

September 26, 2000

MEMORANDUM

TO: Jim Johnston
Idaho Falls Regional Office

FROM: Wade C. Woolery, Associate Engineer
State Technical Services Office

SUBJECT: **Permit to Construct Technical Analysis**
P-000504, DOE - Argonne Group - West
(PTC Amendment Application)

PURPOSE

The purpose for this memorandum is to satisfy the requirements of IDAPA 58.01.01.200 (*Rules for the Control of Air Pollution in Idaho*) for issuing Permits to Construct.

PROJECT DESCRIPTION

The Argonne National Laboratory - West (ANL-W), also referred to as Argonne Group-West (AG-W), proposed to amend their current permit-to-construct (PTC), PTC No. 011-00022. The two prominent changes are 1) elimination of the sodium carbonate process, and 2) replacement of the borosilicate HEPA filters in the caustic process system with an expanded polytetrafluoroethylene (e-PTFE, or e-Teflon) HEPA filter. This second item was originally submitted to DEQ under Project No. 000501, but was issued in this PTC amendment.

SUMMARY OF EVENTS

A. P-000504

On March 10, 2000, the Idaho Department of Environmental Quality (DEQ), Idaho Falls Regional Office (IFRO) received a PTC application for an amendment to the Sodium Process Facility (SPF) at the ANL-W. On March 13, 2000, the DEQ Technical Services Office (TSO) in Boise received the same application. On April 6, 2000, DEQ determined this application, P-000504 complete.

B. P-000501

On February 22, 2000, IFRO received a PTC application for an amendment to replace the borosilicate HEPA filters with e-PTFE HEPA filters at the Sodium Process Facility (SPF) at the ANL-W. On March 13, DEQ TSO received the same application. On March 31, 2000, DEQ determined the application incomplete. On April 14, 2000, ANL-W submitted the additional information requested by DEQ. On May 1, 2000, DEQ determined this application, P-000501, complete.

C. Permit Issuance

On July 17, 2000, the PTC for P-000504/P-000501 was issued by the DEQ. On August 2, 2000, the PTC engineer was connected via conference call to the Idaho Falls Regional Office, with staff from the Idaho Falls Regional Office, DOE, and Argonne in attendance. On August 18, 2000, the DEQ received requested changes from Argonne Group West. On August 25, 2000, the PTC engineer discussed, via conference call, the proposed changes with staff from Argonne and DOE. On August 28, 2000, the DEQ received a letter from Argonne requesting copies of the draft permit and tech memo be sent to Argonne for their review.

DISCUSSION

1. Project/Process Description

In addition to this PTC amendment, the Technical Analysis Memorandum, which is dated March 26, 1997, for the prior PTC modification, may be referenced in this analysis.

A. P-000501

The borosilicate filters in the caustic process system were exposed to caustic (NaOH) and moisture in the existing process, and were subject to deterioration by the process. ANL-W proposed to replace the borosilicate HEPA filters with an e-PTFE HEPA filter, which is resistance to moisture and acidic/basic gas streams. The Nuclear Air Cleaning Handbook (ERDA 76-21) states that paper/borosilicate HEPA filters should not be exposed to moisture or acidic/basic gas streams, and it appears that ANL-W operated their system counter process guidance directions.

The current PTC required that the facility use the Flanders HEPA (borosilicate), or DEQ-approved equivalent. I had the option of revising the PTC for this change, and then, approximately a month later, revising the PTC for P-000504. Rather than create the extra paperwork, and in an effort to expedite the process to enable ANL-W to install the e-PTFE filters, the completeness letter was issued an approval of the installation and operation of the e-PTFE filters, although testing of the efficiency would be required. ANL-W stated in their April 14, 2000 submittal, that the e-PTFE filters would provide the 99.97% particulate removal efficiency for particles of 0.30 micron, and larger, diameter under the SPF operating conditions.

Borosilicate glass HEPA filters will still be utilized in the Sodium Process Facility in systems such as the facility HVAC system. The use of expanded Teflon, however, will be used to control emissions from the caustic process.

B. P-000504

When the SPF PTC was modified in 1997, ANL-W planned to process elemental sodium into 50 wt% NaOH solution, and then into a dry sodium carbonate powder. It has been determined that this process is not practical, and ANL-W wants to produce a 70 wt% NaOH solid for disposal at the Radioactive Waste Management Complex (RWMC) on the INEEL.

