Kodak Park
Waste Disposal Facilities

Abstract
A large industrial company with varied products has a wide range of wastes. The paper describes facilities for burning separately and in combination waste paper, chemicals, solvents, filter cake, sludges and bulky objects. The use of incineration in metal salvage is also discussed.

Existing Facilities
The Kodak Park incineration facilities provide waste disposal for all Eastman Kodak Company plants in Rochester, New York. There are four plants employing about 30,000 people and of these about 20,000 are employed in the Kodak Park Works. The Kodak Park site consists of over 1000 acres with more than 120 buildings. The other plants consist of only a few acres of land at each site. This presentation will concern itself mainly with Kodak Park, although services are provided for the other plants. The plants produce photographic material, paper, chemicals and vitamins.

A Waste & Pollution Service Group has been established in the Engineering Division to coordinate and standardize the disposal of all wastes for Kodak Park. The ultimate goal is to recover all waste materials in an economic manner. When reclaiming is not possible the material is either burned, severed or buried. Very little material is buried if it must be of a non-hazardous nature. When a material is to be disposed of, it is the Waste & Pollution Service Group that decides where and how. This group has compiled a directory of items disposed of and the most desirable means of disposal. New or unknown materials are burned in small quantities to establish burning characteristics before normal incineration takes place.

Kodak Park is located in a section which borders on residential sections of Rochester, Greece and Irondequoit. Kodak has a good public image and will go to great lengths to maintain good neighbor relations in the community.

The waste disposal facilities consist of:
1. A Nichols Monobearth Incinerator where general plant trash, waste solvents, oils and various solids and liquid chemicals are burned. This unit is operated by the Utilities Division.
2. A Bartlett & Snow Drier-Kiln used to dry and burn industrial sludge removed in a primary industrial waste treatment plant from the industrial sewer with vacuum filters. This unit is operated by the Utilities Division.
3. A Goder, Oil-Fired Decontamination Furnace for burning harmful and toxic chemical from drums and pails, burning solid drums of material and burning insulation from wiring. The metal recovered after burning is sold as scrap. This operation is run by the Salvage Department.
4. An open field burner where lumber is burned and large drums, pipe, heat exchangers, and reactors are decontaminated in the lumber fire. Selected scrap lumber is placed in pens where the public is allowed to take what
they want. The pens are cleaned frequently and this lumber is burned on the scrap pile. This is operated by the Salvage Department.

5. A Pittsburgh-DesMoines Fixed-Grate Incinerator where sensitized paper and other silver-bearing material are burned and the silver recovered from the ash. This unit is operated by the Recovery Department.

Nichols Incinerator

The Nichols incinerator (See Fig. 1) consists of a furnace, primary combustion chamber, secondary combustion chamber, and a water-spray gas scrubber and cooler. The unit is rated at 3.7 tons per hour or about 89 tons per day. Our daily load of general plant trash, solvents and chemicals is about 72 tons. We are presently burning five days a week on two shifts and will be going to three shifts very soon.

Plant trash is delivered by packers and dump truck to a pit through three overhead doors. A clam-shell bucket crane feeds trash to the hopper, where it is charged by the operator when desired. Our waste is exceptionally dry, and therefore we have sprays for wetting the trash in the pit to prevent furnace pulsations. The pit is protected from fires by a sprinkler system. Solvents and chemicals in drums or other small containers are delivered to a platform. Other deliveries of solvents and chemicals are made by enclosed load luggers or by tank car. The liquids are put into a tank if they are received in drums. The tank is equipped with a steam coil to cause thermal mixing. Two steam-atomizing burners fire the solvents and chemicals into the primary combustion chamber. The chemicals arriving in enclosed load luggers or tank cars are piped directly to the burners, others are pumped from a storage tank. Other chemicals are charged through a special charging hopper into the primary combustion chamber where they burn on the chamber floor. Air is passed into the primary combustion chamber through holes just above the floor so as to expose new surface of burning material. Caution must be exercised because, although the quantities of some material are extremely small, they burn with explosive force.

All chemicals sent to the incinerator must carry an indentifying tag or they will be sent back to the originator. The card contains such information as
The solvents burned were found to vary considerably due to water dilution. At one time the solvents would be burned through the liquid burners. In these cases, we controlled so as to maintain a 1600 F temperature at the top of the primary combustion chamber. This temperature and the temperature before and after the scrubber are recorded. Draft is maintained at minus 0.5' W.G. at the top of the primary combustion chamber.

A smoke-density detector brings in an alarm whenever a smoky condition exists at the breeching entrance to the stack. This alarm is automatically recorded. This is the operator's indication of a poor combustion condition.

Due to the nature of our products, we have found traces of silver in the ash from our incinerator, but it is of such a low concentration that it has not been economical to recover the silver.

An induced draft fan, with damper control, was installed for use when there was insufficient draft but we have found that it is seldom needed because we are using a 345 ft x 17 ft chimney. The fan has now been abandoned.

