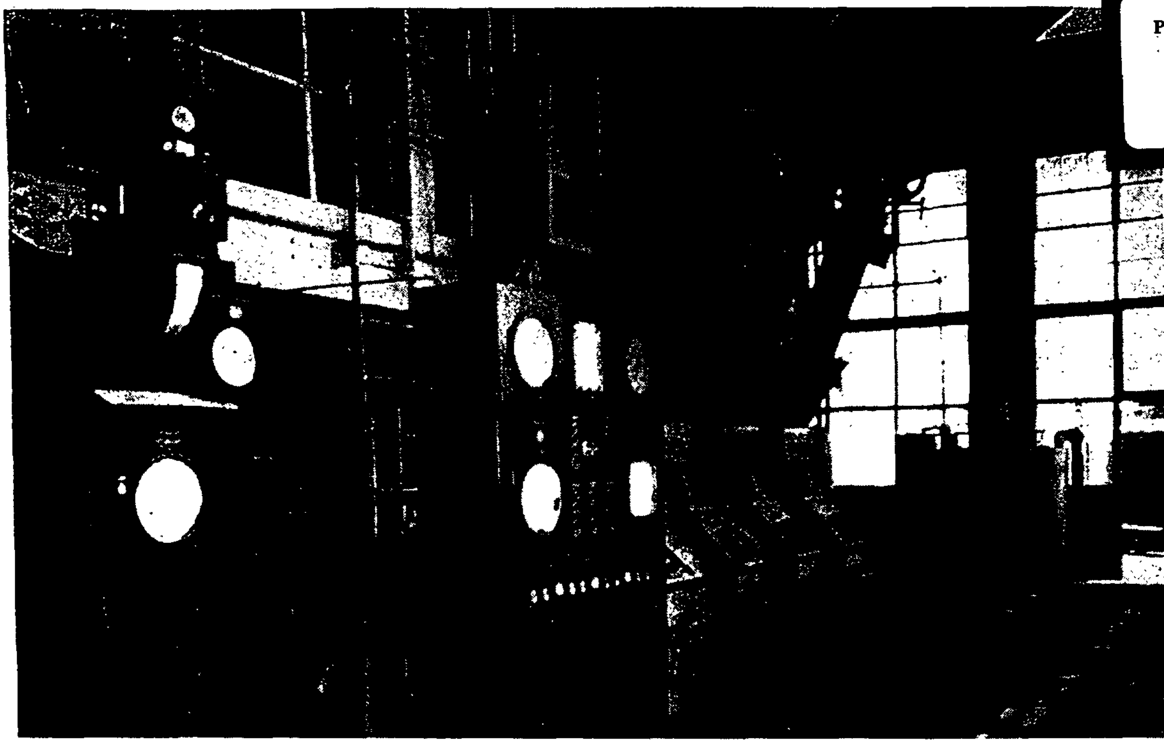
E. H. SMITH

PLAINTIFF'S EXHIBIT

RS-243



Recently installed cross-drum, water-walled boiler floats on line as original boilers are base loaded

STOKELY FOODS, INC. REDUCES COST OF STEAM 33 CENTS PER 1,000 LB

After an extensive survey, instead of greatly increasing steam capacity, this company added one new boiler and changed over to alternating current to improve efficiency from 62 to 78.2%. Even higher efficiency is expected when the plant is 100% completed

J. P. RUTLEDGE, *Development Engineer*
Stokely Foods, Inc.

AFTER an extensive survey of the Stokely Foods, Inc., plant in Indianapolis, engineers found the over-all power plant efficiency was only 62%. Analysis also indicated the boiler house was not the full cause of this low efficiency, but that non-condensing turbines driving d-c generators were very inefficient. A careful study of two possible solutions was made, namely: (1) installing enough boiler capacity to take care of all processing needs and installing additional d-c generating equipment; and (2) installing one boiler to take care of the increasing processing needs, purchasing alternating current at 4,160-v. from the local utility and reconverting the entire plant to a-c operation. The latter system was deemed more efficient.