In the caustic process, the resultant off-gas from the Na/NaK reaction passes through the reaction vessel baffles and demister, condenser, mist eliminator (mesh type), scrubber, mist eliminator (vane type), parallel polypropylene prefilters and parallel expanded polytetrafluoroethylene (e-PTFE, or e-Teflon) high efficiency particulate air (HEPA) filter. A heated nitrogen (N₂) gas diluent may be added to the off-gas. Only one (1) HEPA filter of the redundant system will be on-line during normal operations. The only air

pollution control was assumed by the HEPA filters in the calculation of the emission estimates provided by the applicant.

The PTC changes requested by ANL-W are delineated in the original application received by DEQ TSO on March 13, 2000 (DOE date March 9, 2000). Most of the requests were implemented into the new PTC. Variations from the request are as follows:

1. Section 1.1.C--"And" was used in lieu of "or", implying the facility must comply with all requirements. A third requirement of complying with Appendix A was also included.
2. Section 1.2--The word "projected" to describe emissions was deleted.
3. Section 1.3--The equipment listing was not deleted from the permit. Because of the complicated nature of the processing, equipment changes could result in increase emissions. Changes should be seen by DEQ prior to implementation of the permit. An example of this logic is apparent from the operation of borosilicate HEPA filters in a gas stream that was not recommended by the process guidance documents.
4. Section 2--the last sentence will maintain the $8.8E-02$ mrem/yr as opposed to the request of 0.1 mrem/yr. The use of the 0.1 mrem/yr appears to be a holdover from earlier use of "maximum flexibility" in the permits. Because of the nature of the emissions, this will remain at the current limit.
5. Section 3.7 (now 3.5)--"Nominal" was changed to "maximum" rate.

On August 18, 2000, the DEQ received a list of proposed changes based upon the August 2, 2000 permit handoff.

1. The facility wanted to include the use of borosilicate filters, in case the Teflon filters do not function as designed. The problem, however, is that in the original PTC application, the presence of caustic solution deteriorated the borosilicate glass filters much faster than the Teflon filters. For clarification, the Teflon filters were defined as the final filter system for the caustic process off-gas. This prevents the possible confusion that an inspector could have when he/she sees the borosilicate glass filters in the HVAC system. The July 17, 2000 PTC did not make the distinction between the two types of filters in the Sodium Process Facility.
2. The Process Description of the 07/17/00 PTC was revised, with portions that described equipment being moved to this Tech Memo. This was to reduce the possibility of a compliance violation due to a change in the equipment which would not increase the emissions.

The prior PTC (1997) removed reference to the scrubber as control equipment, however, this application states that "the scrubber and

pre-filters prevent excessive radioactive particulate and caustic from reaching the atmosphere". This statement implies the scrubber is a piece of air pollution control equipment. In a June 12, 2000 telephone conversation with Mr. Alan Croft, I was informed that the emission calculations in Appendix A were calculated under the assumption there was no emissions reduction in the scrubber and prefilter.

3. The current INEEL PTCs contain an Appendix regulating the use of the HEPA filters. Most of these requirements were contained within the 1997 and 07/17/00 PTC, and required minor changes. To maintain consistency with other PTCs issued to the INEEL, the sections were removed, and covered by the current HEPA filter requirement. The facility had requested that any exceedances (Section 3.2 of the HEPA Filter General Requirements) be made maintained quarterly and available to DEQ, however, the HEPA Filter General Requirements require that a quarterly report be submitted to the DEQ. Mike Simon (DEQ State Office) believed that consistency is the best policy in this case, i.e., some sources would have to prepare the quarterly report, while others would not. Therefore, the use of the quarterly reporting is in the PTC.
4. The 07/17/00 PTC required that temperature controls be in place to monitor the off-gas temperature, which was limited because the manufacturer listed the maximum temperature of 140°F. The facility proposed that in lieu of monitoring the off-gas, that monitoring the temperature of the HEPA filter housing would be sufficient for monitoring the temperature of the off-gas at the exit of the HEPA filter. Also, the off-gas was required to be maintained at least 10°F above the dew point temperature to prevent buildup of entrained water, which could reduce removal efficiency, per the manufacturer.
5. The DEQ suggested that the hourly throughput rates be removed because the regulated emissions are delineated on annual basis. The only throughput requirement is an annual limit.

