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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JULY 2 1980

Docket No. 50-271

LICENSEE: Vermont Yankee Nuclear Power Corporation

FACILITY: Vermont Yankee Nuclear Power Station

SUBJECT: VERMONT YANKEE RADWASTE INCINERATION MEETING, JUNE 24, 1980

On June 24, 1980 the NRC staff met with Vermont Yankee Nuclear Power Corporation and their consultants to discuss technical issues related to a possible proposal of a radwaste incinerator for Vermont Yankee.

The incineration system discussed was the Helix System described in the enclosure, which was developed at Los Alamos Scientific Laboratory. Additional performance testing (e.g., tracer studies) is planned at LASL to evaluate the application for incineration at Vermont Yankee.

The staff asked and answered various questions related to review of incineration systems. In particular, the staff noted that allowance in scheduling should be made for possible public involvement in the licensing process. Information was also given as to the types of safety and environmental analysis which are necessary to evaluate incinerator application.

Vermont Yankee Nuclear Power Corporation anticipates a decision will be reached on their radwaste processing intentions about August of this year.

A list of attendees is attached.

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Enclosures:
As stated

cc:

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HELIX PROCESS SYSTEMS

PROCESS INFORMATION BULLETIN

LOW LEVEL COMBUSTIBLE WASTE INCINERATION SYSTEM

Introduction

Helix Process Systems is developing a low-level combustible waste incineration system for nuclear power plants and regional waste disposal facilities.

Helix Process Systems, a division of Helix Technology Corporation, is a major supplier of quality radioactive waste management systems for BWR, PWR, and CANDU nuclear power plants in the USA, Canada, Mexico, and overseas. We are the leading supplier of state-of-the-art offgas systems to nuclear plants. Helix Technology also supplies large HEPA filtration and iodine removal equipment to nuclear facilities.

The Helix low-level waste incinerator system is based on the controlled-air incineration process (CAI) developed at Los Alamos Scientific Laboratory (LASL). LASL has several years of operating experience with their system which is used for the volume reduction of transuranic (TRU) contaminated wastes. Helix is modifying the LASL design to make it suitable for processing fission and corrosion-product contaminated wastes.

The Helix system will be easily maintainable to minimize operator radiation exposure, compatible with available solidification processes, flexible with regard to layout and space considerations, economically justifiable, and will utilize highly reliable, proven components. The offgas system in particular incorporates proven techniques and equipment developed and manufactured by Helix for particulate and volatile radionuclide removal which are in use in over a dozen operating power plants.

Advantages

1) Helix offgas and liquid radwaste experience insures that the system can meet the requirements for nuclear waste processing.

2) Proven, standard components throughout the system provide a high degree of reliability resulting in minimum downtime due to equipment malfunction.

3) Helix offgas modules provide the ultimate in iodine removal and HEPA filtration which minimizes radionuclide releases.

4) Controlled air incineration results in low particulate loading on the offgas system, continuous and simple operation, and high volume reduction.

5) Extensive testing and actual incineration of radioactive materials in the development system proves the design basis and assures successful operation of a completed installation.

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System Description

The Helix system for use on combustible low-level fission and corrosion product contaminated wastes is based on the Los Alamos CAI process. However, the Los Alamos incinerator design is for the volume reduction of TRU wastes. Helix, therefore, has made several design modifications to handle the unique characteristics of fission and corrosion products typically found in nuclear power reactor wastes.

The Helix incineration system consists of four skid mounted sub-systems and a control panel. They are the incinerator, offgas system, scrub solution skid, and ash removal skid.

The incinerator is a commercially available controlled air unit utilizing a primary combustion chamber followed by an excess air afterburner chamber. Due to the large diameter of the primary chamber and the resultant quiescent burning, and the secondary chamber's effectiveness in particulate combustion, the offgas system particulate loading is very, very low. This will yield a number of benefits such as long HEPA and scrub filter life, low radiation fields from the offgas components due to minimal radionuclide carryover, and reduced possibility of ash sludge plugging in the scrub solution system. Also, licensing of the system should be eased because these incinerators have been thoroughly tested and exceed federal EPA and state air quality standards for particulate emissions.

