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CONSOLIDATED INCINERATION FACILITY MODEL VIDEOTAPE*

By

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Abstract - Consolidated Incineration Facility Overview

PRESENTATION OF CIF MODEL VIDEO TO
THE INTERNATIONAL CONFERENCE ON INCINERATION OF
HAZARDOUS RADIOACTIVE & MIXED WASTES
MAY 4, 1988

A Consolidated Incineration Facility (CIF) is in final design for construction at the Savannah River Plant in Aiken, SC. The CIF will detoxify and volume reduce combustible radioactive, hazardous and mixed waste. A study model was constructed during scope development for project authorization to assist with equipment layout and insure sufficient maintenance access. To facilitate the Department of Energy Validation process, a videotape of the model was developed. This ten minute videotape includes general information about the incineration process and a tour of the study model with a discussion of activities in each area. The videotape will be shown and the current status and schedule for the CIF presented.

SPEAKER BIOGRAPHY INFORMATION

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John is a Senior Engineer for DuPont and is presently assigned to the Savannah River Plant's Waste Management Project Liaison Office in Charlotte, NC. He is a member of the Consolidated Incineration Facility Project Team with responsibilities for overall project coordination and Quality Assurance. Prior responsibilities included project liaison for other hazardous waste projects at the Savannah River Plant and technical assistance and pilot plant development at other DuPont locations. John received his B.S. in chemical engineering from the Universitiy of Rochester in 1981.

THE CONSOLIDATED INCINERATION FACILITY

Welcome to the Consolidated Incineration Facility at the Savannah River Plant. In the next few minutes we'll examine the preliminary design of this facility and the process it will use to incinerate certain wastes generated at Savannah River Plant.

We are using a study model and artist's renderings to tour the planned facility looking at:

- The general site location.
- Liquid waste receiving and the tank farm.
- Solid waste receiving and the box handling area.
- The incineration equipment which includes a rotary kiln primary combustion chamber and a secondary combustion chamber to insure complete destruction of any remaining hazardous constituents.
- The off-gas system which cools the gasses leaving the incinerator and removes particulates and acid gasses.
- We will also cover the handling of small quantities of residual materials from the incineration process.
- Finally, we will discuss support systems and equipment not directly related to the incineration process.

The CIF is located in the northeast corner of H Area, at the Savannah River Plant. Immediately south of this project is the proposed Solid Waste Support Facility which will provide for personnel support such as change rooms and offices for this and other solid waste projects.

The CIF is northeast of existing H canyon and sand filter area and southwest of the Defense Waste Processing Facility or S-Area.

Southwest of the CIF is the solvent burner demonstration facility, which has been incinerating both solid and liquid low-level radioactive waste since 1985.

The liquid waste tank farm is located 100' west of the CIF processing building for fire and safety reasons.

Liquid waste will be brought to the incinerator by truck and pipeline. DWPF organic waste will be transferred by pipeline directly to a 6,000 gallon organic waste tank. The remaining organic waste will be brought by truck to one of two 3,500 gallon blend tanks. Another 5,000 gallon tank will be used exclusively for aqueous based waste. In addition to these waste tanks, the tank farm will contain a 12,000 gallon fuel oil storage tank and a nitrogen tank. Fuel oil is the auxiliary fuel used for the incinerator.

There are two truck unloading stations, one for plant trucks carrying radioactive waste, and the other for "clean" trucks carrying fuel oil and caustic.

Remote from the tank farm is a propane storage tank. Propane fuels the burner pilots in the incinerator.

The waste and fuel tanks are surrounded by a diked concrete pad for containment purposes should a leak occur.

Fire protection for ignitable organic material is an important part of the tank farm. The tanks are blanketed with inert nitrogen for explosion prevention. There are also foam and water fire suppression systems and dry chemical extiguishers located around the tank farm.

After an initial check for radioactivity levels by the generator, solid boxed waste will be loaded on covered trucks and brought to the facility. Here the boxes will be manually loaded onto a conveyor and should not require additional manual handling unless rejected for incineration after the portal monitor, x-ray, or assay test. Minimizing manual handling will reduce radiation exposure, althought approximately 90% of the boxes received will have no detectable radioactivity. The remainder will be between 0 and 10 mili rems per hour.

The first inspection after arrival occurs at the portal monitor. Any box radiating over 10 mili rems per hour will alert the operator to remove the box from the conveyor and place it in the reject area. Remaining boxes will then be analyzed by x-ray to determine if they contain any materials unacceptable for incineration such as free liquids, aerosol cans or other metals. Next, the boxes will be assayed for radionuclide content. This step will ensure no fissile or transuranic material is introduced into the process. There is approximately four hours of box storage space available on the conveyors.