Furthermore, cost of two additional boilers, necessary coal and ash handling equipment, and increased water treatment plant would have been prohibitive. The new system is now in operation and boiler house efficiency has increased to 78.2%. Cost of 1,000 lb of steam has been reduced 33 cents.

One water-wall integral boiler, having a total heating surface of 5,860 sq ft, was placed into operation alongside the two original boilers early this year. This boiler has a capacity of 50,000 lb of steam per hr and is operated at 150 psi, saturated. The furnace volume is 2,050 cu ft, and a spreader stoker, with a grate area of 126 sq ft, is automatically controlled. In addition an integral economizer, having a heating surface of 975 sq ft, maintains the feedwater at 212 F.

Overfire air, drawn from the ash pit, is blown into the furnace at low pressure, and smoke is held at the minimum. The two original boilers will operate at base load, while the new boiler will float to effect a good steam balance.

Coal Handling

Indiana coal is delivered by rail and unloaded over a track hopper. Dumped coal is lifted by means of a bucket conveyor to an overhead bunker, which has a capacity of 70 tons. Coal drops from this bunker through a meter into individual spouts leading to boiler coal hoppers. Each boiler has three separate spouts leading to the stokers. Entire coal feeding system is controlled automatically. This in itself has increased operating efficiency considerably.

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Editorial

CO-OPERATIVE RESEARCH

MANUFACTURERS and industries have always sought to improve their products. They have always sought to develop new ones. Not too many years ago, the approach was entirely empirical—all the emphasis was on "try-and-see" operations based on intuition and know-how.

Productivity of mere inventiveness, with emphasis on mechanical ingenuity, began to fade at the beginning of this century. And as it began to fade, organized science began to become effective in promoting industrial progress. Today, research is big business. About one billion dollars is spent annually in industrial and government laboratories, by universities and by research foundations.

It is claimed in many quarters that a billion dollars a year for research is insufficient; that it should be about two billions if the optimum welfare of our country is to be maintained in peace and war. This claim is based on fact: several industries have demonstrated that an average expenditure of two per cent of their gross sales on research leads to the maximum in quality and quantity of goods produced, as well as maximum profit. Parallel expenditures by all industry would attain the two billion dollar figure.

C. C. Furnas, director of the Cornell Aeronautical Laboratory, has often emphasized the problems involved in industrial research. Included is the fact that many industries, particularly small and medium-sized ones, have no research in the modern sense of the word. Others have practically none. They are vulnerable because they can't keep up with the procession. And where industrial research laboratories do exist, the following three important items for successful operation are often disregarded.

1. Research should be in a relatively autonomous position. It should exist and contribute in its own right; it should be parallel and not subservient to sales, production or engineering.

2. It must be conducted at a relatively constant level, providing continuity of effort and reasonable security to the staff. No research program will be successful if its budget follows violent fluctuations of business cycles.

3. The research man must have freedom and opportunity for individual action. Research cannot be confined to a strait jacket of rigid regulation and rules or it becomes unproductive.

