Waste Into Energy

Industry now is easing many headaches by burning useless waste products in giant furnaces and creating valuable heat energy.

By RALPH THOMAS

➤ PEANUT SHELLS, coffee grounds, bark, sawdust, sugar cane fibers—in short, almost everything but the pig's squeal—is being burned as waste material in our nation's huge industrial boilers to produce heat energy to cut fuel costs and to dispose of cumbersome by-products.

Every homeowner can testify that the piles of leaves, twigs, grass and dried weeds gathered from the backyard are a disposal problem. The most obvious solution is in burning the refuse, which is cheaper than paying to have it hauled away.

If the "burn it" policy could produce additional savings on household fuel and hot water bills, the method would be even more inviting. Although homeowners cannot use this method, industry is adopting such a system of burning unused materials to slash waste and cut soaring operating costs.

Fuel Savings Are High

Much is written about industry's progress in automatic control systems, highly complex production machinery, step-saving processes and a host of other widely heralded developments.

Less well known, but just as important, is industry's search to cut fuel bills and to retrieve some of the millions of dollars that almost literally pour from smokestacks daily.

Prospective fuel savings alone are enough to stimulate a second look at the chamber in which fuel is burned, called the furnace. However, there are other reasons for considering what materials are burned and how. Industrial processes and improper fuel combustion often cause disposal problems and pollute air, rivers and streams.

Special equipment can extract valuable heat energy and convert many leftover materials to useful products, while curbing pollution. It can also wring valuable energy from many of the materials once hauled to the dump for a price.

Installation of such "waste heat" units has grown by leaps and bounds during the past decade.

Making use of by-product fuels, gases and waste heat is a complicated engineering problem. Each plant and process has specific conditions calling for custom-made equipment. The range of operating requirements has led to many designs of units for such basic industries as pulp and paper, petroleum, smelting and steel.

Leading manufacturers of steam-generating equipment—such as the Babcock & Wilcox Company, Combustion Engineering, Foster Wheeler, Riley Stoker and Wickes—have pursued waste heat utilization through many years of research and development.

Waste-Heat Categories

Steam-generating boilers separate into three basic categories—those burning liquid or solid waste products, those using heat from process gases or those burning waste gases directly.

In today's boilers, a surprising array of by-products can be fired with an auxiliary fuel or burned directly to dispose of them more economically. Boilers burning liquid or solid wastes are designed to fire such by-product fuels as wood, bark, shavings, sawdust and sander dust, such used chemicals as spent cooking liquor from pulping processes, peanut shells, and even bagasse, which is a sugar cane residue.

Bagasse has become an economically significant "waste fuel" in certain parts of the world. One of the world's largest bagasse boilers was installed in Puerto Rico's biggest sugar mill. Steam generated from burning this potentially burdensome by-product is used throughout the mill for process and power generation.

Pulp and paper mills require large quantities of steam and power, which are partially generated by burning liquors. Collection, combustion and recovery of waste heat and chemicals make problems for the engineer, but repay the investor with fuel savings and reclaimed cooking chemicals.

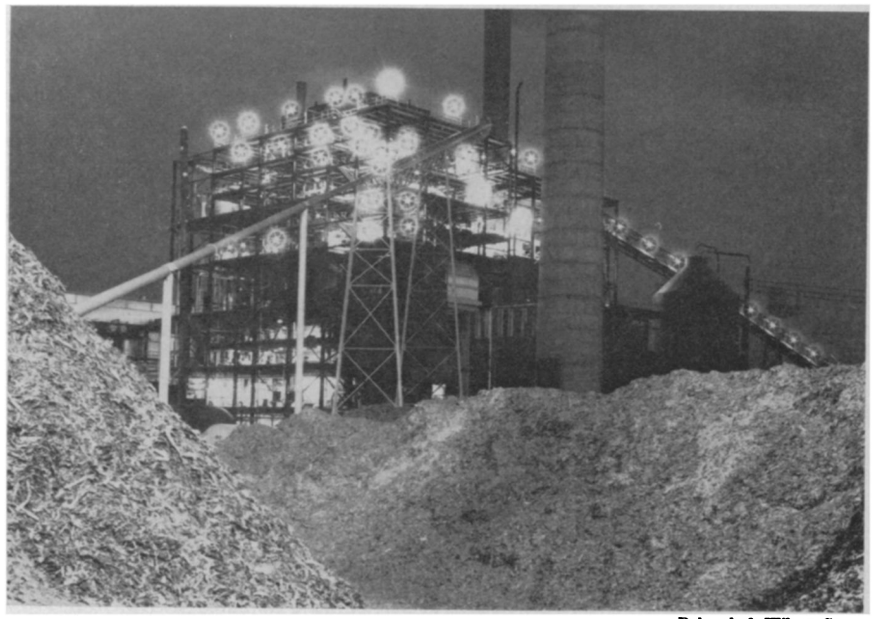
Some manufacturers report installing boilers that will burn peanut shells and even coffee grounds from an instant coffee plant to make steam.

Another method is being used by an Alaskan pulp mill. It is saving on fuel and power costs by burning its bark and lignin waste products in a specially designed boiler, which generates steam for the mill's pulping process. The results are evident—a reduction in waste disposal problems while cutting fuel costs.