The box handling area is enclosed and ventilated. Air from this area is exhausted through HEPA filters to avoid any possible radioactive releases to the environment.

The boxes are raised to the box feed level in a box lift. Up to 29 boxes per hour may be sent to the ram-fed rotary kiln. To reduce the number of cycles required, the feed system can send up to three boxes per charge to the ram chamber. These boxes will then be fed to the rotary kiln.

The ram feeding system is enclosed and ventilated to prevent the accumulation of explosive pyrolytic gasses. Air from the ventillation system is exhausted through HEPA filters to prevent radioactive released at this stage of processing.

The rotary kiln will be approximately 25' long with an 8' internal diameter. Besides the 29 boxes per hour to be fed into the kiln, liquid waste is also burned. A highly turbulent vortex burner provides almost complete destruction of principle organic hazardous constituents, or POHC's. Another burner will feed fuel oil to heat and maintain the unit at its operating temperature of 1800 degrees Farenheit.

The kiln's rotating design agitates solid waste as it moves down its length promoting excellent burnout. Ash will drop into a water filled trough, be pulled out with a hydraulically operated backhoe, and be deposited into 55 gallon drums. The ash will be solidified with cement in drums using equipment already demonstrated at the Savannah River Laboratory. Solidification drums will be stored temporarily to cure. Then they will be shipped to an SRP Hazardous Waste/Mixed Waste disposal facility.

The combustion gasses leaving the rotary kiln enter the Secondary Combustion Chamber. In the 35 X 6' chamber an organic waste from DWPF will be incinerated. A 2-second residence time is required for complete destruction of this waste. A fuel oil burner will also be provided for startup heating and to maintain a temperature of above 2000 degrees Farenheit.

Gasses are cooled in the next step after incineration. The acid gasses and particulates are then removed and the gas is filtered to remove any residual radioactive particles.

More specifically, gasses will be cooled from above 2000 degrees Farenheit to 180 degrees Farenheit by evaporating a recirculated solution in the quench vessel. A caustic solution is also added in the quench vessel to neutralize any acid gasses present.

The next step is a free-jet scrubber. This system has been confirmed by the EPA as the best available technology for off-gas cleanup. Steam is used to educt the off-gas and a recirculated solution is added that results in high turbulence, good mixing, and finally enlargement of minute particulates within water droplets. These particulates are removed in a cyclone separator.

The residual liquid from the quench and scrubber will build up concentrations of both salt and particulates. For efficient scrubber operation, these must be minimized by steadily purging the system. If this stream has a high solids content, it will be fed to a filter feed tank, filtered through inertial filters and the liquid returned to the system.

Filtered solids and high salt concentration blowdown will be placed into one of two waste hold tanks. This material will be trucked to proposed on-plant cement solidification facilities for this and similar waste streams.

After particulates and acid gasses are removed to below regulatory limits, the gas is filtered through high efficiency particulate air or, HEPA filters before final discharge. Since HEPA filters would be quickly blinded if water droplets were present, the saturated gas leaving the cyclone separator is passed through a high efficiency mist eliminator. The off-gas then passes through a reheater to prevent condensation in the HEPA filters, then through the HEPA filters and induction fans. After passing through monitoring equipment to ensure compliance with regulatory limits, gasses are exhausted out of stack.

In addition to the equipment already mentioned this project will also have a motor control center and control room located on the corner of the 31,000 square foot CIF building.

The box handling, box feed and ashout areas are enclosed, ventilated and HEPA filtered for contamination control. Airflow moves from box handling, the least potentially contaminated area, through the box feed area, and into the highest potentially contaminated area, the ashout area, before HEPA filtration and out the exhaust stack. The seals around the kiln, although not specifically modeled, are also ventilated into this system for contamination control. The sides of the CIF building are open to enhance cooling, and a roof prevents rainwater which could become contaminated from accumulating in the process building.

We hope this brief tour of the CIF model and renderings has informed you of our process for treating hazardous, radioactive and mixed waste. At the Savannah River Plant we view this proposed facility as a key part of our overall waste management plan. The CIF will provide the safest most efficient means for the plant's future compliance with The Resource Conservation and Recovery Act.

