

# Spreader Stoker Steam Generators Combined with Industrial Waste Incineration

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A unique system of industrial plant waste incineration has been built by The Great Atlantic and Pacific Tea Company, Ann Page Division, its main eastern distributing plant, at Horseheads, New York. The plant, in operation since mid 1965, utilizes plant waste scrap material in combination suspension and solid material combustion in two steam generator/incinerator units.

Combination firing of bituminous coal and plant waste scrap fills a gap for economical cost where size and plant conditions can justify the capital investment and return in waste heat steam production and eliminates the usual difficulties of disposing of this waste.

Most previous large industrial plant incineration arrangements have consisted of a separate incinerator not combined with a boiler or steam generator. This, of course, means that two independent systems have to be constructed. When faced with an incineration problem, A & P Company, after researching the background data, decided to build a combined system.

The new boiler plant at Horseheads includes three steam generators, all rated at 80,000 PPH continuous. Steaming conditions are 175 psig saturated with 250°F feedwater. Bituminous coal is burned on traveling grate spreader stokers using rear ash discharge. Each unit is equipped with a bare tube continuous loop economizer.

Two of the units are equipped with refuse fuel firing equipment for combination firing of coal and refuse.

Figure 1 shows the sectional elevation arrangement. As noted, two pneumatic refuse fuel distributors are installed above the three spreader coal feeders. Each pneumatic refuse fuel distributor is fed proportioned waste material by refuse fuel feeders located above the boiler front and directly above the spreader coal feeders. The system of waste fuel conveyors and surge storage hopper is connected directly to feeder inlets for gravity feed.

Being a food industry plant, the collected refuse waste covers a wide variety of scrap materials. The major portion consists of many kinds of paper and paper board, wood board and other sections, vegetables, meat and other plant food scrap, plus minor amounts of tin cans and even steel baling wire and straps. This collected waste scrap is brought to a central storage area from which it is fed to an industrial hogger or shredder. Figure 2 shows the general arrangement of the hogger. As noted, this machine has incorporated in its design a large inertia fly wheel to supply shearing and breaking force to chop or hog the waste scrap materials.

After discharge from the hogger, the waste refuse is carried by an air conveyor system to an upper cyclone for separating the conveying air. The waste refuse is then discharged to the surge storage hopper.

The water-cooled combustion furnaces are designed to handle varying amounts of coal or scrap hogged waste. The operating procedure adopted burns the waste scrap during each working day, sometimes continuously or sometimes part time. During the waste