Boilers that burn waste gases or use their heat involve complex engineering studies and custom-made units. Many high-temperature gases must be cooled to collect and recover metallic solids carried in the waste gas. Such units are installed in copper refining furnaces, cement and rotary kilns, gas turbins, open hearth and oxygen converter furnaces for the steel industry, and petroleum refineries.

Carbon Monoxide Boiler

One unit of this kind, made by Babcock & Wilcox for the petroleum industry, is known as the carbon monoxide boiler. It collects and burns carbon monoxide gas produced in the catalytic cracking of petroleum for high octane gasoline. Steam generated by the carbon monoxide unit runs machinery and heats the refinery's buildings.



Babcock & Wilcox Co.

USING WASTES—More and more industries are finding that previously unused wastes can be burned, thus increasing production at lower costs. This power and recovery boiler, built by Babcock & Wilcox Company for the Great Southern Land and Paper Company's mill at Cedar Springs, Ga., burns a mixture of bark and coal (on the other side of the unit) to generate steam for the mill's operation.

By burning the high-temperature gases (1,000 degrees Fahrenheit) that ordinarily would be discharged into the atmosphere, the boiler pays for itself with fuel savings in just a few years.

The steel industry also is benefiting from the increasing number and size of waste heat boiler installations. Republic Steel Corporation has ordered from Babcock & Wilcox the world's largest capacity waste boiler. Designed to reclaim heat from waste gases of two oxygen-lanced open-hearth furnaces, the boiler will generate nearly 300,000 pounds of steam per hour to operate machinery and heat buildings.

Many industries overseas are showing increased interest in cost-cutting installations, such as a petrochemical complex being built in Argentina. The plant's design includes three waste heat boilers that will use hot exhaust from gas turbine generators to make steam for chemical processes and for driving turbines.

The exhaust (about 800 degrees Fahrenheit) will be combined with a base fuel and fired in the boiler. Reclaiming the heat reduces fuel consumption and the oxygen is sufficient to support combustion.

Steam-generating equipment manufacturers have been conducting extensive research and testing models of new and more efficient methods to convert waste heat into useful energy. Most waste and by-products can be heated and turned into energy.

One of the latest improvements is a water-cooled steam-generating hood for basic oxygen steelmaking, a process coming into widespread use in the United States. Made essentially of hundreds of welded steel tubes, the membrane hood fits over the furnace to collect, transport, cool and recover heat value from the high temperature gases (3,500 degrees Fahrenheit).

By cooling the furnace gases, gas cleanup systems can operate still more effectively to remove dust, helping to curb air pollution.

The unit makes steam, at rates up to 200,000 pounds per hour, that can be used by steel mills for power generation and process heat.

Industry's fuel savings can be conservatively estimated at millions of dollars annually—dollars that otherwise might literally have gone "up the stack."

• Science News Letter, 86:282 October 31, 1964

INVENTION

Patents of the Week

The newest policeman's aid is a dual-purpose axe to capture criminals that chops holes in doors and then shoots tear gas grenades—By William McCann

➤ AN AXE that can chop a hole in a door and shoot tear gas into a room barricaded by a criminal has been developed to help make police work a little less dangerous.

Rather than having to batter down a door and face the muzzle of a trapped criminal's gun, police can slash a hole in a door with the axe. With the axe sticking in the door they can pull a ring, shooting a tear gas grenade into the room through a tube that has its opening at the face of the axe.

The device, which is about 30 inches long and weighs 15 pounds, can be swung like a sledge hammer against the door by an officer standing off to one side, thus avoiding exposure to gunfire through the door.

Carl Weinert, Pittsburgh, Pa., was awarded patent 3,152,417 by the U.S. Patent Office for his police saver, which was successfully tested at the FBI Academy at Quantico, Va., earlier this year. Patent rights were assigned to Federal Laboratories, Inc., Saltsburg, Pa.

The invention is most effective in attempting to apprehend an armed criminal in a room without windows or in areas where shooting tear gas from the outside would not be advisable, Mr. Weinert reported in his patent.

Smoke and Fire Alarm

A device that can "see" smoke or "feel" fire and then whistle for firemen has been patented.

The device is a smoke and fire alarm which contains a heat-responsive thermostat and a photoelectric cell unit. The thermostat senses if a room gets too hot and causes an aerosol-operated horn to bellow for help. Similarly, the horn will blow if the hazy smoke comes between the light beam from the photoelectric cell and a receiving eye located across from the cell on the alarm.

The smoke and fire alarm was invented by John L. Jensen, Estherville, Iowa, who was awarded patent 3,153,226.

Back Seat Head Rest

Back seat drivers can now sit back comfortably with the aid of a newly developed back seat head rest.

William Buhl, Medford, Ore., earned patent 3,152,831 for the head rest, which may be easily removed and used as a cushioned seat. It has been designed so that it will not block the driver's view through the back window.

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Do You Know?

Most young women in the United States suffer from *"pump bumps,"* a bony outgrowth on their heels, which results from closely-fitting high-heeled shoes.

The number of *blind* people in the world is expected to increase from today's 14 million to 20 million by the year 2000.

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