Both chambers are made of carbon steel and are coated with a mastic material to protect the shells from acid-gas corrosion. The chambers are lined with a high density castable refractory incorporating unique Helix design features to minimize permeation of radionuclides into the refractory.

Proper operating temperatures are maintained by burners which use either propane or fuel oil. Once proper operating temperatures have been established, the primary chamber burners are turned off so that fuel is required only for the afterburner at a rate of less than 3 GPH of fuel oil or equivalent amount of propane.

A hydraulic ram feeder is provided to load solids into the incinerator. Loading is a batch operation performed by an operator located behind a shield wall. The feeder can handle batches up to 1 cubic yard volume through a 28" x 34" opening. Other than removal of large noncombustible objects, feed pretreatment is not required. Small noncombustibles such as nuts and bolts will not interfere with proper operation. The steps taken for corrosion resistance, such as the proper selection of construction materials, allow high levels of PVC material (to 50%) to be burned which eliminates the need for segregation of feed constituents.

Organic liquid wastes and spent low level ion exchange resins are injected into the unit through separate ports.

HELIX PROCESS SYSTEMS

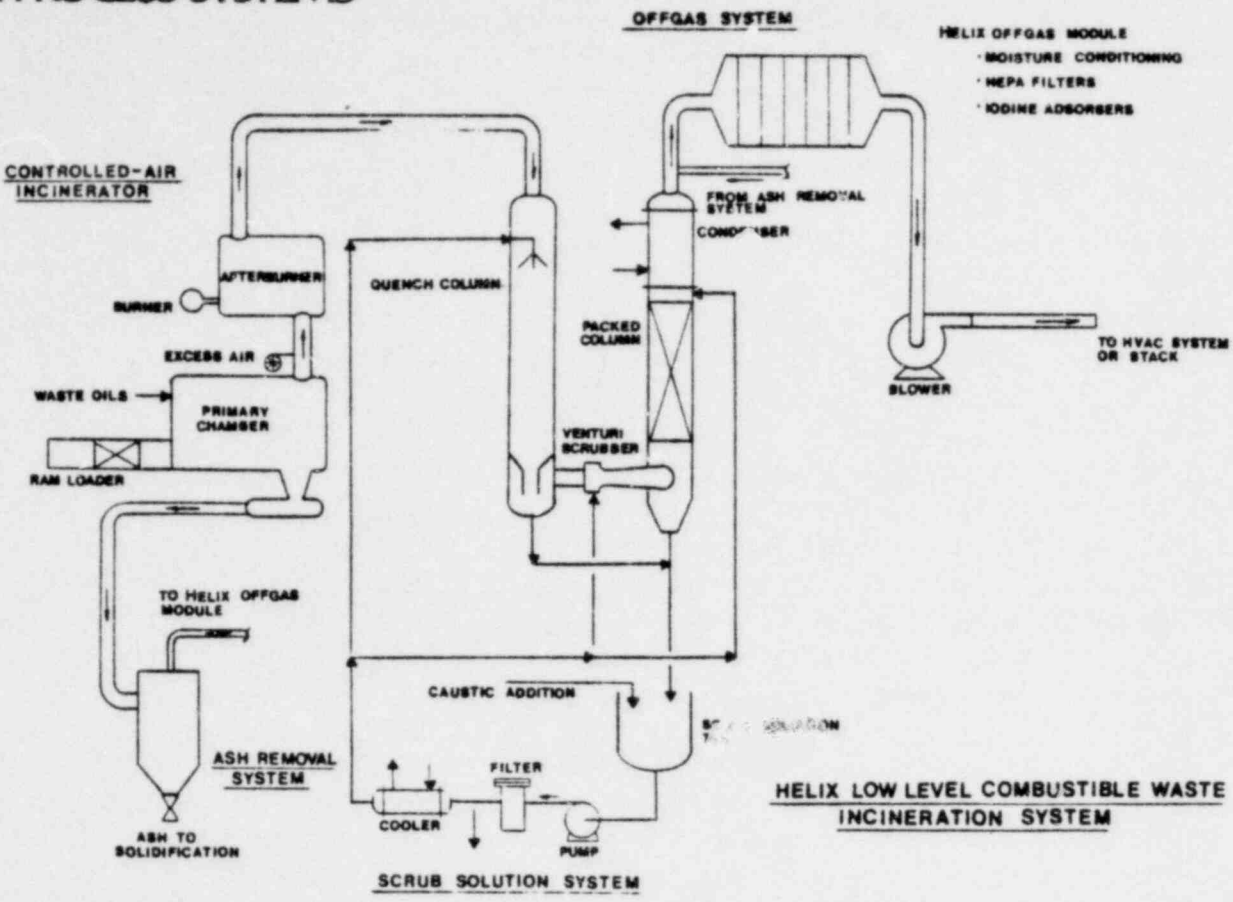


Figure 1

