed.	
		Review maintenance backlog to verify there is no open pre-start maintenance work that will impact startup of the dissolver off-gas trapping system. <ul style="list-style-type: none"> <li>• Email: Smith to Blair, dated 12/16/2008, "Re: 7920 Dissolver Off-Gas readiness status" states: "#38 – "Maintenance backlog review for impact on startup of off-gas rack" has been completed by Tom McConnell, Porter Bailey, and myself. No outstanding maintenance items were identified that could impact the off-gas rack installation and operation."</li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. Verify that all post-installation testing is complete. <ul style="list-style-type: none"> <li>• Test procedures/work instructions written and approved</li> <li>• Test conducted functionally and operationally</li> <li>• Corrective actions taken where applicable</li> <li>• All equipment verified operational</li> </ul>	
		Test Report – Test Instruction 08-TI-7936-005, Component Testing of the Building 7920 Dissolver Off-Gas Rack	Complete
		Test Report – Test Instruction 08-TI-7936-006, Component Testing of the Building 7920 Dissolver Off-Gas Rack	Complete
		Test Report – Test Package 08-PK-7920-001, DOG Rack Integrated Startup Testing: 08-PK-7920-001 [DU Integrated Test Run]	Complete



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<b>Guiding Principle #5</b> – Before work is performed, the associated hazards are evaluated and an agreed upon set of standards and requirements are established which, if properly implemented, provide adequate assurance that employees, the public, and the environment are protective from adverse consequences.			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#7 – Facility safety documentation is in place and has been implemented that describes the “safety envelope” of the facility. The safety documentation should characterize the hazards/risks associated with the facility and should identify preventive and mitigating measures (systems, procedures, administrative controls, etc.) that protect workers and the public from those hazards/risks. Safety structures, systems, and components (SSCs) are defined and a system to maintain control over their design is established.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	CR#8 – A program is in place to confirm and periodically reconfirm the condition and operability of safety SSCs. This includes examination of records of tests and calibration of these systems. The material condition of all safety process, and utility systems will support the safe conduct of work.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#9 – The facility systems and procedures, as affected by facility modifications, are consistent with the description of the facility, procedures, and accident analysis included in the safety basis.	
Safety Basis			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. Unreviewed Safety Question Determination (USQD) Screening or USQD for activity has been approved.	
		USQD/REDC/07-092, Revision 0, “T-555 Dissolver Off-Gas Trapping System and Mixer-Settler Off-Gas Sampling System” (approved 10/22/08) (for installation and operation of an off-gas trapping system designed to collect gases generated during dissolution of spent fuel oxides in hot cell cubicle 5 at Building 7920 and associated sampling systems that can collect off-gas samples from the T-555 Dissolver or mixer-settler)	Complete
		USQD/REDC/07-092, Revision 1, “T-555 Dissolver Off-Gas Trapping System and Mixer-Settler Off-Gas Sampling System” (approved 12/02/08) (for NNFD-7920-OP-157, Rev 0, <i>Building 7920 Dissolver Off-Gas Rack Operation</i> )	Complete
		USQD/REDC/08-152, “New Procedure NNFD-7920-OP-159 Rev 0” (approved 12/15/08) (for NNFD-7920-OP-159, <i>T-555 Dissolver Operations</i> )	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	2. The documents such as SAR, TSR, and Authorization Agreements, including the accident scenarios, as applicable, have been updated and approved.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. Surveillance procedures have been successfully performed in accordance with periodicity specified by the safety basis.	
		Per ORNL/7920/TSR, <i>Technical Safety Requirements – Radiochemical Engineering Development Center – Building 7920</i> , the following SRs support the dissolver off-gas system: SR 4.1.1.1 Verify VOG system pressure in hot cell cubicles is less than pressure in corresponding hot cell cubicle pits by at least 0.1 in of water – DAILY SR 4.1.1.3 Demonstrate VOG system HEPA filter stage(s) OPERABLE by verifying HEPA filter stage(s) to be at least 99.95% efficient for removal of the test aerosol – SEMIANNUALLY SR 4.1.1.5 CALIBRATE instruments used to determine pressure differentials for SR 4.1.1.1 and SR 4.1.1.2 – ANNUALLY SR 4.1.1.7 Perform FUNCTIONAL TEST of VOG system fan motor control system and fan discharge check valves – ANNUALLY SR 4.1.1.10 Perform FUNCTIONAL TEST of VOG system cubicle header pressure differential control system – ANNUALLY ( <i>only applies when system is in service and not placed in failed-safe mode</i> )	See below

Plan of Action and Readiness Review for Level 1 Readiness Assessment

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		<p><b>NNFD-7920-SR-200</b>, <i>Implementation of Building 7920 Technical Safety Requirements (TSR)</i>, Rev 3 (for compliance with TSR requirements)</p> <ul style="list-style-type: none"> <li>• <u>SR 4.1.1.1</u> – <b>Appendix B</b>, <i>Building 7920 Log of Technical Safety Requirements</i></li> <li>• <u>SR 4.1.1.3</u> – <b>Appendix D</b>, <i>HEPA Filter Efficiency Semi-Annual Testing Data Sheet</i> <ul style="list-style-type: none"> <li>○ SSI 150, <i>Inspection and Testing of HEPA Filtered Systems</i></li> </ul> </li> <li>• <u>SR 4.1.1.5</u> – <b>Appendix E</b>, <i>VOG System ΔP Instrumentation Calibration Data Sheet</i> <ul style="list-style-type: none"> <li>○ MMD/CREA 1022, <i>Calibration of Electronic Recorders</i></li> <li>○ ICS/CIDG 1023, <i>Calibration of Pressure Gauges</i></li> <li>○ MMD/CTME 1300, <i>Calibration of Foxboro Intelligent D/P Cell Transmitters</i></li> </ul> </li> <li>• <u>SR 4.1.1.7</u> (see below)</li> <li>• <u>SR 4.1.1.10</u> [not implemented – system placed in failed-safe mode]</li> </ul>	Complete
		<p><b>NNFD-7920-SR-203</b>, <i>Functional Test of VOG System Fan Motor Control System and Fan Discharge Check Valves</i>, (Rev 0)</p> <ul style="list-style-type: none"> <li>• SR 4.1.1.7</li> </ul>	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	4. Required safety significant and safety class systems are properly calibrated.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	5. USQD process has been completed for SAR changes and new/revised NCSAs and procedures prior to use.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	6. Safety System Assessments are up-to-date.	
General Health and Safety			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. A Hazard Analysis has been performed and documented in accordance with SBMS Subject Area: Work Control.	
		<p>RSS number 7017.1, AFCI Dissolver Off-Gas Rack Operations</p> <p>Principal Investigator: Bob Jubin                      RSS Division: Nuclear Science &amp; Technology Division                      RSS approved: 01/14/2009</p>	Complete
		JHE for NNFD-7920-OP-157, Building 7920 Dissolver Off-Gas Rack Operation	Complete
		JHE for NNFD-7920-OP-159, T555 Dissolver Operations	Complete
		<p>Screening for Work Acceptance in Non-Reactor Nuclear Facilities Risk Assessment Proposal ID: None</p> <p>Project Title: GNEP Technology Research, Development, and Demonstration Project</p> <p>Screening Approval date(s): Group Leader: 5/26/2006; Facility Leader: 5/26/2006</p> <p>{Reference: SBMS Procedure: <b>Proposing Research Work</b>}</p>	Complete  FND-01 closed 05/28/2009
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. Review all listed hazards and verify prevention/mitigation is in place. Ensure that personal protective equipment (PPE) requirements have been met.	
		Reviewed JHEs for procedures and RWP for operation. Hazards have been properly identified and mitigated; the PPE, as spelled out in the JHEs and RWP, is appropriate for the operations being conducted.	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. PPE for new operation or activity is available, in acceptable condition, and in sufficient quantity.	
		<p>Listing of required PPE and verify that PPE is available and acceptable for use.</p> <ul style="list-style-type: none"> <li>• Walkdowns performed 3/20/2009, 3/23/2009, and 3/25/2009</li> <li>• Interview supervisor (Roger Weaver) to discuss each of the items below</li> <li>• Supplies found to be adequate to support operations</li> </ul>	Complete

