

***Fabrication of
ATALANTE Dissolver
Off-Gas Sorbent-Based
Capture System***

Fuel Cycle Research & Development

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SUMMARY

A small sorbent-based capture system was designed that could be placed in the off-gas line from the fuel dissolver in the ATALANTE hot cells with minimal modifications to the ATALANTE dissolver off-gas system. Discussions with personnel from the ATALANTE facility provided guidance that was used for the design. All components for this system have been specified, procured, and received on site at Oak Ridge National Laboratory (ORNL), meeting the April 30, 2015, milestone for completing the fabrication of the ATALANTE dissolver off-gas capture system. This system will be tested at ORNL to verify operation and to ensure that all design requirements for ATALANTE are met. Modifications to the system will be made, as indicated by the testing, before the system is shipped to ATALANTE for installation in the hot cell facility.

CONTENTS

SUMMARY	iii
FIGURES	v
ACRONYMS	vi
1. DISCUSSION.....	1

FIGURES

Figure 1. Schematic diagram of the ATALANTE off-gas capture system. 2

Figure 2. Design of the sorbent column for the ATALANTE off-gas capture system. 2

Figure 3. Design specifications for the HTS/Amptek heating jackets. 3

Figure 4. Photograph of the individual components used for fabrication of the ATALANTE DOG
capture system. 3

ACRONYMS

ATALANTE	<i>ATelier Alpha et Laboratoires pour ANalyses, Transuraniens et Etudes de retraitement</i>
DOG	dissolver off-gas
ORNL	Oak Ridge National Laboratory

FABRICATION OF ATALANTE DISSOLVER OFF-GAS SORBENT-BASED CAPTURE SYSTEM

1. DISCUSSION

A small sorbent-based volatile radionuclide capture system was designed that could be placed in the off-gas line from the fuel dissolver in the *ATelier Alpha et Laboratoires pour ANalyses, Transuraniens et Etudes de retraitement* (ATALANTE) hot cells with minimal modifications to the ATALANTE dissolver off-gas (DOG) system. Discussions with personnel from the ATALANTE facility provided guidance that was used for the design. A schematic diagram of this system is shown in Figure 1.

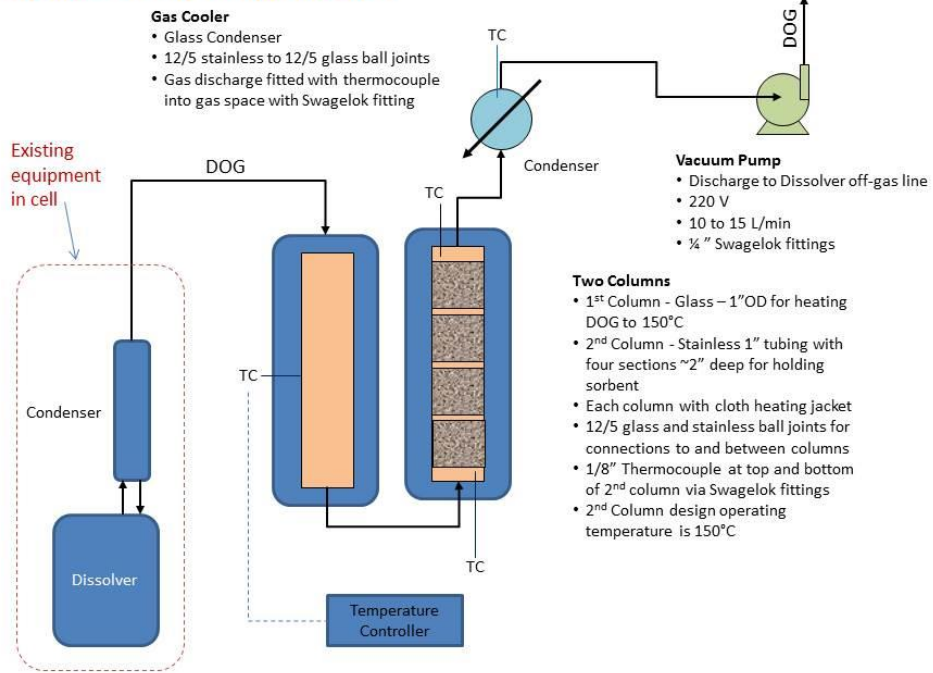
The entire DOG stream, which is expected to be ~100 L/h, will be diverted from the ATALANTE DOG condenser, already located in the cell, into the capture system. The capture system will consist of an ~1 in. diameter glass column filled with quartz wool or glass beads for heating the gas, an ~1 in. diameter stainless steel column to hold the sorbent, a gas cooler to cool the gas exiting the sorbent bed, and a vacuum pump. Each of the columns and the condenser will be ~13 in. in length to meet the ATALANTE requirement that each item be no more than 15 in. long. Both of the columns will be covered by cloth heating jackets that are designed to heat the gas to, and maintain it at, 150°C. To meet ATALANTE requirements, the jackets are designed to maintain a temperature <50°C on their outer surfaces. Thermocouples and a temperature controller will be used to monitor and control the temperature of the gas in the system. Power in the cell is available at 220 Vac and 2000 W.