THE INCINERATOR EFFLUENT FROM THE AFTERBURNER CHAMBER FLOWS INTO THE OFFGAS TREATMENT SUB-SYSTEM. THE HIGH TEMPERATURE GASES ARE COOLED IN A QUENCH COLUMN BY MULTIPLE REDUNDANT SCRUB SOLUTION SPRAYS. THE GAS THEN ENTERS A HIGH ENERGY VENTURI SCRUBBER WHERE THE REMAINING PARTICULATES ARE REMOVED. ANY ACID GASES ARE NEUTRALIZED IN A COUNTERFLOW PACKED COLUMN. A CONDENSER COOLS AND REMOVES WATER VAPOR FROM THE GAS.

A SELF CONTAINED HELIX OFFGAS MODULE FILTERS AND REMOVES TRACE IODINE FROM THE COOL, ACID-FREE GAS. THE OFFGAS MODULE CONTAINS A MIST ELIMINATOR, RE-HEATER, PRELIMINARY HEPA FILTER, IODINE ADSORPTION SECTION AND FINAL HEPA FILTER.

THE MOTIVE FORCE FOR THE GAS FLOW IN THE SYSTEM IS PROVIDED BY A BLOWER WHICH FOLLOWS THE HELIX OFFGAS MODULE. BY LOCATING THE BLOWER AT THE DISCHARGE OF THE SYSTEM, THE ENTIRE INCINERATOR SYSTEM IS UNDER NEGATIVE PRESSURE THUS INSURING THAT SHOULD ANY LEAKAGE OCCUR, IT WOULD BE INTO THE SYSTEM.

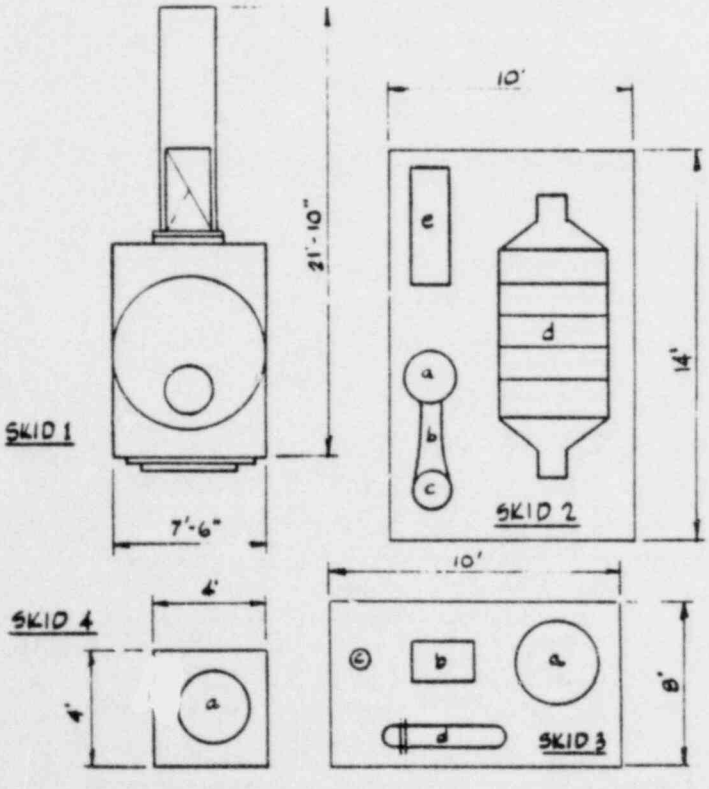
A SCRUB SOLUTION SUB-SYSTEM PROVIDES A CAUSTIC SOLUTION TO THE QUENCH COLUMN, VENTURI SCRUBBER, AND PACKED COLUMN TO COOL THE GAS, REMOVE ENTRAINED PARTICULATES, NEUTRALIZE ACID GASES, AND ABSORB CERTAIN VOLATILE RADIONUCLIDES. THE SUB-SYSTEM CONSISTS OF A CAUSTIC SURGE TANK, PUMP, COOLER, AND CARTRIDGE FILTER. THE FILTER REMOVES PARTICULATES FROM THE SCRUB SOLUTION. THE FILTER ELEMENTS ARE MADE OF COMBUSTIBLE MATERIALS SO THAT ONCE THEY ARE EXPENDED, THEY CAN BE BURNED IN THE INCINERATOR.