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		JHE for NNFD-7920-OP-157, <i>Building 7920 Dissolver Off-Gas Rack Operation</i> <ul style="list-style-type: none"> <li>• Face shield (when connecting &amp; disconnecting liquid nitrogen supply) [2 are available]</li> <li>• Cryogenic gloves (when connecting &amp; disconnecting liquid nitrogen supply)</li> <li>• Goggles (when connecting &amp; disconnecting liquid nitrogen supply)</li> <li>• Non-skid shoe covers (elevated work) [yellow shoe covers]</li> <li>• Hand &amp; arm thermal protection (when operating valves &amp; heating equipment is operating) [available in the LAA]</li> <li>• Safety glasses</li> <li>• Goggles &amp; gloves (when transferring NaOH solution)</li> <li>• Chemical Goggles &amp; gloves (when transferring HNO<sub>3</sub> solution)</li> </ul>	Complete
		JHE for NNFD-7920-OP-159, <i>T-555 Dissolver Operations</i> <ul style="list-style-type: none"> <li>• Hand &amp; arm thermal protection (when operating valves &amp; heating equipment is operating)</li> <li>• Chemical Goggles &amp; gloves (when transferring HNO<sub>3</sub> solution)</li> <li>• Safety glasses</li> </ul>	Complete
		RWP REDC-19010, "Operation of the Dissolver Off-Gas System" <ul style="list-style-type: none"> <li>• 1 disposable coveralls                             <ul style="list-style-type: none"> <li>◦ (Lab coat may be worn for work that does not involve kneeling or climbing.)</li> </ul> </li> <li>• 2 rubber gloves</li> <li>• 1 disposable shoe covers</li> <li>• Additional rubber gloves (available in the work area) (to be used during sampling activities to minimize contamination)</li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. Required Safety and Health work permits/plans (RWP, Hot Work, Critical Lift Plans, etc.) are correct and in place, and are consistent with respect to PPE requirements.	
		Lift Plan for moving rack into LAA	Complete
		RWP 19010, "Operation of the Dissolver Off-Gas System" (note: RWP expires 05-31-2009)	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. Housekeeping walkdown has been performed and deficiencies corrected.	
		Housekeeping walkdown performed by Porter Bailey <ul style="list-style-type: none"> <li>• Email: Bailey to Blair, dated 03-09-2009, "Re: 7920 Dissolver Off-Gas status" states "The housekeeping walkdown has been completed, and will be performed again prior to any additional uses of the DOG rack." Further conversation on the topic indicates that there were no findings or deficiencies to be corrected.</li> </ul>	Complete
		Review previous quarterly safety assessment and ensure any pre-start actions are complete <ul style="list-style-type: none"> <li>• Reference 1<sup>st</sup> quarter FY09 Health &amp; Safety walkdown (completed December 2008) (ACTS 11792.1.1 through 11792.1.6)</li> </ul>	Complete
Industrial Safety			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. Lifts performed to support activity have been classified per SBMS Subject Area: Hoisting and Rigging, and have been approved.	
		Lift Plan for moving rack into LAA	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	13. Welding, burning, and other hot work, and the appropriate controls, have been approved.	

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Industrial Hygiene			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	14. Ventilation and exhaust systems have been balanced, and the balancing work approved.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	15. Hoods and gloveboxes are on periodic air flow/pressure surveillance, and surveillance is current.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. HEPA filter requirements are identified and met.	
		<ul style="list-style-type: none"> <li>• HEPA Filter in Cubicle 6 (IE-2304)</li> <li>• HEPA Filter in LAA (IE-2302)</li> <li>• HEPA Filter on quick disconnect (no identification number) used for venting system at startup – no testing documentation available [see OBS-01]</li> </ul>	Complete OBS-01 closed 06/23/2009
<input type="checkbox"/>	<input checked="" type="checkbox"/>	17. An ergonomic review has been conducted of the operations and documented.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	18. Heat/cold stress awareness has been provided.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. The applicable MSDS have been made available.	
		<ul style="list-style-type: none"> <li>• The following chemicals have been identified in the JHEs:                             <ol style="list-style-type: none"> <li>(1) Hydrogen Mordenite / Zeolite H-Mordenite Powder (REC ID A9700) [contained in the Xenon and Krypton traps]</li> <li>(2) Silver Mordenite (IONEX Type Ag-900) (REC ID 92333) [contained in the Iodine traps]</li> <li>(3) Ethylene Glycol – 50% mixture with water (REC ID L0481) [contained in the chilled water system]</li> <li>(4) Drierite – Calcium Sulfate and Cobalt Chloride (REC ID 82362) [contained in the drier]</li> <li>(5) Sodium Hydroxide solution (NaOH) (REC ID 06411) [contained in the CO<sub>2</sub> scrubber]</li> <li>(6) Nitric Acid (HNO<sub>3</sub>) (REC ID 00275) [produced during scrubbing of NO<sub>x</sub>]</li> <li>(7) Liquid Nitrogen [used to cool the Xe/Kr traps]</li> </ol> </li> <li>• The MSDSs for Drierite, NaOH, HNO<sub>3</sub> were available upon first inspection (3/20/2009) of the book in the control room. The supervisor (Roger Weaver) explained that the others (Hydrogen Mordenite, Silver Mordenite, and Ethylene Glycol) were not expected to be routinely handled by the NNFD technicians as part of the DOG rack operations. It was discussed at the OJT sessions how to access the MSDSs on-line.</li> <li>• The Liquid Nitrogen MSDS was added to the book in the control room on 3/30/2009.</li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. Hazardous Chemical Inventory has been verified and the maximum allowable quantities are within facility limits.	
		<ul style="list-style-type: none"> <li>• The following chemicals have been identified in the JHEs:                             <ol style="list-style-type: none"> <li>(1) Hydrogen Mordenite / Zeolite H-Mordenite Powder (REC ID A9700) [contained in the Xenon and Krypton traps]</li> <li>(2) Silver Mordenite (IONEX Type Ag-900) (REC ID 92333) [contained in the Iodine traps]</li> <li>(3) Ethylene Glycol – 50% mixture with water (REC ID L0481) [contained in the chilled water system]</li> <li>(4) Drierite – Calcium Sulfate and Cobalt Chloride (REC ID 82362) [contained in the drier]</li> <li>(5) Sodium Hydroxide solution (NaOH) (REC ID 06411) [contained in the CO<sub>2</sub> scrubber]</li> <li>(6) Nitric Acid (HNO<sub>3</sub>) (REC ID 00275) [produced during scrubbing of NO<sub>x</sub>]</li> <li>(7) Liquid Nitrogen [used to cool the Xe/Kr traps]</li> </ol> </li> </ul>	Complete

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		<ul style="list-style-type: none"> <li>USQD/REDC/07-092 (pgs 10-11) states: "(2) a toxic, corrosive, reactive material hazard associated with nitric acid used in the dissolutions that could be discharged through the piping to the LAA, NO<sub>x</sub> decomposition products passing into the gas trapping system, sodium hydroxide solution in the CO<sub>2</sub> scrubber, silver mordenite (AgZ) in the iodine trap, hydrogen mordenite (HZ) in the Xe and Kr traps; ethylene glycol in the cooling loops and reservoir for the chiller units, non-CFC refrigerant used in the chiller units, mixed refrigerant gases in the refrigeration system for the gamma detectors, small amounts of lubricants in pumps and compressors, and small amounts of organic solvents that may be carried over in off-gas from the mixer-settler;" ... "Except for the radioactive and fissionable material hazards, all these hazards are present below their associated screen-out measure quantities and are considered only for their ability to initiate an accident (energy sources) involving other unusual hazards in the area, primarily the radioactive materials and fissionable materials that will be in the gas trapping system and sampling systems."</li> <li>Per conversation with Mike Green, Facility Safety Engineer, 3/12/09, these chemicals are "within facility limits."</li> </ul>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	21. Chemical shelf life specifications have been verified.	
		<ul style="list-style-type: none"> <li>The following chemicals have been identified in the JHEs:                             <ol style="list-style-type: none"> <li>Hydrogen Mordenite / Zeolite H-Mordenite Powder (REC ID A9700) [contained in the Xenon and Krypton traps]</li> <li>Silver Mordenite (IONEX Type Ag-900) (REC ID 92333) [contained in the Iodine traps]</li> <li>Ethylene Glycol – 50% mixture with water (REC ID L0481) [contained in the chilled water system]</li> <li>Drierite – Calcium Sulfate and Cobalt Chloride (REC ID 82362) [contained in the drier]</li> <li>Sodium Hydroxide solution (NaOH) (REC ID 06411) [contained in the CO<sub>2</sub> scrubber]</li> <li>Nitric Acid (HNO<sub>3</sub>) (REC ID 00275) [produced during scrubbing of NO<sub>x</sub>]</li> <li>Liquid Nitrogen [used to cool Xe/Kr traps]</li> </ol> </li> <li>Items (1), (2), and (4) are not expected to be exposure hazards to personnel in Building 7920. These chemicals are contained in the traps or components, and are removed from the facility intact.</li> <li>Item (3) is contained in the chiller system, and is expected to be a closed-loop system. Review of the MSDS shows no storage time limit concerns.</li> <li>Items (5) through (7) are chemicals routinely handled throughout Building 7920. Review of the MSDSs for these chemicals show no storage limitations, provided that the concentration for HNO<sub>3</sub> remains below 70% (red fuming concerns with organics).</li> </ul>	Complete
Radiological Controls			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	22. RWPs have been reviewed for accuracy, are approved, and in place.	
		RWP 19010, "Operation of the Dissolver Off-Gas System" (note: RWP expires 05-31-2009)	Complete
Nuclear Criticality Safety			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	23. Nuclear Criticality Safety Approvals (NCSAs) and other applicable NCS documents (e.g., inventory control procedures) have been generated, approved, and issued.	
		NCSA-128, <i>Fissionable Material Operations at the Radiochemical Engineering Development Center, Building 7920</i> (Rev 3)	Complete

