Abstract

Problems encountered at various points in an incinerator are described. The scale is sometimes too small; dust and fires in the storage bin may be a problem; and attention must be given to maintenance of refractory in ignition and combustion chambers. Instrumentation is sometimes overdone. There may be ignition and air supply problems in furnace operation; cranes need careful maintenance; provision for burning large objects may be available; and removal of fly ash and residue needs further study.

Introduction

There are many problems encountered in the operation of a large incinerator plant; this paper presents some of the problems that have prevailed. The paper is not intended to be critical of design or consulting engineers. The author feels that the problems and some of the solutions to the problems presented herein will help engineers to design more efficient plants in the future.

Scale House

It seems to be the trend of truck manufacturers to increase the size of the rig and the weight of the payload. If the weighmaster can weigh the tractor and box in one operation it will decrease the weighing cycle and speed up the movement of traffic. The capacity of the scale is important. It should be able to record a maximum of 65,000 pounds. The dimension of the weighing platform should be at least 34' x 10'.

Storage Bin

Storage bins present a constant fire hazard due to spontaneous combustion as well as the danger of accumulation of methane gas in the pit and the adjacent sump wells. The dust condition created by dumping loads of refuse into the storage bin presents a serious housekeeping problem. This condition can be kept at a minimum by the use of water sprays situated adjacent to the bin. These sprays can also be utilized to confine a fire in the bin until the proper fire fighting personnel can get into action. The sump well should be properly ventilated by power driven equipment to prevent the possibility of an explosion.

Maintenance of Ignition and Combustion Chambers

The buildup of slag on walls and roofs of ignition and combustion chambers presents one of the most serious problems in an incinerator plant today where high temperatures prevail and production has increased to a point where it is necessary to keep down time at a minimum. This is a problem that should be thoroughly investigated by design engineers and consultants. A chemical analysis of the slag should help engineers to reach a solution to this problem. It has been the author's experience that during a two-shift operation
this problem has not been as great, but a twenty-four hour a day operation does not allow time for the furnace to cool and allow the slag to contract and drop back into the chambers. This condition also presents a safety hazard to the maintenance personnel when it is necessary for them to enter the chambers to do repair work.

The down time due to the suspended fire brick dropping from the roof of the chambers after they have been cooled during a shut-down period over the week-end is another problem that we must contend with. This condition seems to prevail after an incinerator has been in operation for several years. One method of keeping this condition at a minimum is by cleaning the top of the chambers so that the heat can dissipate during the operation. This method makes it possible to protect the metal hangers from burning out.

**Instrumentation**

The trend today seems to be toward over instrumentation. Too much instrumentation can confuse many operators; it should be simplified to coincide with the I.Q. of the operator. The operator should use more visual observation of the burning chamber and not rely too much upon the instrument panel board. The most important function of the instrument board is to alert the operating personnel when the proper operating temperatures have been reached. Low temperatures cause an undesirable smoke emission from the venting stacks. Temperatures above 2200 F is not conducive to the long life of the equipment.

The data that is obtained through the use of charts, recording pyrometers, etc. can be of value to engineers in designing incinerators of the future.

**Operation of Furnaces**

It is the author's contention that the use of auxiliary heat such as oil burners to maintain proper operating temperatures in the ignition chamber during inclement weather is not efficient. It has been found that spraying No. 4 oil on the wet rubbish and garbage, as it is being dumped into the storage bin, speeds up this operation.

In some large plants today the combustion air is supplied to the furnaces via the furnace room. It is mandatory to open windows in the furnace room to relieve the partial vacuum and to supply air to the furnaces. This method presents a very undesirable condition in cold weather both to the operating personnel and the danger of freezing water pipes.

To remedy this situation the proper method is to install ducts which will transfer the combustion air from outside the building directly into the ignition chamber where it is possible to regulate the air by the use of adjustable louvers.

**Overhead Cranes**

Modern incinerators are equipped with electric overhead cranes. These cranes are exposed to fluctuating temperatures in the various seasons. They are protected from the elements nevertheless they operate in a range of extreme temperatures. Therefore, it is necessary to have an efficient maintenance program in effect. The gear oil should be changed periodically to correspond with seasonal temperatures. The author recommends the use of a gear oil with the viscosity rating of SAE No. 120 for summer use and SAE No. 90 for winter use. The cranes are also exposed to prevailing dust conditions that exist in all incinerators. Electric motors should be protected from this dust. The relays, contactors and controls should be vacuum cleaned periodically. The crane bucket should be lubricated at least once in a twenty-four hour period.

**Burning of Large Objects**

Incinerator superintendents throughout the country are faced with the problem of burning large objects such as bulky furniture, house demolition, large rubber tires, etc. Since municipal incinerators are designed to destroy household rubbish and garbage and the waste products from manufacturing within limitation, this presents a serious problem.

It is possible to burn these large objects in the combustion and expansion chambers if they are equipped with large cleanout doors to facilitate the handling of bulky objects. The plant superintendent should have strict supervision over the type of material that is brought into the plant for disposal by incineration.

**Removal of Fly Ash**

Municipal incinerators are responsible for the generation of large amounts of fly ash. There are various methods of trapping, collecting and removing this fly ash. This phase of incineration should be explored further by design engineers.

**Removal of Furnace Residue**

There are many methods of removing furnace ash from the ignition chamber. At the present time these methods are satisfactory, but the transportation of the residue from the incinerator plant to the disposal site has created some problems because of the high moisture content of the residue after going through a quenching operation. The author suggests the disposal truck be equipped with a discharge gate that has gasket inserts which will prevent water spillage on the highway. Under ordinary conditions this spillage creates an unsani
tary condition and during freezing weather creates an icy road hazard.

Summary

Through the years the progress of incineration has been based on trial and error. In the past decade great strides have been made in this field. More efficient plants have been constructed and the use of automation has helped to combat the rising cost of operation. Machinery has replaced the antiquated manual techniques that existed previously in incineration. As pointed out in this paper many problems still exist in a modern incinerator and it is the goal of the ASME Incinerator Committee to consolidate existing knowledge that will contribute to better and more efficient incinerators in the future.