A drawing of the stainless steel column is shown in Figure 2. The DOG will enter and exit the column through ¼ in. diameter stainless tubing. Connections to the rest of the system will be made using 12/5 glass or stainless ball joints. Swagelok fittings are located at both the top and the bottom of the column for the insertion of 1/8 in. diameter thermocouples. Four removable inner sections, each with a stainless steel screen welded to the bottom, will contain the capture sorbents. The top Swagelok fitting (SS-16-UT-6) located at the top of the column is removable so that the inner sections holding the sorbent can be removed.

The heating jackets were provided by HTS/Amptek. The design specifications are shown in Figure 3. The jackets are ~2 in. thick, so the overall diameter of the columns with the jackets installed will be much less than the 9.45 in. design limit required by ATALANTE. Each jacket is provided with a thermocouple that can be used to control the temperature of the heating jackets.

A photograph of the individual components used for fabrication of the capture system is shown in Figure 4. These will be assembled using the glass and/or stainless ball joints recommended by ATALANTE. The capture system will be tested at ORNL to verify operation and to ensure that all design requirements for ATALANTE are met. Modifications to the system will be made, as indicated by the testing, before the system is shipped to ATALANTE for installation in the hot cell facility.

ATALANTE OFF-GAS SORBENT DESIGN



Rev 2 - 21 Apr 2015

Figure 1. Schematic diagram of the ATALANTE off-gas capture system.