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		Email: Goluoglu to Blair, dated 09-30-2008, "Re: NCS issues for GNEP Dissolver Off-Gas Rack" states: "There is a potential for fissionable material holdup on the in-cell HEPAs, as indicated by USQD/REDC/07-092, and the amount is tiny, the approval requires that the holdup be considered. Holdup was addressed in the evaluation, so its not a big deal. For the VOG and COG systems, OP-104 had a gross bounding estimate for the associated inventory, and that was that."	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	24. NCSAs are current and properly controlled.	
		NCSA-128, <i>Fissionable Material Operations at the Radiochemical Engineering Development Center, Building 7920</i> (Rev 3) is available in the Integrated Document Management System (IDMS) on the 7920 page.	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	25. NCS documents have been reviewed for consistency with safety basis documents, Change Package description, etc.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	26. NCSAs necessary to support the operation or activity have been implemented.	
Fire Protection			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	27. Fire Hazard Analysis (FHA) has been updated and approved to acknowledge new work.	
		Fire Protection Assessment 7920/FPA/Off-Gas Trapping, <i>T-555 Dissolver Off-Gas Trapping System and Mixer Settler Off-Gas Sampling System</i> , Revision 1 <ul style="list-style-type: none"> <li>Approved and issued 01-20-2009</li> </ul>	Complete
		FPA Recommendations: (1) Combustible material in the LAA should be kept at minimal quantities. Combustible loading procedure inspection should be implemented in the LAA area prior to project Readiness Assessment (RA). [Prerequisite 4.1] (2) Maintain a 36" unobstructed egress at all times in the LAA area. [P/L 2.3] (3) Emergency exits from the upper LAA to Room 216 and Room 215 should be clear and unobstructed at all times. [P/L 2.4] (4) Keep combustible materials at least 3 feet from the rack system. [P/L 2.5] FPA recommendations to be implemented in NNFD-7920-OP-157, Precautions/Limitations (section 2) and Prerequisites (section 4).	Complete
		Email: Sipes to Blair, dated 01-20-2009 "Building 7920 Off-gas walkdown" states: "Doug Freels and myself conducted the walk-down of the LAA Off-Gas Rack installation as requested. We reviewed the installation to determine that the recommendations from the fire protection assessment are in place. ... Based on the walk-down, it did appear that the recommendations were implemented. As a result of the walkdown, <b>we also recommended</b> that a welding blanket be provided to cover/shield the nearby glove-box face during operation of the rack and an approximate 5-gallon container of oil be removed from the area. In addition, a review of the draft operating procedures documented that the procedures will ensure these recommendations continue to be implemented."	Complete
		Email: Bailey to Blair and Smith, dated 01/22/2009 "Re: Building 7920 Off-gas walkdown" states: "The drum was removed from the area and the welding blanket was installed as recommended. Both were performed last week."	Complete
Environmental			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	28. Applicable environmental permits that govern facility operations have been evaluated to ensure proposed operation or activity will not violate or exceed approved operating limits.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	29. Waste streams have been identified and agreements are in place for management of wastes.	

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Functional Capabilities – Equipment			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	30. Functional capability requirements have been identified for each facility/system or facility/system modification. This may include, but is not limited to, the following: a. Support systems (e.g., electrical power, etc) are available to operate equipment needed. b. Ventilation systems operational c. Sufficient lighting is available d. Temperature controlled environment is operational and maintained.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	31. Preventive/corrective maintenance, recall requirements, and calibrations for equipment and systems have been identified and verified complete as required by the periodicity requirements.	
		Develop listing of required equipment and verify equipment is available and PM/calibrations are up to date. • See Attachment 2	Complete  OBS-01 closed 06/23/2009
<input checked="" type="checkbox"/>	<input type="checkbox"/>	32. Preventive maintenance, recall requirements, and calibrations for identified equipment and systems have been entered into the computerized maintenance management system (CMMS).	
		Develop listing of required equipment and verify equipment PMS/calibrations are loaded into DataStream as needed. • DataStream report, dated 03/10/2009	Complete  OBS-01 closed 06/23/2009
<input checked="" type="checkbox"/>	<input type="checkbox"/>	33. List of operation or activity specific equipment required is identified and equipment is verified to be ready for operation.	
		Verify NNFD-7920-OP-157 has a listing of required equipment and verify equipment is available. Verified via interview with Supervisor (Roger Weaver) on 3/30/2009 and field walkdown on 3/31/2009 that the following items were available to support the dissolver off-gas activity: <ul style="list-style-type: none"> <li>• Vacuum jet (J-C6A-J) in cubicle 6 – <i>no known outstanding maintenance activities; system is functional</i></li> <li>• Compound auxiliary vacuum gauge (-30 in Hg / +30 psig range) to be inserted into sample ports when evacuating expansion tanks – no indication of calibration on this gauge [See OBS-01]</li> <li>• Flexible vacuum hose (to connect from HV 344 to HV 354)</li> <li>• ¼-in flexible line with ¼-in JACO tubing union</li> <li>• “suitable open-end container” for 4L water (for filling NO<sub>x</sub> scrubber) – two available</li> <li>• HEPA filtered vent with needle valve (to connect to sample ports)</li> <li>• “suitable container” for 4L 1M NaOH solution (for filling CO<sub>2</sub> scrubber)</li> <li>• 35 L dewars (x2) with minimum 14” LN<sub>2</sub></li> <li>• Dissolver control and data acquisition system</li> <li>• Gamma spectrometer (AIT 303) on outlet line from off-gas rack</li> <li>• 3-ft length of ¼-in flexible line with JACO tubing union (for CO<sub>2</sub> and NO<sub>x</sub> scrubber draining)</li> <li>• Labeled screw-top plastic sample container with a capacity of 4L or more (equipped with catch pan carrier) (x2) (for CO<sub>2</sub> and NO<sub>x</sub> scrubber draining) – <i>Neither Roger nor Porter were sure about “catch pan carrier” configuration; planned to be using the same containers to drain the scrubbers that were used to fill the scrubbers [See OBS-02]</i></li> <li>• Adequate supply of 500 cc vacuum reservoirs and 50 cc sample cylinders (equipped with male quick disconnects) (number needed will be determined by NSTD SME personnel) – <i>per Dan Ramey and Bob Jubin, an adequate</i></li> </ul>	Complete  OBS-01 closed 06/23/2009  OBS-02 closed 05/22/2009

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		<i>supply of these reusable items is available and ready (~50 sample cylinders are presently located in 4501 mass spec lab)</i>	
		Verify NNFD-7920-OP-159 has a listing of required equipment and verify equipment is available. Verified via interview with Supervisor (Roger Weaver) on 3/30/2009 that the following items were available to support the dissolver off-gas activity: <ul style="list-style-type: none"> <li>• Administrative Control Tag (ACT) to turn off auxiliary air supply for Cubicle 5 – <i>an adequate supply is kept in the control room</i></li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	34. Lifting fixtures, slings, cranes, fork trucks, relief valves, and other equipment requiring QE&I inspection have current and valid tags.	
		<ul style="list-style-type: none"> <li>• PSV-301</li> <li>• PSV-302</li> <li>• PSV-303</li> </ul>	Complete OBS-01 closed 06/23/2009 OBS-04 closed 06/23/2009
<b>Guiding Principle #6</b> – Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards. Emphasis should be on designing the work and/or controls to reduce to eliminate the hazards and to prevent accidents and unplanned releases and exposures.			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#10 – There are adequate and correct procedures and safety limits for operating the process systems and utility systems that include revisions for modifications that have been made to the facility.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	CR#11 – A routine drill program and emergency operations drill program, including program records, have been established and implemented.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	CR#12 – An adequate startup and restart program has been developed that includes plans for graded operations and testing after startup or resumption to simultaneously confirm operability of equipment, the viability of procedures, and the performance and knowledge of the operators. The plans should indicate validation processes for equipment, procedures, and operators after startup or resumption of operations including any required restrictions and additional oversight.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#13 – The formality and discipline of operations is adequate to conduct work safely and programs are in place to maintain this formality and discipline.	
Configuration Management			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	1. Configuration Items list is updated and current.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	2. Change/modification packages are correct, approved, and closed.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. Design drawings are approved.	
		<ul style="list-style-type: none"> <li>• N3E020995A110 (rev C), <i>Dissolver Off-Gas Trapping Flow Sheet</i></li> <li>• N3E020995A135 (rev A), <i>Dissolver Off-Gas Rack Operator Aid</i></li> </ul>	Complete



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		<ul style="list-style-type: none"> <li>N3E020995A112 (rev 0), <i>Scrubber Catch Pot Dissolver Off-Gas System Assembly and Details</i></li> <li>N3E020995A113 (rev 0), <i>Scrubber Reservoir Dissolver Off-Gas System Assembly and Details</i></li> <li>N3E020995A114 (rev 0), <i>GNEP Xenon Column Dissolver Off-Gas System Details and Assembly</i></li> <li>N3E020995A115 (rev 1), <i>GNEP Krypton Column Dissolver Off-Gas System Details and Assembly</i></li> <li>N3E020995A116 (rev 1), <i>GNEP Iodine Column Dissolver Off-Gas System Details and Assembly</i></li> <li>N3E020995A118 (rev 1), <i>GNEP Krypton Column Dissolver Off-Gas System Column Details and Subassembly</i></li> <li>N3E020995A119 (rev 0), <i>Dissolver Gas Scrubber Exhaust Gas Outlet Column Assembly</i></li> </ul>	Complete
		<ul style="list-style-type: none"> <li>N3E020995A134 (rev 0), <i>SRNL Gas Sampling Station P&amp;ID</i></li> </ul>	Complete
		<ul style="list-style-type: none"> <li>N3E020995A136 (rev 0), <i>U3O8 Powder Feeder Assembly</i></li> <li>N3E020995A137 (rev 0), <i>U3O8 Powder Feeder Hopper Sampler Weldment</i></li> <li>N3E020995A138 (rev 0), <i>U3O8 Powder Feeder Sampler Weldment</i></li> <li>N3E020995A139 (rev 0), <i>U3O8 Powder Feeder Weldment &amp; Details</i></li> <li>N3E020995A140 (rev 0), <i>U3O8 Powder Feeder Hopper Sampler Weldment Detail Sheet</i></li> </ul>	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	4. Design Analysis and Calculation (DAC) reports, and other technical basis documents, are correct and approved.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	5. Modifications have been determined to be compliant with applicable design codes.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	6. For construction projects, the system turnover is complete and punch list items have been resolved.	
Procedures			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. Procedures necessary to support the operation or activity have been identified and revisions prepared and approved.	
		NNFD-7920-OP-157, Rev 0, <i>Building 7920 Dissolver Off-Gas Rack Operation</i> [effective date 02/27/2009]	Complete
		NNFD-7920-OP-159, Rev 0, <i>T-555 Dissolver Operations</i> [effective date 02/25/2009]	Complete
		NNFD-7920-OP-137, Rev 0, CN-2, <i>Cub 5 Right Rack Equipment Setup and Checkout</i> [effective date 01/14/09]	Complete
		NMP-GS-01, Rev 0, <i>Gas Particulate Sampling in the LAA</i> [effective date 12/11/2008]	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. Procedures identified have been verified to be consistent with the Safety Basis.	
		<ul style="list-style-type: none"> <li>USQD/REDC/07-092, Rev 1 for NNFD-7920-OP-157</li> <li>USQD/REDC/08-152 for NNFD-7920-OP-159</li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. Procedures have been demonstrated to be technically accurate and can be performed as written.	
		Procedure V&V performed using work package WP DOG/DISSOLVER OPS, "V&V of NNFD-7920-OP-157 / NNFD-7920-OP-159" <ul style="list-style-type: none"> <li>V&amp;V began 01/02/2009</li> <li>V&amp;V concluded 01/15/2009</li> </ul>	Complete
		Integrated Test (DU run) performed using Test Instruction 09-TI-7920-001, <i>7920 Dissolver Off-gas Rack Integrated Testing</i> <ul style="list-style-type: none"> <li>Testing began 01/16/2009</li> <li>Testing concluded 01/21/2009</li> </ul>	Complete

