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SUBJECT: Eurochemic Assistance Program: Comments by ICPP, dated March 17, 1959, on Questions for Eurochemic

TO: E. M. Shank, ORNL

FROM: M. E. Weech, ICPP

Acknowledgment

The attached comments were given by ICPP personnel on questions directed to ICPP by ORNL by Eurochemic. The comments have been retyped at ORNL after official release. The original questions are listed in Appendix I.

DISCLAIMER

Here are our best answers to your questions in your letter of December 18, 1958.

1. Fumeless dissolution system. We do not worry about radioactive krypton and xenon in our off-gases but we are concerned about radioactive iodine. Since our fuels are normally long cooled, the only iodine remaining is iodine-129. This is partially removed by reaction with caustic in the Nash Hytor pumps that pump the off-gas into the gas storage tanks and by caustic sprays that are installed in the tanks themselves. The actual iodine removal achieved by this system is difficult to establish since the RaLa system discharges off-gas to the stack also, so any sample taken at this point is a combined dissolver-RaLa off-gas. RaLa uses an MTR element cooled two days so has much more iodine present. It has been noted that transfers of RaLa solutions several weeks after a run completion results in a surge of iodine activity up the stack. In any case, during normal operation the iodine-129 is below tolerance when it leaves the stack.

   The efficiency of the downdraft condenser-absorber for NO_2 removal was discussed somewhat in my previous letter. Due to the design of our system this efficiency is also difficult to define. Below are given some data on gas feed to the condenser and composition after passing through the condenser-absorber and the caustic flooded compressors so the data are uncertain to the extent of NO_2 absorption in the compressor caustic.

CPM DOG Analysis

Vol %

	Before Condenser	After Compressors
NO	65.6	1.76
NO_2	5.22	13.2
N_2O	17.5	9.2
H_2	1.15	0.59
O_2	0	0
N_2	10.3	73.0
A	0.1	0.8

As you can see the efficiency on NO_2 absorption is not particularly good. O_2 and air is fed into the off-gas prior to the condenser and after the first set of analysis was taken. The NO content of the gas sets the oxygen bleed in from the combined O_2 and air. The air is fed in to dilute the H_2 below the explosive limit of 2.5 volume percent. The N_2 and A content of the first sample results from air leakage into the dissolver during the charging period. The DOG flow rate at the time the sample was

taken is approximately 21 scfm on an air free basis. The details of the condenser absorber have already been sent you. This data is on a nominal 5 percent uranium-aluminum fuel.

Data from the pilot plant on dissolver off-gas is given in IDO-14395 (confidential). This report shows a difference in off-gas composition between extruded, and cast elements. There is also evidence that burn-up influences the off-gas composition, so all these factors must be taken into account in the design.

2. Evaporator design and information on the large Lapp Pulsafeeder Pulsers, you should have by now.

3. Recycle and rework system. This has been at least partially answered. The organic stream has never been recycled at ICPP. This stream is put through a water wash, dilute nitric acid wash, carbonate wash, and dilute nitric again. The first two washes remove any uranium that is present so recycle of solutions or the organic stream from the last two washes has never been necessary.

4. Liquid waste storage. The questions you ask here pertain more to Hanford type operations than ours. I believe they could answer them much more satisfactorily.

5. Criticality. We have no criticality documents of our own. We use TID-7016 or the reports listed in this bibliography.

6. In-line instrumentation. We have an instrument developed for in-line continuous uranium analysis. This instrument is based upon uranium absorption peaks in the 3900-4500 angstroms range and works in the 2 grams per liter range. You can find additional information in IDO-14422 and IDO-14443.

7. The cost data you ask for, I understand, Mr. Schwennesen has sent you.

The Eurochemic reports you sent are being perused when time permits and the comments will be sent you as early as possible.

