OFFICIAL PROCEEDINGS

FORTY-FIFTH ANNUAL MEETING

OF THE

National District Heating Association

HELD AT

THE GREENBRIER HOTEL

WHITE SULPHUR SPRINGS, WEST VIRGINIA

MAY 25, 26, 27 and 28, 1954

VOLUME XLV

Price $10.00

PUBLISHED BY THE NATIONAL DISTRICT HEATING ASSOCIATION

827 NORTH EUCLID AVENUE, PITTSBURGH 6, PA.

CONCLUSION

The changes made on these two stokers have resulted in improved fuel distribution and performance. These improvements will be incorporated on the next unit. It will also have a shallower retort.

Chairman Gillespie: Thank you, Mr. Foltz, for your story on the replacement of obsolete and worn stoker equipment at the Beacon Street Heating Plant.

We will now proceed to the next paper, of which George M. Johnson is the author.

ADDITIONAL GENERATING EQUIPMENT AT STATION NO. 9 OF THE ROCHESTER GAS AND ELECTRIC CORPORATION

George M. Johnson

(In this paper the author describes the care taken to conserve operating personnel and space and to use existing equipment and auxiliaries as long as feasible when adding to the original two boilers, each of 75,000 lb. capacity, installed in 1926, a boiler of 150,000 lb capacity in 1948, and another of the same capacity in 1953.)

The problems involved in maintaining the necessary balance between capital investment, operating cost, and return on investment, are basic to industry as a whole. District-heating station operators, due to the nature of the loads, must pay particular attention to these details. At Station No. 9, of the Rochester Gas and Electric Corporation, the issue was further complicated when it became necessary to add capacity in blocks of not less than 150,000 lb per hr in an area originally planned for units of 75,000 lb per hr.

Station No. 9 is an isolated plant serving an industrial zone at the extreme west end of the city. In 1926, the original installation of two boilers, designed to operate at 385 psi and 500F with a rated capacity of 75,000 lb per hr each, was placed in operation. Two years later, an extraction-type, noncondensing, 3000-kw turbine was added. Two men per shift were necessary to operate the station. The addition of automatic controls at this time would not have decreased this requirement, and the savings due to increased efficiency would not have warranted the additional expenditure. In addition, the automatic controls available at that time were not as reliable as those in use today.

In 1943, due to war-plant activity and new industrial construction, the demands for steam service began to increase at a greatly accelerated rate. By 1948, peak requirements of the station were approaching rated capacity and a third unit was required. Due to this accelerated growth rate, and the future potential of the area, a boiler with a capacity of 150,000 lb per hr or twice the capacity originally planned was installed. This involved an extension to the building, and the erection of a new stack which was convenient to and had capacity for a future addition. With minor adjustments, the existing feedwater-treatment system and steam and water lines were adequate for this installation. A new ash-conveyor system was installed with manual controls and provisions for extensions to a fourth unit. Automatic combustion controls were provided for the boiler. Since most of the load could be carried

on the new boiler and the automatic equipment eliminated many of the operations formerly performed manually, an increase in operating personnel was not required. In this manner, the capacity of the plant was doubled with a minimum in capital expenditure and no increase in operating labor.

The demand for steam service continued to increase and by 1953 the fourth unit was required. Studies, made at that time, indicated a capacity of more than 150,000 lb per hr as the most desirable and economical. Since the space originally allocated for this unit was based on a 75,000 lb per hr boiler, a serious problem was posed. Relocation of this unit to provide adequate space would involve a considerable expenditure of time and money. For this reason, an extension to the building at 45 ft by 45 ft x 90 ft was erected as originally planned and a boiler similar to No. 3 and of the same physical dimensions was installed. The space was not entirely adequate and some compromises had to be made, but the saving in capital costs justified the effort.