Plan of Action and Readiness Review for Level 1 Readiness Assessment

APPLICABLE and IN SCOPE	NOT APPLICABLE (N/A)		COMPLETE
		Observe OJT to verify the procedure works as written. <ul style="list-style-type: none"> <li>Observed OJT on 03/20/2009 and 03/23/2009</li> </ul> Reviewed procedures (NNFD-7920-OP-157 and NNFD-7920-OP-159) for general flow and required equipment. Some comments were noted for improvement in the procedure. [See OBS-02]	Complete OBS-02 closed 05/22/2009
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. Examine procedures to verify hazard controls are in place.	
		Verify procedures consistently implement hazard controls of JHEs <b>PRIMARY PROCEDURE</b> <ul style="list-style-type: none"> <li>NNFD-7920-OP-157, <i>Building 7920 Dissolver Off-Gas Rack Operation</i> <ul style="list-style-type: none"> <li>JHE for NNFD-7920-OP-157</li> </ul> </li> </ul> <b>SUPPLEMENTAL PROCEDURES</b> <ul style="list-style-type: none"> <li>NNFD-7920-OP-159, <i>T-555 Dissolver Operations</i> <ul style="list-style-type: none"> <li>JHE for NNFD-7920-OP-159</li> </ul> </li> <li>NNFD-7920-OP-137, <i>Cub 5 Right Rack Equipment Setup and Checkout</i> <ul style="list-style-type: none"> <li>JHE for NNFD-7920-OP-137</li> </ul> </li> </ul>	Complete
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. Procedures for support systems (e.g., vacuum systems, exhaust systems, ancillary equipment, etc.) are in place and adequate.	
		<ul style="list-style-type: none"> <li>NNFD-7920-OP-103, <i>Building 7920 Ventilation System Operation</i>, Rev 1, CN 1 (for operation of the VOG system)</li> <li>NNFD-7920-SR-200, <i>Implementation of Building 7920 Technical Safety Requirements (TSR)</i>, Rev 3 (for compliance with TSR requirements)</li> <li>NNFD-7920-ARP-300, <i>Building 7920 Alarm Response</i>, Rev 1, CN 4 (for receipt of unexpected alarms)</li> <li>NNFD-7920-AP-002, <i>Building 7920 Combustible Control Procedure</i>, Rev 0, CN 1 (for compliance with the fire protection controls)</li> </ul>	Complete
<input type="checkbox"/>	<input checked="" type="checkbox"/>	12. Abnormal Operations Procedures (AOPs) and Emergency Operations Procedures (EOPs) are adequate and approved.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	13. Surveillance procedures for TSRs have been developed/ revised and approved to support the operation or activity.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	14. Procedures incorporate information required as a result of facility/equipment modifications.	
<b>Guiding Principle #7</b> – The conditions and requirements to be satisfied for operations to be initiated and conducted are established and agreed-upon by DOE and the contractor. These agreed-upon conditions and requirements are requirements of the contract and binding on the contractor. The extent of documentation and level of authority for agreement shall be tailored to the complexity and hazards associated with the work and shall be established in a Safety Management System.			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	CR#14 – Formal agreements establishing requirements are in place between the operating contractor and DOE, via the contract or other enforceable mechanism, which governs the safe operations of the facility. A systematic review of the facility's conformance to these requirements has been performed. These requirements have been implemented in the facility, or compensatory measures are in place, and formally agreed to during the period of implementation. The compensatory measures and the implementation period are approved by DOE.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR#15 – A feedback and improvement process has been established to identify, evaluate, and resolve deficiencies and recommendations made by oversight groups, official review teams, audit organizations, and the operating contractor.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	1. Authorization Agreements have been evaluated for revisions necessary for operations.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Issues have been evaluated for lessons learned.	
		3525 Voloxidation Management Self Assessment and Readiness Assessment Final Reports have been reviewed for Lessons Learned. Those applicable to 7920 Dissolver	Complete

Plan of Action and Readiness Review for Level 1 Readiness Assessment

APPLICABLE and IN SCOPE	NOT APPLICABLE (N/A)		COMPLETE
		Off-Gas Rack have been reviewed with 7920 operations and support staff in a series of meetings.	
		Operational Experience/Lessons Learned session held with Operations Supervisors from 3525 and 7920 and NSTD SMEs to discuss specific operational issues. <ul style="list-style-type: none"> <li>• Session conducted 12/30/2008</li> <li>• Session included the following:                             <ul style="list-style-type: none"> <li>○ 7920 personnel: A Smith, M Milburn, R Weaver, and P Bailey</li> <li>○ 3525 personnel: W Keeton, W Bolinger, R Bowman</li> <li>○ NSTD personnel: B Jubin, S Owens</li> </ul> </li> </ul>	Complete
		ACTS review for impacts on startup of Dissolver Off-Gas Trapping system <ul style="list-style-type: none"> <li>• ACTS Review conducted 11/12/2008; justifications provided 11/13/2008</li> <li>• Two actions relative to Dissolver Off-Gas Trapping System identified                             <ul style="list-style-type: none"> <li>○ ACTS 9302.3.2 – CLOSED</li> <li>○ ACTS 9850.17.1 – CLOSED</li> </ul> </li> </ul>	Complete

Plan of Action and Readiness Review for Level 1 Readiness Assessment

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Approval of Assessment Scope, Plan, Team Leader, and Team Members:

*/s/ Tim Powers*

T. P. Powers, NNFD Director

*2/20/09*

Date

**Manageable Items List** (at time of Readiness Assessment):

1. Facility needs to complete training for minimum staffing
- 
- 
- 
- 
- 

Ready for Readiness Assessment:

*/s/ A W Smith*

A. W. Smith, REDC Facility Manager

*3/10/09*

Date

Plan of Action and Readiness Review for Level 1 Readiness Assessment

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**Findings, Observations, & Proficiencies** (see Attachment 1 for further explanation):

**FND-01:** The Screening for Work Acceptance in Non-Reactor Nuclear Facilities form has not been fully completed in accordance with SBMS Procedure "[Proposing Research Work](#)."

**OBS-01:** An evaluation of preventive maintenance and calibration/testing requirements for components on the Dissolver Off-Gas Rack needs to be completed, in accordance with program QA requirements.

**OBS-02:** Several improvements with the operating procedure NNFD-7920-OP-157, *Building 7920 Dissolver Off-Gas Rack Operation*, should be made prior to operating the equipment.

**OBS-03:** JHE training should be provided to all the RCTs that work with the Dissolver Off-Gas rack, and any other support personnel involved in the off-gas rack operations.

**OBS-04:** The installation of the pressure relief valves (PSV-302 and PSV-303) on the expansion tanks has not been documented to meet the requirements of the ASME Pressure Vessel Code.

**PROF-01:** The OJT for the operating procedures was conducted in a positive manner, conveyed useful information, and encouraged open dialogue.

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Plan of Action and Readiness Review for Level 1 Readiness Assessment

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**Lessons Learned:**

(1) Support personnel (RCTs, etc.) should be included in initial training and performance of testing/dry-runs so that they will be adequately prepared to support operations.

(2) When initiating new R&D activities, evaluation of equipment requiring calibration/testing needs to be conducted, and required calibrations/testing performed in accordance with program QA requirements.