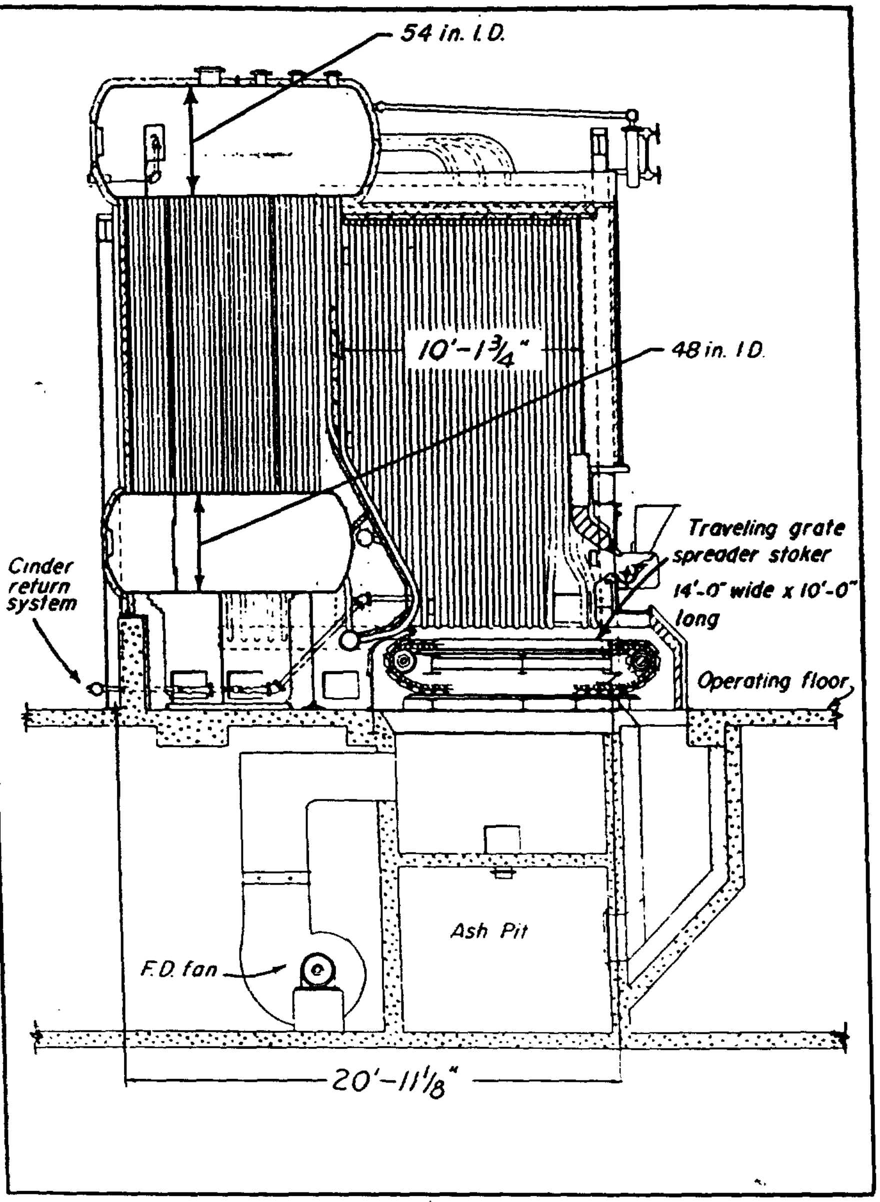
Scientific knowledge on which industrial research is based is so vast and its various categories so specialized that only the largest corporations can hope to support modern research organizations. This indicates the need for greater support of research foundations by small and medium-sized industries. They could, and should, give more support to fundamental research programs of colleges and universities.

Too often when small industries support research foundations and university research programs they expect immediate practical benefits on particular projects. To say the least, that is shortsighted.

Research has become such a predominating factor in the American way of life that industry, both large and small, cannot afford not to give it maximum support. This is not to say that there would be any danger of the pool of knowledge of scientific research and development drying up. The general social trend is such that if free enterprise doesn't support basic research, government will. In fact, this phase of socialization has probably advanced as far as is safe for our future sound economy.

William J. Hargest, Editor

Economizer aids boiler efficiency by maintaining boiler feedwater at 212F



Fly ash trapped in dust collector is picked up by an ejector system and returned to the fire box. The ash drops into the ash pit and it is removed mechanically

Induced and forced draft fans run continuously because of the high resistance offered by the dust collectors, economizer and stack. Flyash is trapped in dust collectors and picked up and returned to the ash pit by means of a high pressure ejector system. Soot is blown twice daily, and smoke is kept at the minimum at all times.

Steam is distributed to processing and turbine operated equipment at 150 psi. These turbines are non-condensing and exhaust at 2 psi back pressure. High pressure steam is reduced through a pressure reduction station to 5 psi, which is necessary for food processing. The heating system, operated at 2 psi, is made up of non-condensed steam from the processing units and turbines.

Make-up Water

Make-up water for the plant is exceptionally high, in fact in the summertime 90% is required. This high amount of make-up is caused by contamination of steam as it comes in contact with sealed cans in the cooking process. There is a certain amount of food spillage on the side of the cans when they are filled. This spillage is washed off in the submerged heaters, and therefore the hot water removed from the autoclave is wasted. In this heating process, hot steam is injected directly into the heater. In such a method, the steam not only acts as a heating agent but a mixing agent to maintain an even water temperature.