The original feedwater-treating equipment, which was adequate for the third unit with only minor revisions could not be revamped to provide water for the fourth unit without increasing its size. The make-up water is drawn from city mains, treated in sodium-zeolite softeners, and after acid treatment and degasification, stored in a hot well. The makeup and returns are collected in the hot well, pumped to the deaerators, and picked up at this point by the boiler-feed pumps. In spite of the limited space, the hot well and degasifier were replaced with larger units and one new deaerator and zeolite softener were added. Three new boiler-feed pumps were installed and a branch line from the hot well serves the other three boilers. These changes enabled the company to take advantage of modern advancements in equipment design at a minimum capital expenditure. The addition of automatic softener regeneration, along with other automatic controls, made it unnecessary to add to the operating staff.

With the boiler located as originally planned, the extension of coal- and ash-handling equipment was accomplished at a minimum capital expenditure, and the existing stack was utilized as planned. Automatic controls for the ash system of both units were installed at this time to reduce operating labor.

The existing source of auxiliary power was inadequate. It was, therefore, necessary to install a new 2500 kva, 34 kv transformer supply from the company-owned substation. This can be made available to the other boilers at a later date. A new 1500 kva transformer at 4150-440 volts was also installed as emergency power for the No. 4 auxiliaries.

The fourth unit is a Combustion Engineering VU-type boiler (with four horizontal burners, two Raymond ball mills, one louvre-controlled forced-draft fan, and one variable-speed induced-draft fan) designed to operate at 450 psi, 560F but operating for the present at 385 psi.

One feature of the fourth unit is worthy of special note. The pulverizers, fans, and slag-removal equipment are sufficiently oversized to provide 50,000 lb per hr of additional capacity for a four-hour period, and a desuperheater in the header insures constant steam temperature at this overload. This capacity is particularly attractive to district-heating station operators. The investment is comparatively small and the capacity can be used to carry the high peak demands which occur for a few hours during the year.

The area served by this station is primarily industrial but it borders on a residential area. As the loads increased and boilers of larger capacity were installed, the elimination of smoke and fly ash became more important. A mechanical dust collector of the multiple-cyclone type was installed on No. 3 unit. When No. 4 was installed, a further effort was made to eliminate the dust nuisance by using an electrostatic precipitator. Although this investment does not show a return in dollars, the public is becoming more and more conscious of the benefits of smoke and dust elimination, and the returns must be reckoned in terms of good will.

Employee relations are recognized as an important factor in maintaining efficient operation. In line with this policy, steps have been taken to make the plant, as well as operating conditions, attractive to the personnel. A new, well-lighted, and well-furnished office has been provided. Two new locker rooms have been constructed for the shift operators and maintenance men.

The expansion program at Station No. 9 points up the need for flexibility in plans for future additions. The growth rate for district-heating stations is often difficult to determine and, in contrast to electric-power stations, may be somewhat erratic. The two additional units have tripled the capacity of Station No. 9. The original plan called for doubling the capacity. This has been accomplished at an increase in capital investment. By avoiding rearrangement, use of automatic controls, and new designs and techniques, the labor requirements have been maintained at the original level. The capital investment required for additional units of increased capacity is relatively less per M lb than would have been necessary for the sizes originally planned. This saving in fixed charges, plus a decrease in production cost has reduced the total cost of steam produced.

Chairman Gillespie: Thank you, Mr. Johnson, for your interesting report on your Company's new steam-generating equipment for district heating.

The third paper this morning deals with combustion-control equipment, which is an important part of any boiler plant. H. R. Fulton, Manager of the Pittsburgh District for the Bailey Meter Company, has prepared this paper, entitled "Meters and Automatic Controls for District-Heating Boilers."

METERS AND AUTOMATIC CONTROLS FOR DISTRICT-HEATING BOILERS

H. R. Fulton [1]

(In this paper the author discusses the application of meters and automatic controls to district-heating boilers, especially the characteristics of such boilers as bear upon the selection of meters and automatic controls; gives a list of and describes suggested equipment and includes a study of the economic possibilities of such installations.)

District-heating boilers operate under conditions and limitations

[1] Pittsburgh District Manager, Bailey Meter Company, Cleveland, Ohio.