### Drier-Kiln

The drier-kiln (See Fig. 2) is a countercurrent flow unit for disposing of the sludge from three 10,000 lb/hr vacuum filters. The kiln was purchased to handle 30,000 lb/hr of 30 per cent solids sludge but experience has taught us that we can only burn about 16,000 lb/hr and control the burning. The filter cake is chopped while being conveyed to the kiln. The kiln is 70 feet long and 10 feet in diameter. The first 20 feet of the kiln are lined with drying flights and the remainder has a monolithic refractory lining. Sprays are located in the drying flights for re-wetting in case the burning area moves back into this area. The temperature sensed by thermocouples is controlled at 1200 F. The burning produces a volume reduction of about 90 per cent. Natural gas is used for startup and for complete burnout as required. The sludge cake has a variable heat value of 4000 to 6000 Btu/lb on a dry basis.

The gas resulting from this drying and burning has an offensive odor. This odor occurs at about 360 F, and in order to destroy the odor a temperature of 1200 F is required. In order to cure this problem a Peabody water scrubber and afterburner were installed. The scrubber also removes condensation from the flue gas to reduce the stack plume. In the afterburner, gas is burned to deodorize the flue gas, at about 1200 F, and also to aid in moving the gases out of the valley. At the present time, the ash is cooled with sprays and removed by a drag conveyor. A big drawback in this operation is the expensive gas consumption of the afterburner. In order to eliminate this expense we are going to move or eliminate this drying and burning operation.

The operation of our kiln is not continuous. We now operate about 12 hrs per day, 5 days per week. We have found that this type of operation is very hard on the refractory. The alternate heating and cooling has caused the refractory to crack and break loose, resulting in fre-
quent spot repairs and more frequent than normal complete replacement of the refractory.

A drier-kiln such as we have will perform correctly only when the material being burned is of consistent composition and is fed at a constant rate. Due to the nature of our sludge, this is difficult to do. The sludge is never the same twice, and this has given us difficulty. The experience of our operators has helped in our ability to do the job because they can now tell, fairly closely, at what point they should regulate the feed rate. There is a weigh conveyor installed and the operator has a strip chart and a pressure gage receiving signals from the load cell which aids him in maintaining an even rate.

**Decontamination Furnace**

The Goder decontamination furnace is run by our Salvage Department. In this facility we burn the chemicals from drums and pails which are then sold as scrap metal. Some drums, with material which has solidified, are burned here. All electrical wire from construction is burned here to remove the insulation, so that the copper may be sold as scrap. The lead from shielded cable is collected and is enough to supply Kodak Park requirements. The furnace is fired with No. 2 oil and is charged by use of a small rail car which is loaded and then pulled into the furnace. This unit requires one man for operation and is run only two or three half-days each week.

In planning for a new facility we will attempt to incorporate this operation in a new design, where we will use the hot flue gases for decontamination. We will save on fuel and possibly some labor in such a facility.

**Silver Recovery**

The Pittsburgh-DesMoines furnace is used for burning sensitized paper for the recovery of silver. This furnace is a three-chamber, fixed-grate incinerator. In order to increase the capacity of this unit we are installing a scrubber to knock down fly ash and silver, and an I.D. fan. This operation requires one man on three tricks, 7 days a week. This facility is run by the Recovery Department which is part of the Chemical Mfg. Division. In this furnace the sensitized material is burned to an ash which is then sent to our Recovery Dept. whereas the silver is smelted and then refined.

**Miscellaneous Disposal**

In the last year we have been investigating pneumatic systems to carry scrap paper from manufacturing areas into power boilers. This is possible because in the area of our main power plant we have a high concentration of manufacturing facilities and runs of pipe are relatively small. At this time, there is a 6-inch line in operation which handles over 3,000,000 lb/year of scrap. Another 6-inch line is now being installed and will be completed in a very short time. A third line has been estimated and is
awaiting management approval. These lines have been justified on the basis of economics and need. The savings involved, include trucking, incinerator operating cost, fuel value in the boiler, internal costs at origin and deferred capital cost of a new incinerator. In addition to these tangible costs there are also the advantages of housekeeping and elimination of some vehicle traffic.

We have the problem of disposing of large amounts of scrap lumber, which is now performed in open field burning. This cannot continue because of our location and construction going on in the vicinity. This lumber is generally large bulky objects which would not go into our incinerator. The City of Rochester has agreed to take this material but we consider this a short-term solution. When we build a new incinerator we plan to size this material so that it may be charged with the other waste material.

**Future Planning**

Planning for future facilities is presently underway and we feel that some of our experience may be useful to other people in a similar situation.

Over the years, a random week has been selected almost every year and a survey was run in which all material going into the incinerator was weighed. This gave us historical data on which to estimate growth. We ran a survey in 1964 for one week, and in addition had a three-week survey by the Industrial Engineering Division. In 1965, the Industrial Engineers ran a two-week survey. The results show that in the last few years the amount of refuse has increased at a much higher rate.

A questionnaire was sent to all departments in 1964 but the results were meaningless because the answers came back in such forms as bales, bags and boxes, and we had no clear measure of the material involved, (See Fig. 3, questionnaire). We asked on the questionnaire whom we should contact with questions about their disposal requirements. With this information the Industrial Engineering Div. contacted all departments and came up with quantities which verified the actual surveys of material and our estimates of growth rates. In order to insure answers from all departments, it was arranged to have the survey sent out under a cover letter from the Kodak Park Manager’s office.