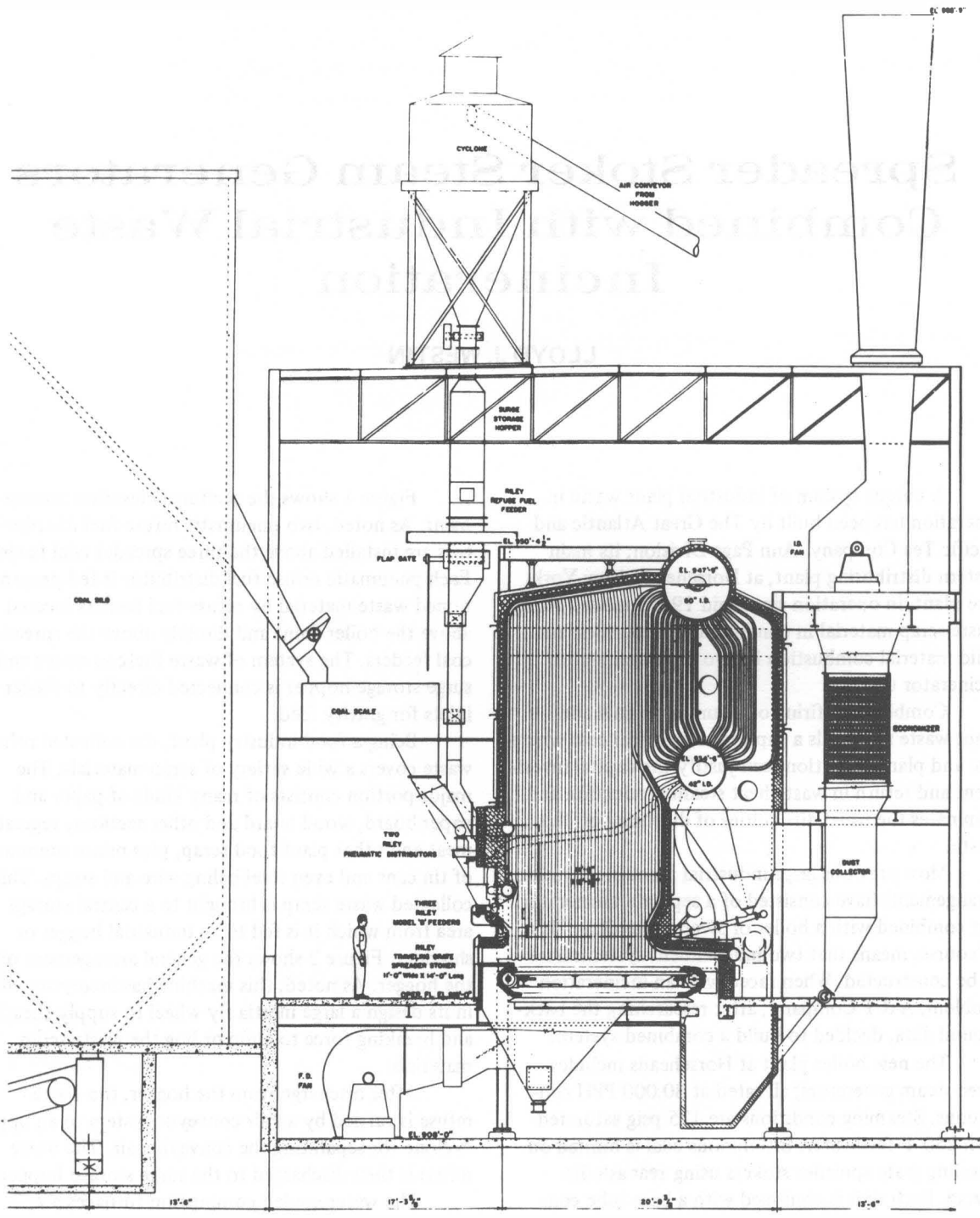


FIG. 1 SECTIONAL ELEVATION TWO BOILER/INCINERATOR UNITS

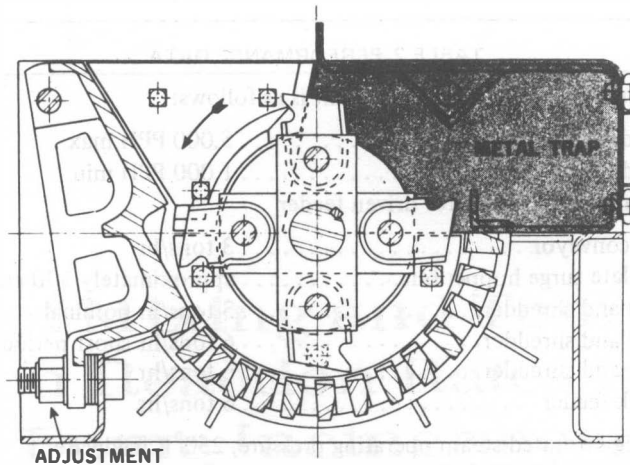


FIG. 2 GENERAL ARRANGEMENT INDUSTRIAL HOGGER

scrap feeding period, the plant steam load is usually sufficient to require burning of some coal by spreader stoker. The mixture of hogged plant waste, depending on constituents, will vary from 4,000 to 7,000 Btu/lb as fired. It has been proven that it is possible to burn all hogged waste with no coal feed required. Prior to hogging, a mixing of the wet and dry ingredients has been found to be necessary.

The units are equipped with combustion air heaters of the steam coil fin tube type. Steam supply is 150 psig saturated. The heaters have capacities to raise ambient room temperature air to 350°F maximum. Normal operating range when used is approximately 300°F. The air preheater need only be used for adverse operating conditions of high moisture coal and/or hogged refuse material.

Each unit is also equipped with centrifugal dust collector for air pollution control.

Problems that have developed:

Early after operating with hogged waste, a screen was added at air discharge from dust collector — purpose to contain pieces of light-weight paper and sheet plastic from spreading over neighboring area.

The incline of spout chutes to pneumatic refuse fuel distributors from refuse fuel feeders was too shallow — the pipe lines tended to clog for some types of feed. For future installations, the refuse fuel feeders and storage bin hopper should be placed higher.

It has been found that waste candy is difficult to incinerate. It melts under heat generated in hogger — shredder and gums up internal parts.

It is forecast that this system of burning waste plant scrap material will become quite popular, particularly since waste disposal from industrial plants has become a very serious problem.

1. Wood ..... 32.6%  
Paper ..... 56.4%  
Cello & Poly..... 1.0%  
Wet Material ..... 10.0%
2. Metal scrap is approximately 440 lb per one (1) day. 420 lbof this is tea chest binding at 1 lb per tea chest or about 24 lineal feet of 1" wide X 18 ga. metal. The remaining 20 lbs is from nails in boards, pallets, etc.
3. Knock down cases on pallets. Wet materials, miscellaneous paper, etc. in tea chests. Tea chests on pallets.
4. Tea chests are 2' X 2' X 2' approx. as a general rule; however, some are as small as 18" X 18" X 18".
5. The cardboard boxes are generally knocked down but some may contain trash.
6. The largest box is 15" X 18" X 48" and vary down from this. As general information the four categories listed above consist of:

TABLE 1. REFUSE FUEL

<b>WOOD</b>	<b>POLY AND CELLO:</b>
Tea Chests	1½ to 4 Mil poly bags.
Broken Starch Boards	
Broken Pallets	
Expendable Pallets	
Pork, cheese, pulp boxes	
Fruit baskets	<b>WET MATERIAL:</b>
	Candy Scrap
<b>PAPER</b>	Olive Rejects
Container Board	Fruit Rejects
Chip board	Bean Skins
Wax paper	Bean Splits
Glassine paper	Spaghetti

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TABLE 2. PERFORMANCE DATA

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The performance data of equipment is as follows:

Hogged refuse feed rate . . . . .	5,000 PPH max
Hogged refuse feed rate . . . . .	1,000 PPH min
with variable speed motor driven feeder	
Flight conveyor . . . . .	3 tons/hr
Steel plate surge hopper bin . . . . .	approximately 100 cu ft
Hogger and shredder . . . . .	3 tons/hr nominal
Hogger and shredder . . . . .	6 tons/hr short period surges
Blower and shredder . . . . .	6 tons/hr
Air lock feeder . . . . .	6 tons/hr
175 psig saturated steam operating pressure, 250° F feedwater	
Efficiency at 80,000 PPH steam load on coal firing –	82.50%
(375° F exit gas temperature)	
Efficiency at 60,000 PPH steam load on coal firing –	84.35%
(345° F exit gas temperature)	
CO <sub>2</sub> in flue gases leaving economizer –	14%
Furnace heat release at 80,000 PPH –	30,000 Btu/cu ft/hr
Furnace heat release at 60,000 PPH –	20,500 Btu/cu ft/hr
Grate heat release at 80,000 PPH –	600,000 Btu/sq ft/hr
Grate heat release at 60,000 PPH –	500,000 Btu/sq ft/hr

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