2. Equipment Listing

The equipment listing in Section 1.2 of the PTC has been removed, and has been inserted into this document, as follows:

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|-----|---|---|
| 2.1 | Sodium Storage Tank:
Manufacturer: | 5,000 gallons
Eaton Metal Products
Drwg D-3838-2 |
| 2.2 | Sodium Day Tank A:
Sodium Day Tank B:
Manufacturer: | 750 gallons
750 gallons
Eaton Metal Products
Drwg D-3838-1 |
| 2.3 | Reaction Vessel
Manufacturer: | Ind. Alloy Fabrications |

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| | | Drwg. D-937 |
| 2.4 | Caustic Cooling Tank:
Manufacturer: | 1000 Gallons
Ind. Alloy Fabrications
Drwg. D-938 |
| 2.5 | Water Holding Tank
Manufacturer: | Gender Machine
Drwg. 7254 |
| 2.6 | Suspect Waste Holding Tank
Manufacturer: | ANL Fabricated
E522274-0012-DD |
| 2.7 | Condenser
Manufacturer: | Ametek
MVHTR-2-B-C1. Size 6-Y-36 |
| 2.8 | Associated equipment, including compressor, pumps, filters, and flow indicators. | |

3. Emissions Estimates

The proposed modification results in no increase in emissions. The emissions in Appendix A of the PTC represent the total unabated emissions, while the emissions in Appendix A of the 1997 PTC used the abated emissions, which were incorrectly labeled as the unabated emissions.

4. Modeling

Because there were no change in emissions, no updated modeling was required. Prior modeling is sufficient to verify compliance with the current rules and regulations.

5. Area Classification

The ANL-W SPF is located within the boundaries of the INEEL and is located in Bingham county which is part of AQCR (Air Quality Control Region) 61 and is designated as attainment or unclassifiable for all criteria air pollutants as defined in 40 CFR 81.313.

6. Facility Classification

The INEEL is not a designated facility as defined in IDAPA 58.01.01.006.27. The INEEL is a major facility as defined in IDAPA 58.01.01.006.55 and in IDAPA 58.01.01.008.10.

The facility's Standard Industrial Classification (SIC) Code is 9999 which is defined as an unclassifiable establishment.

The AIRS Facility Subsystem source/pollutant classification for this facility is an A because actual emissions are greater than 100 tons per year.

7. Regulatory Review

A. The facility is subject to the following permitting requirements

<u>IDAPA 58.01.01.201</u>	Permit to Construct Required;
<u>IDAPA 58.01.01.202</u>	Application Procedures;
<u>IDAPA 58.01.01.203</u>	Permit Requirements for New and Modified Stationary Sources;
<u>IDAPA 58.01.01.205</u>	Permit Requirements for New Major Facilities or Major Modifications in Attainment or Unclassifiable Areas;
<u>IDAPA 58.01.01.209</u>	Procedures for Issuing Permits;
<u>IDAPA 58.01.01.211</u>	Conditions for Permits to Construct;
<u>IDAPA 58.01.01.212</u>	Obligation to Comply;
<u>40 CFR Part 61, Subpart A</u>	General Provisions; and
<u>40 CFR Part 61, Subpart H</u>	Standards for Radio nuclide Emissions from Department of Energy (DOE) Facilities.

B. Regulatory Analysis

The proposed project does not involve any emission increase nor operation change and continues to meet all applicable requirements of IDAPA 58.01.01.200 - 225. It calls only for the amendment of some sections.

8. Permit Requirements

8.1 Emission Limits

The emission limits of the PTC, as described in Discussion, Section 3, above, have changed because the emissions in the most recent PTC were not the emissions cited in the application. The process changes will not result in an emissions increase.

8.2 Operating Requirements

The HEPA filter requirements that were included in the existing PTC Operating and Monitoring Requirements, were very similar to the HEPA filter requirements that DEQ now includes as an Appendix in new/modified PTCs. The HEPA filter requirements were deleted from the body of the

permit, and are now regulated by the HEPA Filter General Requirements (Appendix B), which has been added to the permit.