A HELIX DESIGNED ASH REMOVAL SUB-SYSTEM COMPLETES THE PACKAGE. ASH IS REMOVED FROM THE PRIMARY INCINERATOR CHAMBER BY GRAVITY AND IS TRANSFERRED TO A HOPPER PNEUMATICALLY. THE HOPPER CAN THEN BE LOCATED REMOTELY TO PROVIDE FOR SHIELDING REQUIREMENTS AS WELL AS FOR PROXIMITY TO THE SOLIDIFICATION EQUIPMENT.

A SYSTEM NOMINALLY RATED AT 350 LB/HR OF SOLID WASTE WILL HAVE THE SKID DIMENSIONS SHOWN ON FIGURE 2. THE MAXIMUM HEIGHT FOR THE SYSTEM IS SIXTEEN FEET. THE INCINERATOR CHAMBERS WILL BE LOCATED BEHIND SHIELD WALLS WHILE THE LOADING POINT FOR THE RAM FEEDER WILL PENETRATE THE WALL TO ALLOW LOADING OF THE UNIT IN A LOW RADIATION AREA.

THE INCINERATION SYSTEM WILL PRODUCE A VERY HIGH DF FOR THE RADIONUCLIDES TYPICALLY FOUND IN LLW. THE OFFGAS SYSTEM IS BASED ON PROVEN PARTICULATE AND IODINE REMOVAL TECHNIQUES AND SIMILAR HELIX COMPONENTS HAVE BEEN IN SERVICE IN NUCLEAR POWER PLANTS FOR YEARS. WE HAVE DONE EXTENSIVE TESTING ON THE OFFGAS MODULES AND HAVE VERIFIED HIGH REMOVAL EFFICIENCIES. FURTHER TRACER TESTING WILL BE PERFORMED AT LASL TO DETERMINE THE DF OF THE WET OFFGAS COMPONENTS SO THAT AN OVERALL SYSTEM DF CAN BE ESTABLISHED.

VOLUME REDUCTION FACTORS FOR LLW TYPICALLY FOUND IN NUCLEAR POWER PLANTS IS AN AVERAGE OF 40:1. THIS WILL VARY IN EITHER DIRECTION DEPENDING ON THE EXACT NATURE OF THE WASTE TO BE PROCESSED. ION-EXCHANGE RESIN VOLUME REDUCTION FACTORS ARE EXPECTED TO BE A MINIMUM OF 15:1. ALL THE VR FACTORS ARE GIVEN PRIOR TO SOLIDIFICATION.