PRINCIPAL EQUIPMENT IN STOKELY FOODS, INC. PLANT

Boiler	Riley Stoker Corp.	Overfire air fan motor	Crocker-Wheeler Electric Mfg. Co.
Integral economizer	Riley Stoker Corp.	Induced draft fan	American Blower Corp.
Spreader stoker	Riley Stoker Corp.	Induced draft fan motor	Crocker-Wheeler Electric Mfg. Co.
Coal handling equipment	Fairfield Engineering Co., The	Forced draft fan	American Blower Corp.
Combustion controls	Hagan Corp.	Forced draft fan motor	Crocker-Wheeler Electric Mfg. Co.
Boiler feedpump	Dean Hill Pump Co.	Switch gear	I-T-E Circuit Breaker Co.
Boiler feedpump turbine	Dean Hill Pump Co.	Plug-in bus duct	BullDog Electric Products Co.
Boiler feedpump motor	Crocker-Wheeler Electric Mfg. Co.	Motor generator sets	Westinghouse Electric Corp.
Soot blowers	Diamond Power Specialty Corp.		General Electric Co.
Flow meters	Republic Flow Meters Co.	Air compressors	Worthington Pump and Machinery Corp.
Overfire air fan	Clarage Fan Co	Air compressor motor	Reliance Electric and Engineering Co.

During the winter make-up runs between 30 and 40% because of the returned condensate in the heating system. Originally steam at 150 psi was delivered to two non-condensing turbines, which drove a 500 and a 350-kw d-c generator. Current was developed at 280-v, and these units supplied all the necessary power to drive the d-c electrical equipment throughout the powerhouse and processing units located in the plant.

Steam Balance

As these turbines were non-condensing it was impossible to have a proper steam balance. In the new system dual operated processing and powerhouse equipment has been installed. This consists of an electrical driven and turbine driven unit. To insure a good steam balance, the turbines are placed into operation whenever there is a surplus of steam.

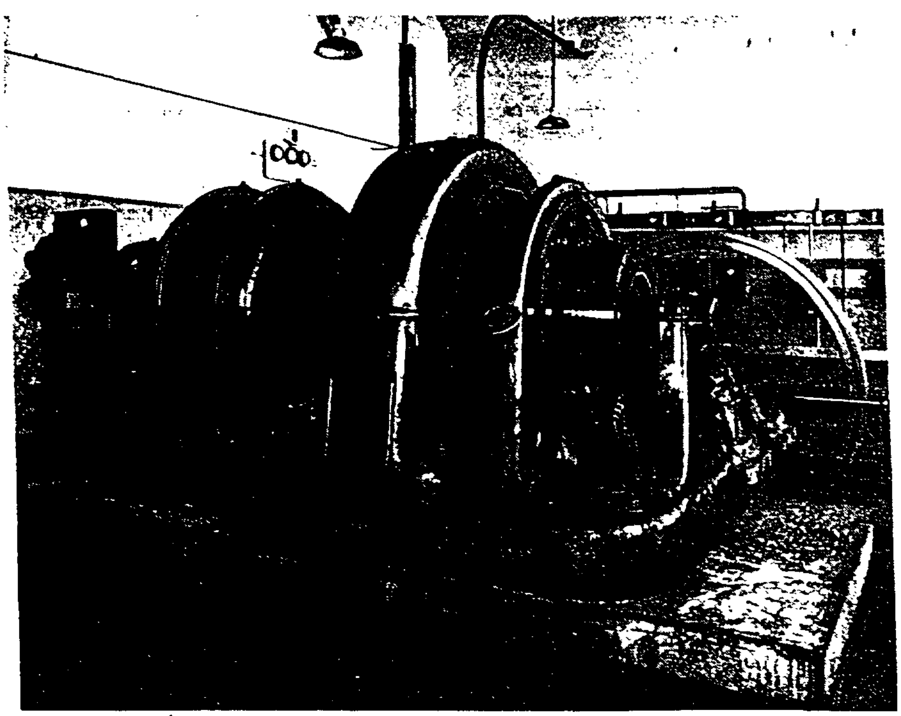
To start the changeover, two motor-generator sets, 500 and 300-kw, were installed and connected to the purchased power supplied. These d-c generators were connected to the old plant electrical distribution system, and d-c operated apparatus continued uninterrupted. However, a temporary 220-v a-c three-phase line was installed, and a-c equipment was tied in as the replacements were made. The new electrical equipment will be 220/440, three-phase, 60 cycle and all permanent bus duct equipment being installed will be 440-v. An analysis showed that it would be cheaper to run in the temporary 220 v line, as some equipment had been operated at this voltage.

