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District Heating in Denmark, Norway, Sweden and Finland

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In the four Scandinavian countries Denmark, Norway, Sweden and Finland the natural conditions for development of district heating systems have been quite different.

In **Denmark production** of electric power as well as heating of buildings is based chiefly upon imported fuel, for which reason the natural conditions are in favor of development of combined power-heat production. It is true that the first district heating systems were either heating works exclusively, or heating works utilizing waste heat, for instance from Diesel engines, but no doubt future development of district heating will, on the whole, be combined with production of electricity.

In **Finland, Norway** and **Sweden** the power consumption is chiefly covered by the very ample water-power available within the respective territories of these countries. Only in recent years have thorough discussions concerning district heating combined with electric power been taken up—especially in Sweden.

FINLAND

District Heating Systems—in the real sense of this term—have not been erected in this country. It is true that a few building blocks have been furnished by a single heating plant, but the conduits required in this connection have been very short.

About ten years ago a proposal was made to supply Helsingfors, the capital, with power as well as with heat from a public electric works of the city, as it had been proven that in this case combined production would afford great advantages because of the climatic conditions. The relatively long winter would, on the whole, involve maximum power consumption at the same time as the demand for heating was maximum. However, this project has never become a reality.

NORWAY

District heating in Norway has until now been extended only very moderately. On the whole only two plants have been built, about which some information is given below:

THE STEAM STATION AT OSLO

The steam station supplies heat for a series of buildings in the neighborhood including the Town Hall.

The pipe network has a total length of 1200 to 1500 feet. The pipes have a diameter of 8 in. and are placed in concrete conduits in the ground. The width of the conduits is about 20 in. and the depth about 24 in. The pipes are insulated with 2 to 2½ in. of rock wool and wrapped with asbestos.

Inspection wells are provided, which are like ordinary sewer wells. The spacing of the wells is approximately 450 feet.

Superheated water is used as a carrier for the heat. Usually the heating is effected through waste power in an electrode boiler of 20,000 kw capacity. When no waste power is available, heating by oil is employed. When the water has left the boiler, it is conducted to a high-pressure water accumulator of 250 m^3 (8800 cu ft). The water has a temperature of up to 190 C (375 F). As a rule the pressure in the flow pipe is 24 kg per cm^2 (340 psi). The temperature of the water varies somewhat according to the demand, but the flow-water has an average temperature of about 120 C (250 F). The return-water has a temperature of about 60 C (140 F).

The capacity of the system is about 15 mill. kcal/h. By electric heating an efficiency of 75 per cent is obtained, and when oil is used 60 per cent of the potential heat is utilized.

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Ulleval Hospital

This hospital, presumably Norway's biggest, with 2000 beds housed in a series of buildings, is heated by one heating system. The following information can be given about it.

It is a steam plant. The total length of pipes is about 1500 feet, the diameter is 9 in. at the outlet, and decreases gradually to 4 in.

The pipe lines are insulated with 2 to 2½ in. of kieselguhr wrapped with asbestos. The pipe lines are suspended in passable concrete subways in the ground, except a few stretches in non-passable concrete conduits. The boilers operate at a relative pressure of 9 to 10 kg per sq cm (140 psi), and the total capacity is 18000 kg (40000 lb) steam per hour. There are 9 boilers, three of which are electrode boilers, using 6000 kw waste power in total. 2 boilers are heated by oil and 4 boilers by coal. The 2 electrode boilers heated by waste power, consume under normal conditions up to 33 mill. kwh per year.

The working pressure of the district heating network is maximum 5 to 6 kg/cm^2 (85 psi). The return water temperature is 60 to 70 C (140-160 F).

DENMARK

District heating from public works has been practiced for more than 20 years in Denmark, and to a very great extent considering the size of the country. In the January 1949 NDHA Bulletin, Mr. N. C. Geertsen, Chief Engineer of the Copenhagen District Heating Works, will give a more detailed report on the most important public Danish heating works, and in addition thereto he will describe methods used for measuring of the heat consumed.

SWEDEN

The position of district heating in Sweden may be characterized as an average one. Up to now the district heating has, on the whole, comprised only private plants with rather limited ranges. At present, however, a large-scale combination of public electricity works and district heating is being thoroughly discussed. These discussions concern, to begin with, Gothenburg and Malmo, the second and third towns in Sweden respectively. Mr. P. Alsen, Civil Engineer of Sodra Sveriges Angpanneforening, Malmo will report on the present position of district heating in Sweden in the April 1949 NDHA Bulletin.

The ASTM

Leo F. Collins

The 51st Annual Meeting of the American Society for Testing Materials was held in Detroit, Michigan, June 21 to 25 inclusive. In attendance were some 1800 delegates. As one of the latter, the writer represented the NDHA in accordance with an assignment from President Henry L. Martin.

The avowed purpose of the ASTM is "the promotion of knowledge of the materials of engineering, and the standardization of specifications and the methods of testing"*. Participating in these endeavors are some 6500 individuals. All parts of the U. S. A. are represented, and a modest number of members reside in Canada, England, Latin America and other foreign countries.

The development of methods for the testing of fuels, lubricants, ceramics, plastics, metals, and waters as criteria of their industrial usefulness comprise the "heart" of the work. Of particular interest to NDHA members is the work of Committee D-19 on Water For Industrial Uses. Therein, exact procedures for testing boiler water and steam, comprise most of the activity. Under the sponsorship of this committee, the NDHA corrosion tester has been elevated to a **Tentative Standard Method** for measuring corrosion.

*Quotation from 1947 Year Book, ASTM.