SKID 1 - INCINERATOR
INCINERATOR UNIT W/ LOADER

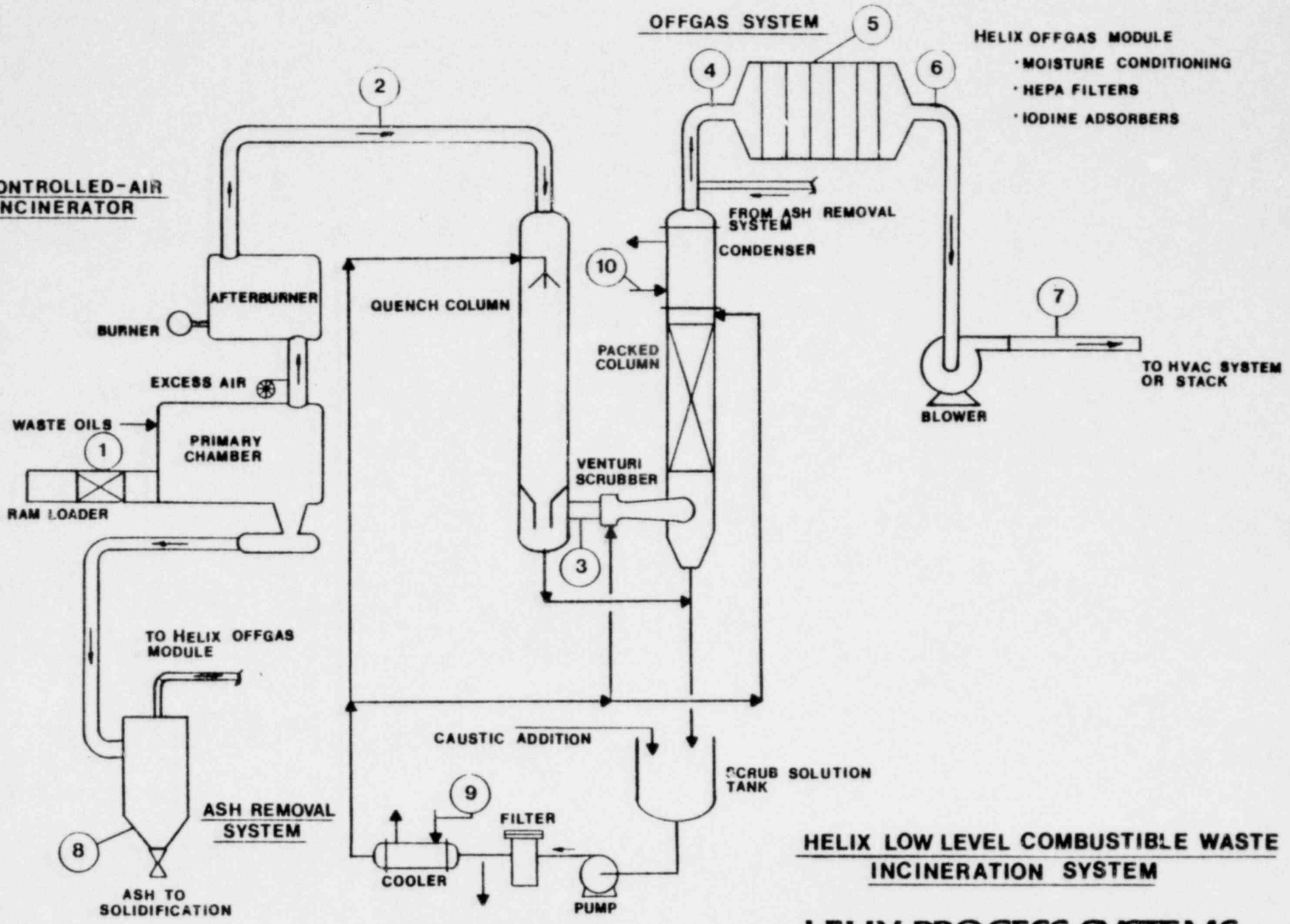
SKID 2 - OFF GAS SKID
a. QUENCH COLUMN
b. SCRUBBER
c. PACKED COLUMN
d. HELIX OFFGAS MODULE
e. BLOWER

SKID 3 - SCRUB SOLUTION SKID
a. CAUSTIC TANK
b. PUMP
c. FILTER
d. COOLER

SKID 4 - ASH REMOVAL SKID
a. ASH HOPPER

HELIX INCINERATION SYSTEM

Figure 2



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JUNE 24, 1980

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