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DESIGN PHILOSOPHY

The Savannah River Plant design has had the benefit of the considerable experience in air cleaning problems which has been accumulated at other AEC sites. The intent has been to profit by the developments which have successfully withstood the test of time at other installations, to avoid past difficulties which have arisen when possible, and to adapt new developments to special or conventional problems where no new risk is assumed in so doing. The basic design philosophy has three main points:

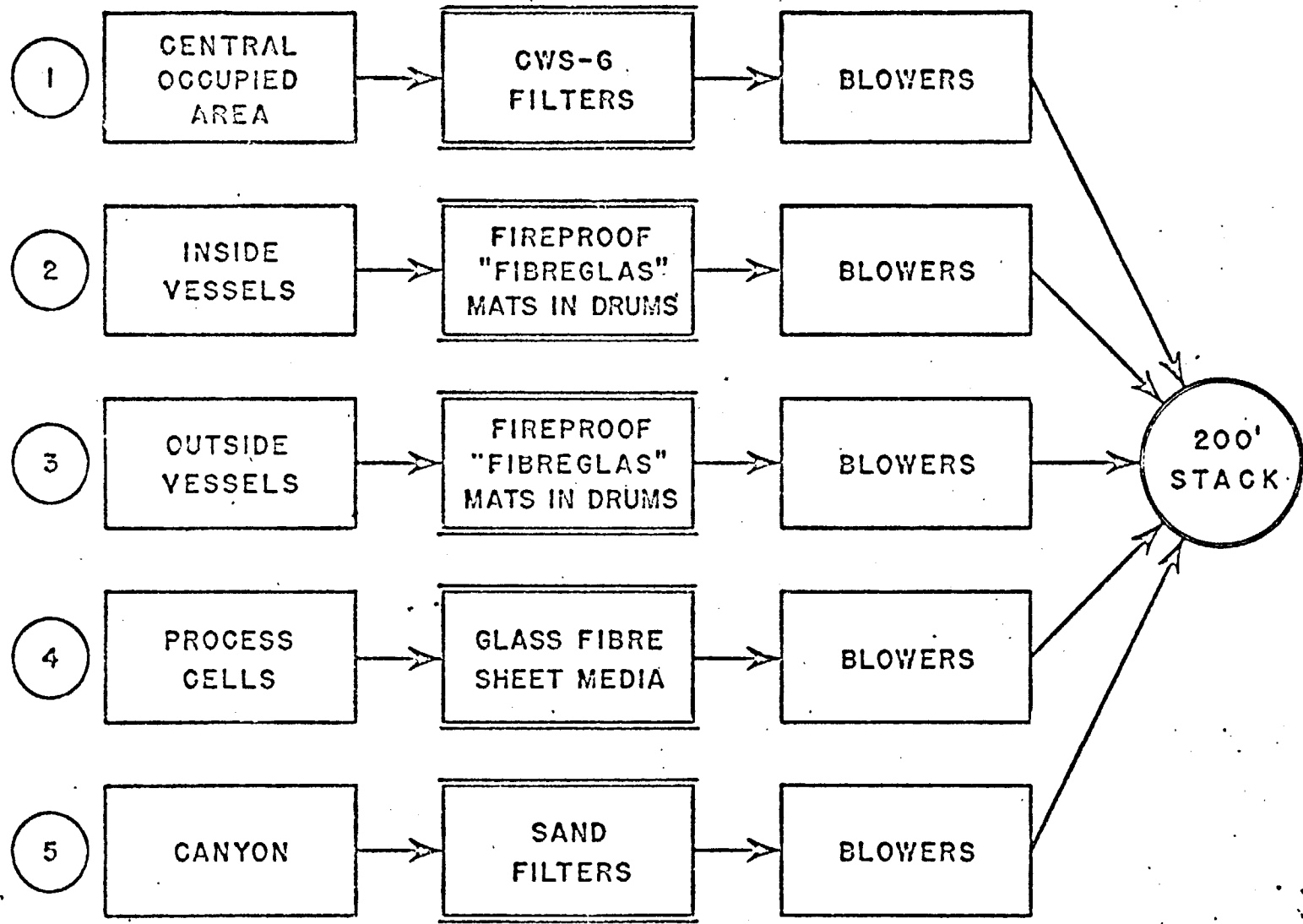
- (1) All air streams containing radioactive particulates are cleaned — we do not depend upon dilution.
- (2) Contamination is confined to the smallest possible area. Therefore we have adopted individual venting of the process vessels in conjunction with area venting in the "hot" areas.
- (3) Considerable attention has been given to protecting outside areas from the release of radioactive contamination, by fires and spills, even where these occurrences may be extremely unlikely.