The throughput flow rate was increased to reflect current requirements, but there was no increase in emissions. Any emission increases were offset by the decrease in emissions due to elimination of the carbonate process.

The inclusion of a maximum temperature requirement of 140°F reflects the manufacturer's maximum recommended operating temperature. Initially, the requirement was made to monitor the off-gas temperature, however, the facility stated that the temperature of the HEPA filter housing was already monitored, and would be a warmer temperature than the off-gas. The HEPA filter could provide some insulation value, which could result in a lower filter housing temperature than off-gas temperature. The temperature of the filter housing and the off-gas probably reach a steady-state temperature, however, the time to reach this stability is unknown.

As stated previously, moisture and caustic in the off-gas had a deteriorating effect on the old borosilicate HEPA filters. Teflon is resistant to caustic, however, according to the second submittal, the presence of free water can reduce removal efficiency. Initially, the incorporation of a requirement to maintain an off-gas temperature at least 10°F higher than the dew point was placed in the permit to prevent free water from being present in the off-gas. In a telephone conversation with Argonne/DOE on August 25, 2000, the facility stated that after a shut down in processing waste, an efficiency test (DOP, Emery 3004, etc.) is performed on the HEPA filters. Entrained moisture can be retained by the Teflon HEPA filters for hours after shutdown, therefore, if there is any entrained moisture present, it will be present during the efficiency test. After processing, the efficiency test reveals a higher than normal pressure, which Argonne attributes to entrained moisture. DEQ bases their compliance concerning the entrained moisture on this premise supplied by Argonne.

Previous PTCs also specified the origin of the Na/NaK which would be reprocessed. This is not pertinent permitting information, as long as the facility complies with the emissions delineated in their permit applications. The origin of the Na and NaK is as follows:

- 8.2.1 Eighty thousand gallons (70,000 gal) of elemental sodium from the FERMI nuclear reactor.
- 8.2.2 Eighty seven thousand gallons (87,000 gal) of primary Na/NaK and thirteen thousand gallons (13,000 gal) of secondary sodium which were used to cool the EBR-II reactor.
- 8.2.3 Other elemental sodium and/or Na/K waste, provided that emissions from processing these waste streams, when combined with the emissions from processing the waste delineated in

Sections 8.2.1 and 8.2.2, above, does not result in an effective dose equivalent which exceeds $8.8E-02$ millirems per year (mrem/yr) to the maximally exposed off-site individual as described in Section 2.1 of this permit, and cannot exceed the emissions delineated in Appendix A of this permit.

8.3 Monitoring Requirements

The HEPA filter monitoring requirements have been moved to the Appendix B HEPA Filter General Requirements, which have been included in new INEEL PTCs that utilize HEPA filters for air pollution control. In addition to those requirements, the facility will record the annual throughput and the temperature of the off-gas/filter housing. The previous permit required hourly and annual throughput recording, however, because the emissions are based on an annual emission standard ($\mu\text{Ci/yr}$) and an annual effective dose rate (mrem/yr).

9. Permit Coordination

A draft copy of the PTC and technical analysis was made available to the Idaho Falls Regional Office and the State Office for review prior to final issuance

10. AIRS Information

The current AIRS file for the ANL-W SPF did not delineate any emissions. I was told that the reason was probably because the emissions are radio nuclides, which are regulated as $\mu\text{Ci/yr}$, instead of the mass per time (i.e. tons/year) measurement utilized for other pollutants.

FEES

The INEEL facility is a major facility as defined in IDAPA 58.01.01.008.10 and is, therefore, subject to registration and registration fees in accordance with IDAPA 58.01.01.528. The INEEL is current in their payment of applicable fees. This PTC amendment does not change the amount of fees paid by the facility.

B. Analysis

There are no emission nor process changes and therefore the technical analyses done for the processing of the SPF permit (P-950072, 9/21/95 and P-950241, 2/8/96) are still relevant and may be referred to if necessary.

RECOMMENDATION

Based on the application, and review of all applicable federal and state rules and regulations, staff recommend that the existing PTC for the Sodium Process Facility at the ANL-W be amended as requested. No public comment period is recommended, no

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entity has requested a comment period, and the project does not involve PSD requirements.

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