## Readiness Review Team Approval:

*/s/ Natasha LP Blair*

N. Blair, Readiness Review Team Leader

*04-09-2009*

Date

*/s/ Bob Orrin*

B. Orrin, Readiness Review Team

*4-9-2009*

Date

*/s/ M J Pierce*

M. Pierce, Readiness Review Team

*4/9/09*

Date

Readiness Review Checklist  
Plan of Action and Readiness Review for Level 1 Readiness Assessment

Revision 2

Follow-up RA Review after System Modifications:

**Findings, Observations, & Proficiencies** (see Attachment 3 for further explanation):

**OBS-05:** The use of a code-stamped pressure vessel under vacuum conditions without a pressure-relieving device should be reviewed by the ORNL AHJ for pressure vessels.  
[PRE-START]

**OBS-06:** A review of why lessons learned are not being applied from one facility to the next should be conducted. [Post-start]

**OBS-07:** The design/installation problems with the Temporary Recirculation Loop Vacuum Pump need to be resolved. [PRE-START]

**OBS-08:** The Temporary Recirculation Loop Vacuum Pump needs to be labeled ("HS-305") in the field. [PRE-START]

**OBS-09:** The latest draft of NNFD-7920-OP-157, *Building 7920 Dissolver Off-Gas Rack Operation* (provided for review on 06/24/09) had some minor comments that needed to be resolved prior to issuing the procedure as approved for use.  
[PRE-START]


**OBS-10:** Operator Aid drawing N3E020995A135 (rev B), "Dissolver Off-Gas Rack Operator Aid" needs to be revised to show the two different "Temporary Recirculation Loops" as indicated by the legend in the top right corner. [Post-start]

**OBS-11:** Design Analysis Calculation NNFD-7920-DAC-2009-008, "Xe/Kr Expansion Tank Relief Valve Evaluation" should be revised to account for the new vacuum pump.  
[Post-start]

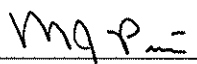
Follow-Up Review Team Approval:

  
N. Blair, Readiness Review Team Leader

06-25-2009  
Date

  
D. Campbell, Readiness Review Team

6-25-2009  
Date

  
M. Pierce, Readiness Review Team

6/25/09  
Date

Plan of Action and Readiness Review for Level 1 Readiness Assessment

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Ready for Startup/Restart Authorization:

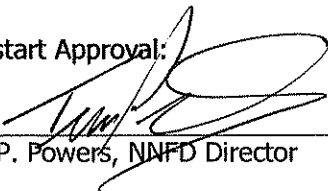


A. W. Smith, REDC Facility Manager

6/25/09

Date

Restart Approval:



T. P. Powers, NNFD Director

6/25/09

Date



## Attachment 1 – Findings, Observations, and Proficiencies

### Findings

- 1) **FND-01**: The Screening for Work Acceptance in Non-Reactor Nuclear Facilities form has not been fully completed in accordance with SBMS Procedure "[Proposing Research Work](#)."
  - a) Step 5 of SBMS Procedure "Proposing Research Work" in the SBMS Subject Area: Work Control states the following for work that will be conducted in category 2 or 3 non-reactor nuclear facilities: "PI or program manager (PM) defines the hazards, scope, and cost of proposed new research by electronically completing the Screening for Work Acceptance in Non-Reactor Nuclear Facilities form. The work acceptance process must be completed prior to ORNL acceptance of funding for project implementation."
  - b) A review of the electronic system of screenings available did not identify any that were applicable to 7920 that included the Dissolver Off-Gas trapping system in the scope of the review.
  - c) On March 19, 2009, a scanned copy of a screening form was provided. It had been submitted and approved by Facility Management in May 2006. However, the screening form states: "SBMS requires all new work be reviewed by the Nuclear Review Panel prior to acceptance." The provided documentation does not have any indication of review and/or approval by the Nuclear Review Panel.

### Observations

- 1) **OBS-01**: An evaluation of preventive maintenance and calibration/testing requirements for components on the Dissolver Off-Gas Rack needs to be completed, in accordance with program QA requirements.
  - a) No calibration information was found in the field (or in DataStream) for several electronic controllers/transmitters.
    - i) The following electronic devices did not have evidence of calibration:
      - TIC-2, heater controller for iodine trap
      - TIC-12 / TIC-8, heater controller for iodine trap / Xe/Kr Trap 1
      - TIC-10, heater controller for Xe/Kr Trap 2
    - ii) The following response was received by NSTD SME Dan Ramey on 3/31/09, regarding these items:
    - iii) "[These items] deal with the calibration of heater controls. A true calibration, where the controller and heater are removed from a contaminated area, is not economically feasible. All heater controls were functionally tested when installed on the DOG rack in Building 7936 and all controllers performed as required in numerous DOG dummy runs with surrogate materials. An in situ functional test of these controllers can be performed in the LAA if needed to confirm proper operation."
  - b) The portable HEPA filter that is used to vent the scrubbers via a needle valve on quick disconnect has no indication of being tested.
    - i) NNFD-7920-OP-157, *Building 7920 Dissolver Off-Gas Rack Operation*, Section 5.3, "Startup of the Dissolver Off-Gas Rack" has several steps where the operator is directed to "Connect a HEPA filtered vent with needle valve to quick connect at valve [\[see below\]](#) and ensure the needle valve is **OPEN**." This occurs at the following steps:
      - Step 5.3.3, when preparing the NO<sub>x</sub> scrubber, the HEPA filter is connected at valve HV 316.
      - Step 5.3.16, when preparing the CO<sub>2</sub> scrubber, the HEPA filter is connected at valve HV 325.
      - Step 5.3.57 (and Step 5.3.91), to control system flow rate, the HEPA filter is connected at HV 366.

## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920

### Attachments

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- Step 5.7.18, when releasing desorbed Xe/Kr from Xe/Kr Traps to the ventilation system, the HEPA filter is connected at HV 331
  - Step 5.8.5, when recovering CO<sub>2</sub> scrubber solution, the HEPA filter is connected to HV 316.
- ii) If the potential exists for any amount of particulates to be pressurized and put into the surrounding atmosphere (as evidenced by the choice of HEPA filter on the vent lines), then the HEPA filter should be periodically tested for reliability.
- c) The pressure relief valves (PSV-301, PSV-302, and PSV-303) on the system do not appear in DataStream, and thus, do not have a periodic inspection/testing scheduled assigned.
- i) The pressure relief valves (PSV-302 and PSV-303) on the expansion tanks and the pressure relief valve (PSV-301) on the test gas manifold have initial test/inspection documentation.
- PSV-301 was inspected and received Satisfactory results on 01/28/2008
  - PSV-302 was inspected and received Satisfactory results on 10/10/2008
  - PSV-303 was inspected and received Satisfactory results on 10/10/2008
- ii) The procedure SSI 2002 was used to test/inspect the valves.
- iii) Review of the Kunkle Installation and Operating Instructions yielded the following: "Maintenance should be performed on a regular basis. An initial inspection interval of 12 months is recommended. Depending on the service conditions and the condition of the valve, the inspection interval may be decreased or increased."
- iv) A review of DataStream assets assigned to Building 7920 yielded no items with the description of "relief valve" (or other similar description) located in the LAA that would be installed on the dissolver off-gas rack.
- v) These items need to be entered into the electronic database to be managed and tracked for periodic inspection/testing.
- vi) At the manufacturer's suggested 12-month interval, PSV-301 is overdue for its next inspection.
- d) The vacuum pump that is used to evacuate the expansion tanks is a Welch Model # 8907.
- i) This is the same model that was used at Building 3525, and had operational problems.
- ii) According to the operating manual: "The oil change interval is completely dependent upon the running conditions of temperature, operating pressure, hours of daily operation, and upon the materials pumped. ... To determine your own oil change interval, visually monitor the pump oil conditions at regular intervals. If you suspect harsh operating conditions, daily visual checks are recommended. When the oil becomes cloudy, dark or includes particles of solids, it is time to change the oil. Oil may be visually checked through the oil level window. However, a much better check is to use the drain to draw out 20-50 ml into a small glass beaker and view the oil with a light behind it. Clean oil can be returned to the pump through the oil fill port. ..."
- iii) A review of DataStream did not identify any items that resembled this pump.
- e) Gamma detector M247934, mounted on the inlet (west) side of the off-gas rack, is out-of-date on its calibration (due 2/4/2009). This gamma detector is currently being used as AIT-304.
- f) The "compound auxiliary gauge (-30 in Hg / +30 psig range)" that is inserted into the sample ports located at valves HV 354 and HV 352 during evacuation of the expansion tanks during section 5.2 of the procedure does not have any indication of having been calibrated.
- g) Refer to **Attachment 2** for additional details of items that need to be evaluated for PM/calibration/changeout requirements.

## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920

### Attachments

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- 2) **OBS-02:** Several improvements with the operating procedure NNFD-7920-OP-157, *Building 7920 Dissolver Off-Gas Rack Operation*, should be made prior to operating the equipment.
- a) There is a typographical error in the NOTE prior to step 5.5.23: "... that the second trap ~~warns~~ **warms** to room temperature."
  - b) The NOTES in Section 5.2, Evacuate Expansion Tanks 1 and 2, and Section 5.5, Shutdown of the Off-Gas Rack, need to be evaluated to ensure that they are in the proper place, relative to the steps that they describe.
    - i) There was some confusion during the initial OJT sessions, as documented in an email from Mark Pinchback, dated 03/11/2009.
    - ii) Step 5.2.4 opens valves HV-201, HV-359, HV-356, and HV-347. The NOTE that follows step 5.2.4 states "This starts the pumping action of J-C6AJ on Expansion Tank 1." Step 5.2.5 ensures that a vacuum gauge is inserted into a sample port at HV-354. Clearly, the NOTE is referring to the action in Step 5.2.4, not Step 5.2.5, and is located in the wrong place.
    - iii) Step 5.5.7 closes valves HV-301, HV-360, HV-361, and HV-204. The NOTE that follows step 5.5.7 states "This action disconnects the Dissolver Off-Gas rack from the T-555 Dissolver." Step 5.5.8 sets the iodine heater controls to 0. Clearly, the NOTE is referring to step 5.5.7, not step 5.5.8, but is in the wrong location.
    - iv) There are other examples where the NOTES are placed after the steps to which they refer, instead of before.
    - v) Per DOE-STD-1029-92, *Writer's Guide for Technical Procedures*, Section 4.10.2, Item [2]: "Position notes so they are complete on one page and appear immediately before and on the same page as the action step(s) to which they apply."
  - c) The procedure calls for a "labeled screw-top plastic sample container with a capacity of 4L or more (equipped with a catch pan carrier)" in steps 5.8.3 (for draining the CO<sub>2</sub> scrubber solution) and 5.9.2 (for draining the NO<sub>x</sub> scrubber solution). When interviewed about these containers, neither supervisor Roger Weaver nor Porter Bailey knew of any 4L containers that were equipped with the "catch pan carrier" configuration. This should either be changed in the procedure, or NSTD should provide the appropriate containers.
  - d) During the OJT sessions, the radio interference with the electronics of the dissolver off-gas system was discussed. It was recommended by one of the technicians that radio interference be mentioned in the procedure, in the Precautions and Limitations.
  - e) Consideration should be given to writing a Startup Plan, and having the revisions to the procedure as a PREREQUISITE to first operations identified in the Startup Plan.
- 3) **OBS-03:** JHE training should be provided to all the RCTs that work with the Dissolver Off-Gas rack, and any other support personnel involved in the off-gas rack operations.
- a) An interview was conducted on 4/6/09 with RCT Steve Lyles which focused on his understanding of the Job Hazard Evaluation associated with the Dissolver Off-Gas rack.
  - b) The interviewee had attended a review session of lessons learned from the 3525 Voloxidation project as the pertained to the 7920 Dissolver Off-Gas Rack.
    - i) This review session did not focus on the hazards of the off-gas rack, nor review the JHE for the procedures.
  - c) When asked if he had an opportunity to review or be part of discussion associated with the Job Hazard Review associated with Work Plan NNFD-7920-OP-157/0, the answer was no.
  - d) Training for the RCTs, and any other support personnel involved in the off-gas rack operations, should be provided prior to initiating work.
  - e) Consideration should be given to writing a Startup Plan, and having the training for the RCTs as a PREREQUISITE to first operations identified in the Startup Plan.

## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920 Attachments

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- 4) **OBS-04**: The installation of the pressure relief valves (PSV-302 and PSV-303) on the expansion tanks has not been documented to meet the requirements of the ASME Pressure Vessel Code.
- a) The piping size, based on documentation, is ½-inch on the inlet side, and ¾-inch on the discharge side. The piping that routes the discharge from the relief valves back to the hot cells (via connection B-2) must be ¾-inch or greater through the entire length. It appears, based upon visual inspection, that the discharge piping size has been reduced immediately upon exiting the relief valves.
  - b) Additionally, the two relief valves discharge into a common header.
  - c) 2007 ASME Boiler and Pressure Vessel Code, Section VIII Rules for Construction of Pressure Vessels, D1, UG-135 INSTALLATION, paragraph (f) states: "Discharge lines from pressure relief devices shall be designed to facilitate drainage or shall be fitted with drains to prevent liquid from lodging in the discharge side of the pressure relief device, and such lines lead to a safe place of discharge. The size of the discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity of the pressure relief devices below that required to properly protect the vessel, or adversely affect the proper operation of the pressure relief devices."
  - d) Per conversation with Design Authority, Don Foster, these pressure relief valves and their associated piping were chosen based on the expected pressures of the expansion tanks.
  - e) There is no formal document that demonstrates that the pressure relief valve drain piping will adequately vent the expansion tanks, in accordance with the requirements of the ASME Pressure Vessel Code.

### Proficiencies

- 1) **PROF-01**: The OJT for the operating procedures was conducted in a positive manner, conveyed useful information, and encouraged open dialogue.
  - a. OJT sessions for NNFD-7920-OP-157 and NNFD-7920-OP-159 were observed on Friday, 3/20/2009 and Monday, 3/23/2009.
  - b. During the classroom portion of the OJT, the supervisor (Weaver) discussed the Precautions & Limitations of the procedure(s), how to obtain an MSDS (both from the book in the control room and on-line), interaction with the NSTD SMEs, and radio interference with the computer controls.
  - c. During the field-portion of the OJT, the supervisor discussed the hazards, pointed out each of the main components on the dissolver off-gas rack, and gave a general overview of the operation of the system. He questioned the operators on the proper method for checking valve positions, and discussed expected conditions during startup and shutdown of components. The valve alignment was reviewed by the supervisor pointing out each individual valve for startup; the shutdown section was turned over to the technicians to find the valves on the rack.

## Attachment 2 – Items Requiring PM and/or Calibration and/or Periodic Changeout

### HEPA Filters

- IE-2304 (in Cubicle 6) – tested 11/10/08
- IE-2302 (in LAA) – tested 11/10/08
- No identification number (portable HEPA filter on quick disconnect used to vent system at startup) – **not tested**

### dP Gauges

- dP gauge on HEPA Filter [IE-2304] (in Cubicle 6) (A000285 or A000286) – calibrated 11/21/08

### Check Valves

- CV-301 – calibrated/tested 10/3/08
- CV-302 – calibrated/tested 10/3/08
- CV-303 – new check valve provided – calibrated/tested 8/4/08 – not installed yet (3/31/09)

### Gamma Spec

- AIT-303 – M242555
- AIT-304 – M247934 (due **2/4/09**)

### Flow Indicators

- FEI-301 – Metrology Tag # 105440 (calibration date 1/12/09; due 1/12/14)
- FEI-302 – Metrology Tag # 105442 (calibration due 1/13/14)

### Pressure Safety Valves

- PSV-301 – Red tape “F.O.1.08.SV.2” (tested **1/28/08**)
- PSV-302 – Red tape “F.O.10.08” (tested 10/10/08)
- PSV-303 – (tested 10/10/08)

### Pressure Indicator Gauges

- PI-307 – no number – **no indication of calibration**
- PI-308 – M216766
- PI-309 – M216767
- No number – portable compound auxiliary vacuum gauge (-30 in Hg / + 30 psig) – **no indication of calibration**

### Temperature Controllers

- TIC-2 (electronic) – no number; **no indication of calibration** – per Dan Ramey & Bob Jubin, should consider testing temperature controllers
- TIC-8 / TIC-8 (electronic) – no number; **no indication of calibration** – per Dan Ramey & Bob Jubin, should consider testing temperature controllers
- TIC-10 (electronic) – no number; **no indication of calibration** – per Dan Ramey & Bob Jubin, should consider testing temperature controllers

### Pressure Transmitters

- PIT-301 – M216720 (calibration date 1/5/09)
- PIT-302 – M216719 (calibration date 1/5/09)
- PIT-303 – M216718 (calibration date 1/5/09)
- PIT-304 – M216717 (calibration date 1/5/09)
- PIT-305 – M216716 (calibration date 1/5/09)
- PIT-306 – M216714 (calibration date 1/5/09)
- PIT-307 – M216722 (calibration date 1/5/09)
- PIT-308 – M216715 (calibration date 1/12/09)
- PIT-310 – M216807 (calibration date 1/12/09)
- SPARE – M216721 (calibration date 1/5/09)

### Pumps

- Vacuum pump (@ HS-304) – Welch Model # 8907 – **requires PM** per manufacturer’s Operating Manual

### Pressure Vessels

- Expansion Tank 1 – Serial # 587793 (inspected 9/5/08)
- Expansion Tank 2 – Serial # 582925 (inspected 9/5/08)

### Attachment 3 – Follow-Up RA Review

A review was conducted on Wednesday, June 24, 2009 of the modifications to the 7920 Dissolver Off-Gas Rack that had been made since the Readiness Assessment was last conducted and the report approved on April 9, 2009. The scope of the review was limited to the physical changes made in the LAA, and the document changes made as a result of those physical changes. In addition, the ACTS actions associated with the original review (See main body of this report) were reviewed to confirm that they were closed, and a brief review of the evidence associated with the action closures.

For the follow-up review, Dean Campbell was added to the team.

#### Physical changes reviewed in the field:

- ☑ Addition of a new HEPA filter on the piping that vents the DOG system to the VOG system in Cubicle 6
- ☑ Addition of a 20-L Auxiliary NO<sub>x</sub> Scrubber Solution Tank, valve HV-371, and associating piping
- ☑ Addition of temporary Recirculation Loops from the Xe/Kr traps through the Expansion Tanks using a new portable vacuum pump and stainless steel braided hose attached to quick connects

#### Documents reviewed:

- NNFD-7920-OP-157, *Building 7920 Dissolver Off-Gas Rack Operation*, Rev 1 – DRAFT
- N3E020995A110, *Dissolver Off-Gas Trapping Flow Sheet*, Rev D
- N3E020995A110, *Dissolver Off-Gas Rack Operator Aid*, Rev B
- Test Package 09-PK-7920-002, *Building 7920 Dissolver Off-Gas Rack NO<sub>x</sub> Scrubber Testing*
- "Inspection and Test of In-the-Line High Efficiency Particulate Air Filters," conducted on 11/10/2008
- ACTS Assessment 12062, "Readiness Assessment for Bldg 7920 Dissolver Off-Gas System" and associated closure evidence
  - Action 12062.1.1 – Letter from J. N. Herndon to K. J. Beierschmitt, dated July 14, 2006, "Nuclear Review Panel Review: GNEP Technology Research, Development, and Demonstration Project"
    - Attachment 6: Screening for Work Acceptance in Non-Reactor Nuclear Facilities – Project Title: GNEP Technology Research, Development, and Demonstration Project; form submitted 05/19/2006; form approved 07/14/2006
  - Action 12062.2.1 – Listing of DOG equipment and their associated calibration/testing status
  - Action 12062.2.2 – Functional Testing results of Dissolver Heater Controls (TIC-2, TIC-8/TIC-10, and TIC-12)
  - Action 12062.3.1 – NNFD-7920-OP-157, rev 0, CN-1
  - Action 12062.4.1 – JHE training records (for RCTs assigned to support DOG)
  - Action 12062.5.1 – DAC for PRVs (on expansion tanks)
- RSS 7017.1, *AFCI Dissolver Off-Gas Rack Operations* – no changes made to this document since 12/31/08 (included in original review)