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CONSOLIDATED INCINERATION FACILITY PURPOSE

- Use incineration to detoxify & volume reduce:
  - Radioactive
  - Hazardous &
  - Mixed Waste
- Prepare secondary waste products for stabilization and disposal

CONSOLIDATED INCINERATION FACILITY JUSTIFICATION

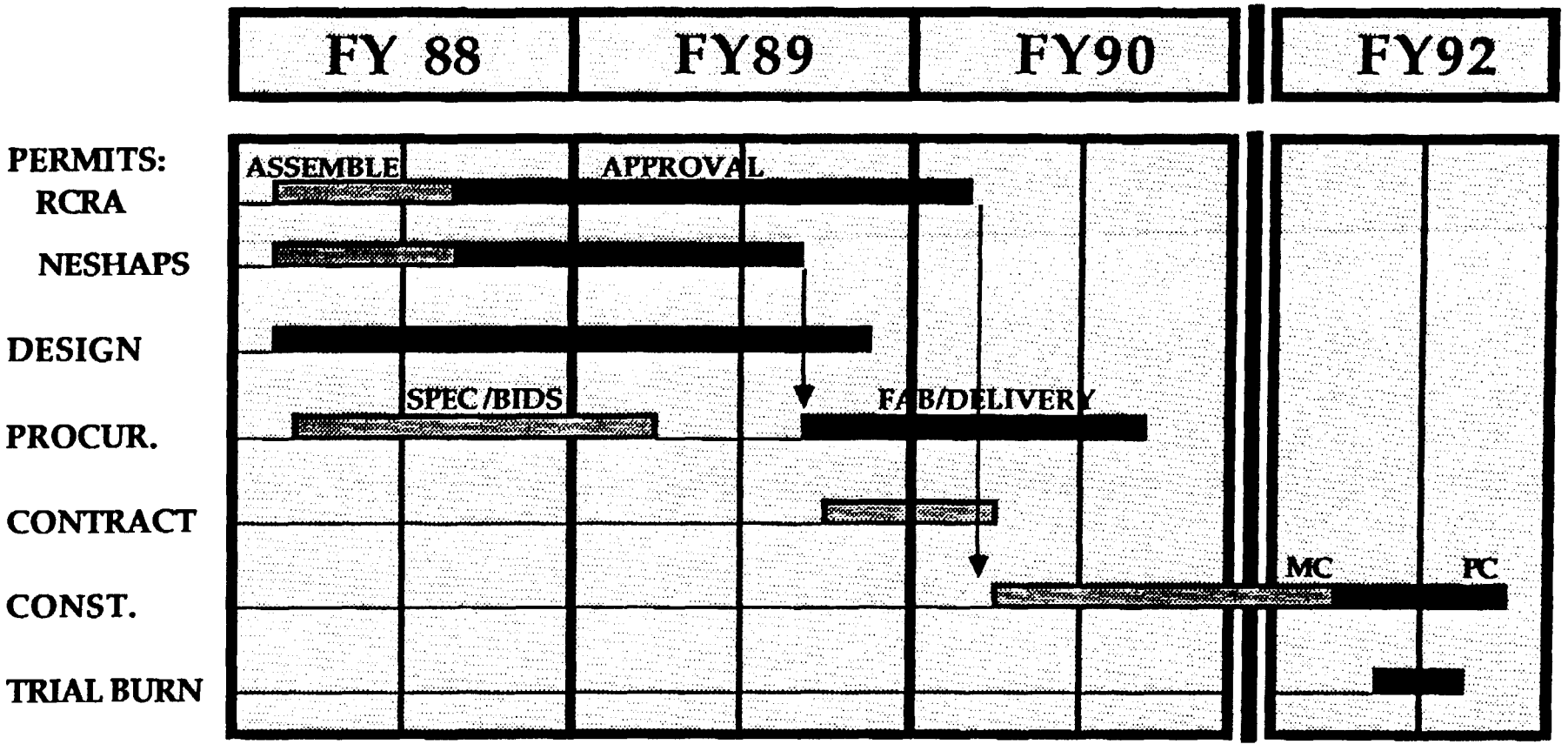
- Compliance with the Law
  - RCRA Storage and Land Disposal Ban
- Environmental Necessity
  - Cannot cease production of waste
  - Must treat waste prior to disposal
  - No mixed waste treatment facilities exist
  - Incineration is best available technology
- Cost Reduction
  - Volume reduction reduces disposal costs
    - by $2.3 MM/yr vs. compaction

CONSOLIDATED INCINERATION FACILITY CAPACITY

Thermal Rating: 19.7 GJ/hr

	Processing Capacity (kg/hr)	
	Maximum	Average
Rotary Kiln:		
Solid	327	327
Liquid	183	85
SCC:	127	63

CONSOLIDATED INCINERATION FACILITY PROJECT STATUS

- Design 10% complete
- RCRA and NESHAPS permits drafted for 6/1/88 submission
- Process and Instrument drawings being finalized
- Major equipment specifications in review

CONSOLIDATED INCINERATION FACILITY PROJECT SCHEDULE