

THE DISTRICT HEATING SYPHON SOUTH DUISBURG

- some details in English -

The Stadtwerke (Municipal Works) Duisburg AG are one of the biggest, municipal companies of the energy and water supply. They are supplying the inhabitants of the city of Duisburg and the local industry with power, natural gas, water and district heat.

Thus nearly 20% of the Duisburg households get district heat from the municipal works.

The modernization of the heating and power station III in Duisburg-Wanheim into a highly modern gas and steam heating and power station (GUD-HKW) is creating a new emphasis on production for the district heat supply of the part of network centre-south-west. To allow the heat to be transported, there have to be made investments into corresponding pipe systems. A considerable instrument is this district heating siphon, executed as FW-STAHLMANTELRÖHR (FW STEEL-CASED PIPE-IN-PIPE) that will secure a direct heat supply to Duisburg-Rheinhausen in future.

Technical Data

	Medium pipe	Encasing pipe	Empty pipe
Quantity	2 (flow and return)	2 (flow and return)	2
Nominal diameter	DN 500	DN 800	DN 100
Dimensions	508,0 x 6,3 mm	813,0 x 12,5 mm	110,0 x 10,0 mm
Pipe material	steel St 52.4	steel St 37.4	PE-HD
Insulation	heat insulation 100,0 mm	PE 3,7 mm (reinforced)	-
Lift security	-	concrete casing approx. 9,0 cm	-
Medium temperature	max. 140 °C	-	-
Pressure	16 bar calculating pressure	1 mbar	-
Route length siphon	approx. 440 m	approx. 440 m	approx. 440 m
Route length land pipeline	approx. 225 m	approx. 225 m	approx. 225 m

Total weight of the siphon: 880 tons / excavated material of the siphon channel: 45.000 m³

FW-STAHLMANTELRÖHR (FW STEEL-CASED PIPE-IN-PIPE)

In order to fulfil any requirements of the district heating pipeline during construction, pulling-in and operation, the decision was made in favour of a FW STEEL-CASED PIPE-IN-PIPE. With an encasing pipe made of steel, this system is extremely suitable for the external mechanical stresses arising during the laying of the siphon.

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In view of the importance of the pipelines, the planning, calculation, construction and manufacture of the FW STEEL-CASED PIPE-IN-PIPE were accompanied by a severe quality control. For example, 100% of the inner pipe and encasing pipe seams, made in our plant, were subject to a radiographic test and the construction units to a construction test by an independent expert.

Thermal strain and pre-stressing anchor points

When having a total length of the siphon including the pipeline above earth of 590 m (between the anchor points), a thermal strain of 960 mm has to be compensated. In order to avoid costly compensation buildings for this purpose, a thermally pre-stressed FW STEEL-CASED PIPE-IN-PIPE is used. During the thermal pre-stressing, the inner pipe is heated up to 75 °C with steam and afterwards stressed with the encasing pipe by means of pre-stressed anchor points. The thermal strain arising during operation is thus omitted as movement and changed into stresses of the encasing pipes. In the pre-stressed anchor points, forces of 1700 kN are to be supported. A natural compensation via the L-bends in the FW STEEL-CASED PIPE-IN-PIPE is the best possibility for the compensation of the continuing pipelines including the residual extension from the bonded system.

Evacuation and vacuum technique

The ring space between inner pipe and encasing pipe was evacuated with mobile vacuum pumps to a final pressure of 1 mbar (absolute) after termination of the works when starting the pipeline. With the vacuum

- the tightness of the system was permanently controlled by means of a remote monitoring
- the thermal loss was reduced by up to 40%
- the corrosion at the inner pipe (external side) and at the external pipe (inner side) was permanently eliminated by means of removing the humidity and de-oxidation

The ring space was sealed vacuum-tightly by means of special axial compensator seals permitting the relative movement between inner pipe and encasing pipe.