#### Personnel contacted:

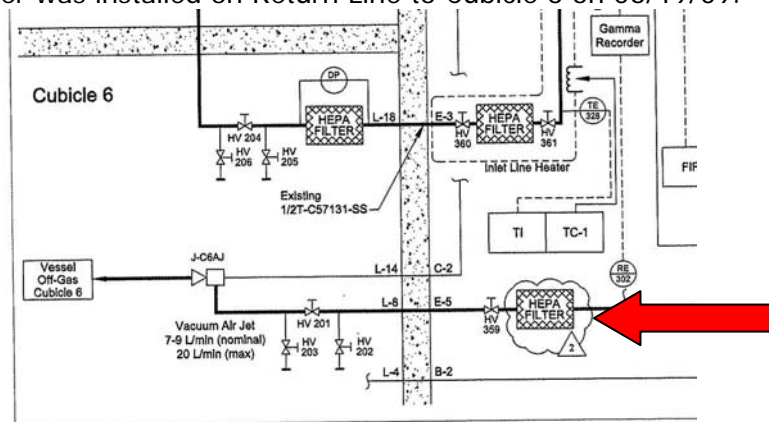
- Allen Smith, REDC Facility Manager
- Mike Green, REDC Facility Safety Basis Engineer
- Porter Bailey, REDC Operations Manager
- Don Foster, NNFD Design Authority
- Nicky Hatton, Procedure Writer
- Bob Jubin, AFCI ATS Project Manager
- Steve Owens, NSTD Dissolver Off-Gas SME

## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920

### Attachments

#### Discussion:

- (1) The new HEPA filter was installed on Return Line to Cubicle 6 on 06/19/09.



- This HEPA filter was added as a result of an Operational Emergency that occurred in Building 7920 on 05/04/09, which was unrelated to the Dissolver Off-Gas system. (Reference ORPS-ORO—ORNL-X10NUCLEAR-2009-0001, "Operational Emergency at Bldg 7920.")
- One of the actions in the ORPS report (Action #2) was to "Perform a high level vulnerability assessment of other systems that pull from the hot cell bank to determine if a similar situation could occur; put into place compensatory measures as applicable." (Reference ACTS Action 0.21192.8.) This action was completed on 05/15/09 with a report signed by Porter Bailey (REDC Operations Manager), Allen Smith (REDC Facility Manager), and Tim Powers (NNFD Division Director).
- The report states: "... only a few systems still offer the slight possibility of causing a release. There would have to be unique circumstances to defeat the procedural and design safety features already in place. These systems are listed below along with the normal methods of mitigation and the unique situations required to defeat these methods."


*Dissolver Off-Gas System (DOG): The DOG System is another system that operates under vacuum and draws from the cubicle into the LAA. This system is protected from solid contaminants by HEPA filters located within the cubicle as well as in the LAA, but the contamination of the system and potential release of radioactive gases is a possibility. Under normal operations the vacuum is created by a vacuum jet located in cubicle 6. Although the system is drawing from the cubicle, it is also returning to the cubicle under vacuum force so a leak in the system would most likely not result in a release. However, a situation exists that could cause part of the system to be pressurized which could result in a release of airborne contamination. The normal vacuum on the system is supplied by an air operated jet, if the jet discharge was to become plugged or blocked by some method, then the drive air could be forced back into the DOG system on the return line and actually pressurize the system.*

## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920 Attachments

- The table included with the report has the following information regarding the DOG system:

DOG Rack					
Purpose	Potential Scenario(s)	Risk for Airborne Contamination Release? (Y/N)	Compensatory Measures Required? (Y/N)	When are Compensatory Measures required?	Is System a candidate for longer-term engineering oversight? (Y/N)
Trap gases evolved during the dissolution of Spent Nuclear Fuel	No HEPA filter on return line to Cell. If vacuum jet were to plug, this could pressurize the return line to DOG rack.	<b>Y</b> Considered low risk since the vacuum jet is ½-inch line and only intended to handle air which reduces the likelihood of plugging	<b>Y</b> Install HEPA filter on return line	Prior to use of DOG rack	<b>Y</b> Future assessment will determine approach

- The Compensatory Measure HEPA filter was installed on 06/19/09 in the existing return line. Field review of the HEPA (on 06/24/09) identified the HEPA filter as IE-2303. Don Foster (DAR) provided the documentation of the test/inspection records for this new filter.

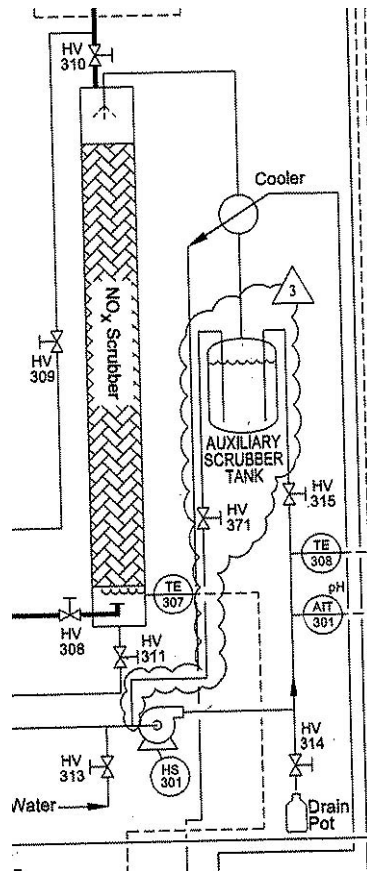
Inspection and Test of In-the-Line High Efficiency Particulate Air Filters ORNL Quality Engineering and Inspection						
IR 13505 * or RPE Test file	Procedure: JSP-151	Photometer MTE No. 213	Calibration Exp. Date:	Type: <input checked="" type="checkbox"/> Scheduled <input type="checkbox"/> Unscheduled		
Building: 4500 N.	Date: Nov 19, 2008	Contact: Don Foster	Acceptance Criteria: 99.95%	LogIn:		
IE Number (or other ID)	Description	Cu (upstream)	Cd (downstream)	Calculated Efficiency	Result	Remarks
2300	SERIAL No. # J1-4	100%	0.004%	99.996%	Accepted	
2301	SERIAL No. # J1-1	100%	0.010%	99.99%	Accepted	
2302	SERIAL No. # J1-6	100%	0.008%	99.992%	Accepted	
2303	SERIAL No. # J1-5	100%	0.004%	99.996%	Accepted	
2304	SERIAL No. # J1-2	100%	0.004%	99.996%	Accepted	
2305	SERIAL No. # J1-3	100%	0.006%	99.994%	Accepted	

- No further comments on the new HEPA filter.



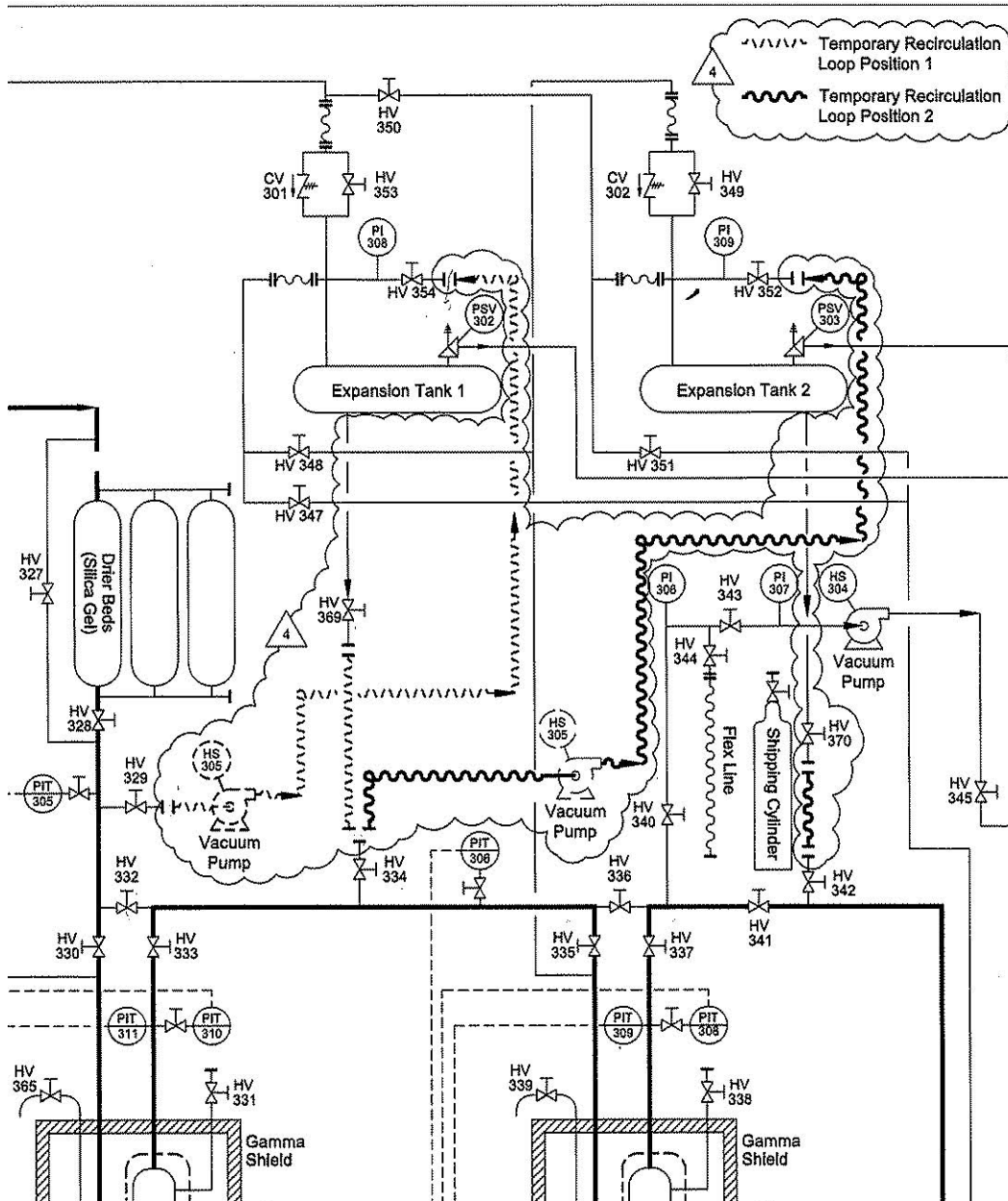
## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920 Attachments

(2) A new 20-L stainless steel Auxiliary NO<sub>x</sub> Scrubber Solution Tank was installed.