Appendix I. Basis for Comments

ORNL CF 58-12-58

Four copies of a report on the Eurochemic Assistance Program are being sent to you under separate cover. Included in the report is a list of assistance desired, and specific contributions on the items marked ICPP are requested. The most urgently needed information is on off-gas handling, evaporator de-entrainment devices, solvent recovery carbonate waste recycle, and off-specification product rework.

Information on specific items has been requested as follows:

1. Fumeless dissolution system. - Health physics controls are very rigorous, requiring complete removal of toxic and radioactive contaminants from the process off-gases prior to off-gas disposal. Since the dissolution steps contribute the greatest quantity of contaminated off-gases, information is needed on fumeless dissolution and off-gas treatment. The information should include design criteria, performance data, drawings, and reports on all phases of off-gas handling. A specific area in off-gas handling was a request for performance data comparison between updraft and downdraft condensers.

2. Equipment design and performance. - Equipment performance was not discussed in detail during my recent visit to ICPP. Design and performance data are needed for evaporator de-entrainment devices and for the large Lapp Pulsafeeder pulsers.

3. Recycle and rework system. - Current design calls for routine recycle of the solvent recovery carbonate waste stream. What is your experience with carbonate recycle as to solution handling properties and material recovery? What problems might be encountered and how might these be handled? In addition, information and recommendations are needed on the overall problem of recovering off-specification material from both organic and aqueous solutions. What is the current ICPP procedure and its advantages and disadvantages for handling off-specification materials? What type of system and operating procedure would you recommend?

4. Liquid waste storage. - Waste tank construction will be very expensive at Mol, Belgium, because the ground water level is about 5 ft. below the surface, and the area is highly populated. Neutralized high level wastes will contain large quantities of precipitated $Mg(OH)_2$, S. $Stl(OH)_x$, etc. The tanks will probably be installed with cooling coils. Specific questions relative to waste storage are tabulated below:

a. Are low level wastes, including jacket removal solutions, stored separately or with high level wastes?

b. What are the chemical, economical, and operational reasons for storing separately or together?

c. Can airlift recirculators be used to prevent "bumping" (as observed at HAPO) when gross quantities of precipitates are present?

d. What is the best method for removing decay heat from waste storage tanks; i.e., cooling coils, reflux condensers, etc.?

e. What materials of construction could be recommended for long term storage of neutralized waste containing $SO_3^=$, $NO_3^=$, Cl^-, F^-, in addition to Al, Mg, S. Stl, Zr, Nb, Na, etc.?

5. Criticality. - Information on the general subject of criticality is desired. Are there ICPP reports on criticality which could be sent to Eurochemic?

6. In-line Instrumentation. - We would like to keep Mr. Nicholson currently informed on the U. S. in-line analytical instrumentation program. Could we receive copies (or report numbers) of any existing ICPP reports on in-line instrumentation as well as future reports as they are published?

8. The nine reports listed below on specific Idaho Operation Area Costs have been requested by Mr. Nicholson. The reports are IDO issued and are classified either Official Use Only or Unclassified. We would like permission to send these reports to Mr. Nicholson (perhaps Mr. Schwennesen, IDO, can assist you).

-- Report on Shield Window Costs - ANP Project, Building 607 (Unclassified).

-- Hot Shop in A and M Building ANP/CE-3-607 (Official Use Only).

-- Analysis of Construction Cost of Hot Cells: MTR Hot Cells (Unclassified).

-- Analysis of Construction Cost of Hot Cells: Multicurie Cell (Unclassified).

-- Analysis of Construction Cost of Hot Cells; ANP Special Services Cubicle (Unclassified).

-- Project Completion Report - Hot Cell Area, Assembly and Maintenance Area, ANP Area - NRTS (Official Use Only).

-- Final Cost Report - Hot Cell Area, Assembly and Maintenance Area, ANP Area - NRTS (Official Use Only).

-- Construction Project Final Cost Report Fuel Element Cutting Facility Building CPP 603 (Official Use Only).

-- Engineering and Construction on Typical Unit Costs Report at July, 1957, Price Index (Official Use Only).

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