At the present time 440-v plug-in bus ducts are planned for each floor of the building, and all 220-v equipment will be eventually connected to this duct. As all electrical equipment purchased to date is 220/400-v, it will be a simple matter to change the 3 phase motor wiring to accommodate this higher operating voltage when completed.

TABLE 1—PREDICTED PERFORMANCE DATA

1. Steam output, pounds per hour	15,000	45,000	50,[illegible]
2. Furnace liberations, Btu per cu ft per hour	9500	28,900	32,[illegible]
3. Excess air at boiler outlet, %	53	35	[illegible]
4. Coal, pounds per hour	1,720	5,240	5,[illegible]
5. Air, pounds per hour	22,500	60,500	68,[illegible]
6. Air, cfm	5,100	13,700	15,[illegible]
7. Steam pressure at boiler outlet, psi	150	150	[illegible]
8. Feedwater temperature, F	212	212	[illegible]
9. Air temperature, F	80	80	[illegible]
10. Exit gas temperature, F	435	590	[illegible]
11. Draft losses, in. of water			
Furnace draft	0.1	0.1	[illegible]
Boiler draft	0.1	0.7	[illegible]
Dust collector (Bubar)	0.05	0.3	[illegible]
Outlet damper and flues	0.05	0.4	[illegible]
Total draft	0.3	1.5	[illegible]
12. Air resistance, inches of water			
Air duct	0.1	0.5	[illegible]
Grate and fuel bed	0.2	1.3	[illegible]
Total resistance	0.3	1.8	[illegible]
13. Heat balance, losses %			
Dry gas	10.17	12.90	13[illegible]
Hydrogen and moisture in fuel	5.33	5.64	5[illegible]
Moisture in air	.25	.31	[illegible]
Unburned combustibles**	1.30	1.50	1[illegible]
Radiation	2.95	.95	[illegible]
Unaccounted for	1.50	1.50	1.5[illegible]
Total loss	21.5	22.8	23.6
14. Efficiency of dust collector, %	90	85	[illegible]
15. Efficiency of unit	78.5	77.2	76.4
16. Steam quality—Not more than ½% moisture with boiler water concentration less than 3500 ppm.			

** Based on reburning dust collector fly ash.



One of two MG sets that supplies 280-v power for d-c operated equipment. After change over to a-c, only the elevators and cranes will utilize direct current

Purchased Power

Purchased power is received at 4,160-v and stepped down in a transformer bank to the necessary 440-v. At the present time with the temporary 220-v bus duct, further stepping down of power is necessary. This, of course, is only a temporary measure and will be eliminated when the system has been changed. Main service, as planned, will be 2,000 amp throughout. The only remaining units to operate on d-c will be the elevators and cranes. Lighting service is supplied through individual transformers located on each floor, and it will be stepped down to 110-v. When necessary, fractional hp motors will be tied into this same 110-v circuit.

Total demand of treated water, for processing and steam, is 1,200 gpm. Daily consumption, which includes processing, steam and cooling water, is 1,700,000 gal. Of this only the city water is treated as the hardness is only 15 to 17 gr as calcium carbonate. The well water has an average hardness of 32 gr as calcium carbonates, and in addition it contains considerable amounts of iron, which would not be desirable for food processing. Therefore, this water is used only for cooling purposes while the treated city water is used for actual food processing.