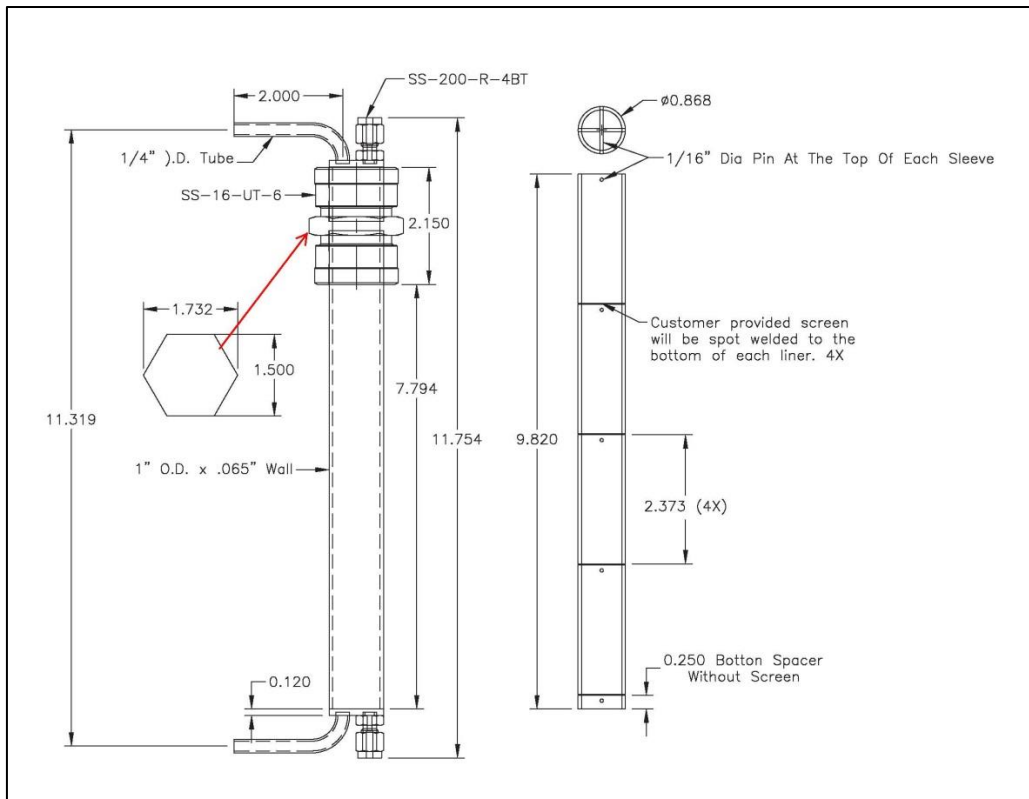


Figure 2. Design of the sorbent column for the ATALANTE off-gas capture system.

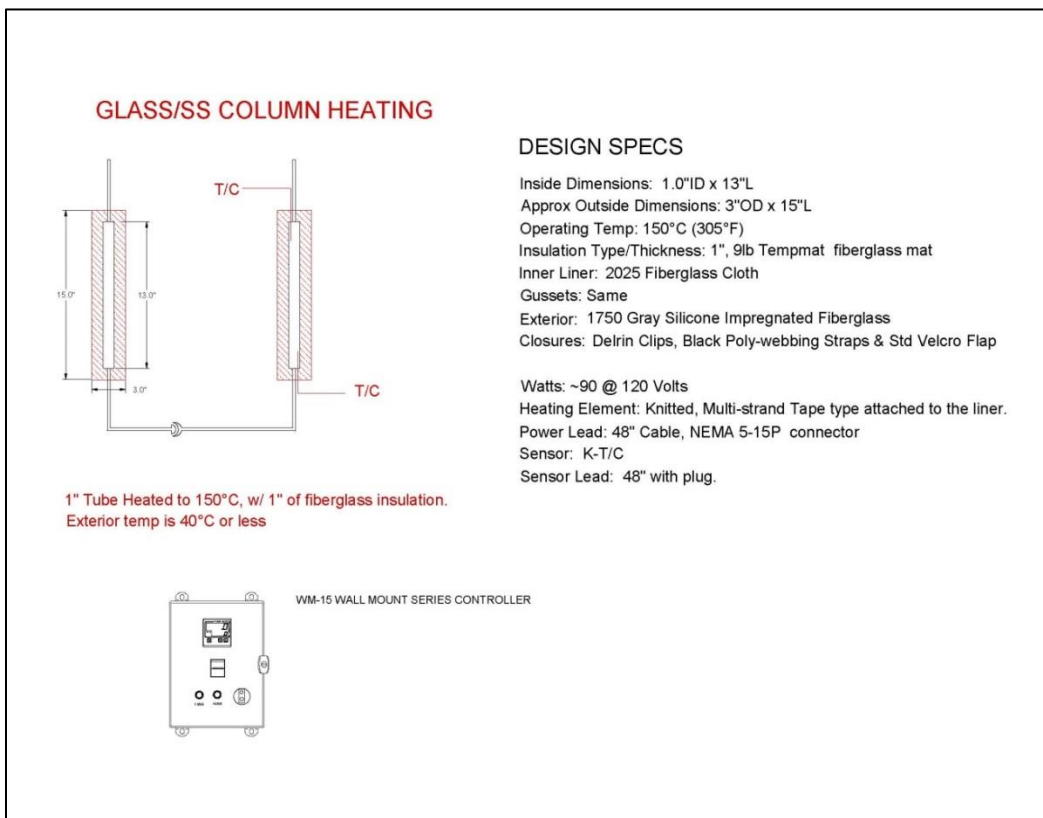


Figure 3. Design specifications for the HTS/Amptek heating jackets.



Figure 4. Photograph of the individual components used for fabrication of the ATALANTE DOG capture system.