AIR CLEANING SYSTEMS IN A PROCESS AREA

The diagram shows schematically the air cleaning systems in a process area which for convenience is here divided into sub-areas. Five different types of sub-areas are equipped with individual air cleaning systems which include four different types of high-efficiency filters. The ventilation air stream from each of these sub-areas is pulled through a filtration system by blowers, and all exhaust to a common stack 200 feet in height.

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### AN AIR CLEANING SYSTEM FOR PARTICULATE REMOVAL AT THE SAVANNAH RIVER PLANT



The fan house is equipped with emergency diesel-electric generating equipment for use in case of failure of the primary source of power. Spare equipment is provided to insure continuity of operation of the blowers. A minimum suction level is set for each of the process sub-areas shown. In the event that the suction falls below this set-point, indicating failure of a blower, an alarm is sounded, and a spare blower starts automatically.

The stack is of corrosion resistant construction. It is equipped with a stainless steel pan at the bottom for collection of condensate, which is transferred to the high activity waste system. Two samplers are provided in the stack, one at the level of 50 feet, and the second at 196 feet. These are designed to sample the gases satisfactorily either for particulate matter or chemical content.

Sub-area 1 on the diagram is the central area occupied by personnel. It is unlikely that the ventilation system in this area will ever become significantly contaminated with radioactive materials. It is equipped with filter units on the exit end in order to confine any such contamination within the building. The filter medium is CWS Type 6 paper. Each filter unit is divided into three compartments which can be individually isolated by remote control for maintenance.

Sub-area 2 as shown on the chart consists of the inside process vessels containing appreciable amounts of radioactive materials. The ventilation air from these vessels is filtered through assembled mats of "Fibreglas" packed into stainless steel drums which can be conveniently replaced as a unit.

The filter packing in the direction of air flow is as follows:

	<u>Type</u>	<u>Density</u>	<u>Depth</u>
1st Layer	115 K	.75	12 in.
2nd "	115 K	1.5	18 in.
3rd "	115 K	3.0	12 in.
4th "	55 PS	3.0	11-3/4 in.
5th "	PF 105 AA	1.2	1-1/4 in.

Total pressure drop through the filter at 30 ft. per min. is 5.8 in. of water. Over-all efficiency is 99.996%.

The blowers on this system are equipped with butterfly dampers on both inlet and outlet side. These dampers are electrically operated to open and close as the blowers start and stop.

Sub-area 3 consists of process vessels having a low content of activity. The vent air from this system is heated to 150°F before filtering to prevent condensation in the filters. The filters are of the same replaceable drum "Fibreglas" type as used in Sub-area 2 on the diagram.

Sub-area 4 on the chart includes ventilation of mechanical cabinets enclosing process equipment. The individual streams of air in this system are filtered through small fire-proof "Fibreglas" base filters. This would prevent release of activity to the stack in the event of fire.

Sub-area 5 has the largest ventilation flow, accounting for about 60 per cent of the total stack gas. This stream is filtered through a deep bed sand filter which is modeled after the Hanford units. The air from the ventilation system enters the bottom of the filter

through a distribution system made up of clay tiles. The sand size decreases going upward through the bed. Above the main layer the filter contains two "hold-down" layers totalling 12 inches to prevent mounding. Efficiency of the 7 ft. sand filter is about 99.7%. The filter is equipped with an automatic dew point recorder operating on the gases entering the filter. Provisions have been made for sampling the entering and exit air continuously. Air from these points is drawn through filter paper contained in a sample unit which is part of the plant Health Physics monitoring system. The building design includes shielding to protect personnel while carrying out their normal assignments.

A stack gas dispersion study was made of the Savannah River Plant area by the Du Pont Engineering Department. The purpose of this study was to determine (1) the ground level concentrations of stack gas contaminants under various conditions, (2) the geometrical shape of the ground level dispersion pattern downwind, and (3) the relationship between short-time peak concentrations and the average concentrations at downwind points. The study also included weather conditions such as dry bulb and wet bulb temperature variations, frequency and duration of inversion conditions, and frequency and duration of rains. As a result of the study, working charts were developed for rapid computation of ground level concentration for various conditions. It was found that stable inversions are usually less than 300 feet thick at the Savannah River Plant site. A new diffusion equation was developed for the Savannah River Plant area based on the data obtained in the study. This is a modified form of the Bosanquet-Pearson Equation.

The Health Physics section at the plant has a rather comprehensive air sampling program for the plant buildings and the outdoor plant areas

as part of its regular HP survey work. Some of the buildings are equipped with vacuum lines exclusively for air sampling purposes. These are designed for a 10 cfm sampling rate assuming a 50% use factor for the multiple sampling points in each area. Other buildings are sampled with modified household vacuum cleaners. The sampling paper used in each case is a 4" x 8" rectangular sheet of CWS Type 6. At a sampling rate of 10 cfm a minimum sample of 300 cf is monitored, using a minimum sampling period of a half hour. Air samplers are counted routinely for  $\alpha$ ,  $\beta$ , and  $\gamma$  activity.