- To ensure that the scrubber solution does not exceed 2M HNO<sub>3</sub> during dissolver operations, additional scrub solution (water) capacity was added.
  - A stainless steel 20-L tank capable of withstanding vacuum pressures expected to be encountered during normal operations of the DOG system was procured and installed in May/June 2009. This increases the scrub solution capacity to a maximum total of 24 L.
  - The new NO<sub>x</sub> scrubber solution tank is a code-stamped vessel. There is no pressure relieving device installed on the tank.
  - Some experience with this occurred during the SNAP project at Building 3525, during which a code-stamped vessel was procured for a design that did not call for a code-stamped vessel. The ORNL AHJ, Mark Lower, interpreted the Pressure Vessel Code, and made the determination that the code-stamped pressure required a pressure relief device.
  - This is a similar situation, and needs to be reviewed by the ORNL AHJ for pressure vessels. **[OBS-05]**
- Test Package 09-PK-7920-002, Building 7920 Dissolver Off-Gas Rack NO<sub>x</sub> Scrubber Testing, was written to ensure that the existing pump (at HS-301) would handle the extra pressure drop and that there would be no abnormalities in the flow.
    - Testing was conducted on 06/23/09. All acceptance criteria were met.
    - The Test Report was approved on 06/24/09.

- (3) Temporary Recirculation Loops – from the Xe/Kr traps to their respective Expansion Tanks – were designed and a new portable vacuum pump procured, quick disconnects installed, and stainless steel braided hose added to make the connections as necessary.



- The new vacuum pump was reviewed in the field. The nameplate identifies the pump as Model # MB-158MOD, manufactured by Senior Operations, Inc., Metal Bellows. The configuration is a pump, motor, and capacitor – all of which are exposed to the surrounding elements.

- The vacuum pump's wetted surfaces are made of stainless steel, except for the gaskets. Therefore, the only leak potential is from the connection points where the hoses connect to the pump inlet and outlet connections.
- The pump that was purchased is designed to be inside an enclosure.



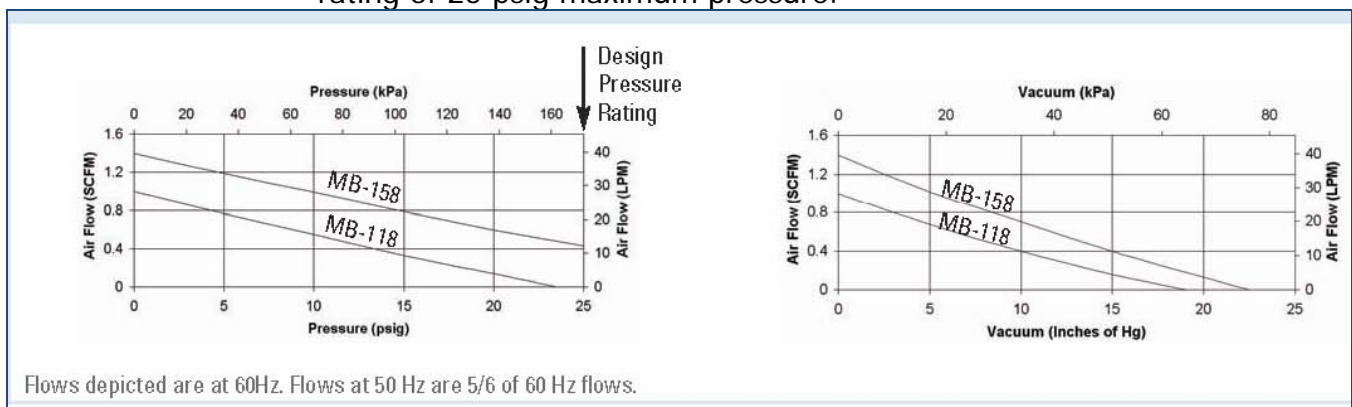
- The pump that was required for this application needs to be enclosed. (See Dean Campbell's comments below.)



- Per Dean Campbell: *"The new pump for the DOG rack is a Senior Aerospace Metal Bellows MB-158. The pump has an open frame motor and single insulated leads on the capacitor. This open frame arrangement should be mounted in an enclosure to adequately guard the electrical parts, and is not designed for stand-alone service."*
- A similar situation was encountered during the Voloxidation project at Building 3525. The same vacuum pump was installed in the west hot cell, and a box was later added to enclose the components. The problems with the cord switch was on a controller in the Charging Area. Given this situation, and the one with the use of the code-stamped vessel (reference OBS-05), a review of why lessons learned are not being applied from one facility to the next should be conducted. **[OBS-06]**

## Startup of Off-Gas Trapping for Hot Cell Dissolution in Building 7920 Attachments

- A brief field review of the electrical components was conducted on 06/24/09.
  - Per Dean Campbell: *"The on/off switch for the pump is installed in a conduit box with knockouts and other openings. These type boxes are not allowed to be used for cord sets. A cast box with strain relief, or a listed in line cord switch is needed for the switch application."*
- The design/installation problems with the Temporary Recirculation Vacuum pump need to be corrected prior to operation. **[OBS-07]**
- The new vacuum pump has not been labeled, as of the field review at ~ 2:00pm on 06/24/09. **[OBS-08]**
- During the original review, the question was raised about the ability of the pressure relief valves on the expansion tanks (PSV-302 and PSV-303) to meet the requirements of the ASME Pressure Vessel Code. (Reference OBS-04 from the original review.)
  - In response to this observation, Design Analysis Calculation NNFD-7920-DAC-2009-008, "Xe/Kr Expansion Tank Relief Valve Evaluation" was written and issued on 06/18/09. (Reference ACTS action 12062.5.1.)
  - It was noted during the follow-up review that an additional pressure source has been added to the expansion tank system by way of the Temporary Recirculation Loop Vacuum Pump (at HS-305).
  - The NNFD DAR was questioned about (1) whether or not this was considered to challenge the pressure-relieving capabilities of PSV-302 and/or PSV-303, and (2) did the DAC address the new pump.
  - According to vendor information, the new pump has a design pressure rating of 25 psig maximum pressure.



- After discussing with the NNFD DAR and the NNFD SES Manager the new Temporary Recirculation Vacuum Pump, and its affect on the pressure in the expansion tanks and associated pressure relief valves, it was decided that the Design Analysis Calculation NNFD-7920-DAC-2009-008, "Xe/Kr Expansion Tank Relief Valve Evaluation" should be revised to account for the new pump maximum pressure. **[OBS-11]**

(4) The latest draft of NNFD-7920-OP-157, Building 7920 Dissolver Off-Gas Rack Operation, was reviewed on 06/24/09 as well conducting a field walkdown.

- The valve lineups were reviewed to ensure they were adequate to support the new equipment installed (as discussed in items (1) through (3) above). The procedure had been V&V'd earlier the same day. No problems were noted with the valving during our review.
- A change had been made to the procedure to change the CO<sub>2</sub> scrubber solution from 1.0 M NaOH to 0.1 M NaOH. This was noted in the procedure in the appropriate location.
- The procedure had been changed to add ~1-2 L of water to the piping in and around the NO<sub>x</sub> and CO<sub>2</sub> scrubbers to keep the pH probes wetted (AIT-301 and AIT-302, respectively).
  - The startup section of the procedure had been modified to drain the water from the scrubbers and associated piping.
  - The shutdown section had been modified to add water to the scrubbers and associated piping.
  - The procedure steps and valve lineup were reviewed. No problems were noted during our review.
- Some minor editorial comments were provided to the procedure writer that should be cleaned up prior to issuing the procedure as approved for use.

**[OBS-09]**

(5) The newest versions of N3E020995A110, *Dissolver Off-Gas Trapping Flow Sheet*, Rev D, and N3E020995A135, *Dissolver Off-Gas Rack Operator Aid*, Rev B, were reviewed.

- All new components identified on the drawings match the field configuration.
- The Operator Aid drawing (-A135) has a legend in the top right corner that identifies the two "Temporary Recirculation Loops" as "Position 1" and "Position 2," and uses two different style wavy lines to identify the loops. (Loop 2 is darker than Loop 1.) On the drawing, there is no distinction between the two loops, as indicated in the legend. **[OBS-10]**
- Flow Sheet drawing (-A110) distinguishes between Loop 1 and Loop 2 as identified in the legend.

(6) A review of the findings and observations from the original Readiness Assessment review was conducted.

- The one finding and five observations were tracked in ACTS under Assessment #12062.
- All actions were confirmed to be closed, and an Independent Review had been performed by NQR Bob Orrin on the closure evidence. The Assessment was closed in ACTS on 06/23/09.