As several divisions are involved in the various modes of disposal, a committee has been appointed by Kodak Park management to co-ordinate the planning and to broaden the scope of interest in the project. The committee representatives consist of the Asst. Supt. of the Utilities Div., Asst. Supt. of the Chemical Mfg. Div., Engrg. Chemical consultant, and an Industrial Engineering project engineer.

In the study, it was determined that all facilities had capacity or could be revised to have sufficient capacity for approximately five years. The first step taken was to

To Mr. H.A. Decker, UTILITIES DIVISION, Bldg.31
Subject: INCINERATOR REPORT - SURVEY

Division Reporting
Individual to Contact For Further Information ___________________ Tel.___
1. Present Waste Material sent to Incinerator (Description, Form, Quantity, Hazardous Properties, Future Increase or Decrease):

2. Problems Involving Present Methods of Handling, Packaging, Trucking etc.

3. Occasional Large Quantities of Material for Incineration Resulting from Startup, Breakdown, Storage, etc. (Quantity, When, Estimated Frequency)

4. Anticipated New Waste Materials for Incineration (Description, Quantity, When)

5. Misc. Information (Burning Problems, Suggested Special Burning Capabilities, etc.)

use additional sheets if necessary Signed ___________________ Date ______________

FIG. 3 QUESTIONNAIRE.

make the necessary changes in the paper burner for silver recovery. This is the stationary grate incinerator with top charging doors. The changes involved adding grates in a third chamber which formerly had been used for burning large objects, installing an induced draft fan, and adding a Pease-Anthony high efficiency scrubber. The renovations will be paid for in approximately one year as a result of increased silver recovery.

The plant incinerator has sufficient capacity for less than five years. The plant waste load can be handled for several years by merely going to additional hours of operation. The life of this plant is being shortened by the high growth rate.

The most difficult part of our problem is how to dispose of our industrial sludge in an efficient manner, eliminate our gas bill, maintain good public relations, and, if possible, return a profit to the Company on the silver recovery. Burning has some advantages, in that we have an established market for the ash where the silver is readily recoverable. Burning is not attractive from the viewpoint that any burning operation will require auxiliary fuel to insure complete combustion and odor elimination, and to improve on today’s operation would require a large capital expenditure. Next, the possibility of recovering silver from unburned sludge was considered. Investigation showed that at existing freight...
rates it would be possible to improve on the present operation by shipping the sludge dry. This is a method involving some risk because the method is new to us and would involve a high capital cost.

Shipping wet filter cake did not seem at all economical at first, but further investigation showed that if the cost of transportation could be reduced it would be possible to make this an economical scheme. This method will eliminate our gas bill and maintain good public relations by removing a burning operation. Overall, this plan involves the least risk, because the capital expense will be low, we will not burn, and therefore will eliminate our gas bill and will not be producing odors. To date, we are in the testing stage and things look favorable.

Originally, the smelter believed that the halides in our sludge might contribute to the loss of other precious metals which naturally occur in their ores. In tonnage testing which has been carried out, their fears have not been realized. We have been following this plan for several months and things have been working favorably for all parties involved.

Disposing of the wet filter cake will also buy us some more time to plan future facilities because it can be started without building. We have only had accurate information on sludge quantities for a few months and this contradicts what we had in the past. Time will allow us to establish sludge and silver quantities much more accurately, so that in the future we will be able to accurately size any installation which we might build, and be in a better position to analyze the economics.

We have investigated burning liquid sludge in a Babcock and Wilcox cyclone boiler. We have tested this on two occasions. At first, this method seemed radical, because we were firing a slurry of about 95 per cent water into a boiler. When examining the maximum rate at which we would ever have to burn, the amount of water introduced into the boiler came very close to the amount fired by B & W when they experimented with burning slurried coal. There are problems of condensation, corrosion, feeding and conveying involved with such a system. At this point, we feel that we could install a workable system but we must do further investigation into the possible effects of condensation and corrosion.

Summary

The big lesson that our study has taught us is that all quantities of material must be measured and that any item which looks as though it is beyond change must be investigated. Actual weighing of our sludge indicated that we have perhaps one third more than was originally estimated by other methods.

There is no doubt that we must improve on our methods in the future. We visualize that in less than five years we will have to build either (1) a single new facility, or (2) combined facilities at a single site. In five years, all facilities will be at peak capacity and near an age to be retired. A single facility to handle all our waste products would be desirable from the standpoint of capital cost and operating efficiencies. In the event that a single facility is impractical, it is felt that the problems of operation can be handled better if located at a single site. Single-site operation may also have some advantages in use of dust-collecting equipment and use of operating labor. With this large source of waste heat at a single location, we must thoroughly investigate the possible inclusion of heat-recovery equipment for a new facility.

All companies and all communities are faced with problems of waste disposal and pollution control. Organizations such as the ASME and these meetings, where there is a free exchange of ideas and experiences, can provide us with the knowledge and background to do a tremendous “clean-up job” in the future.