



INSULATED TUBING (VACUUM (VIT) AND NON-VACUUM)

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Insulated tubing is used as production tubing pipes for oil and gas fields located in the most challenging conditions: in permafrost regions, and/or in zones with gas hydrate/asphaltene deposition, or in high-viscosity hydrocarbon zones.

Insulated tubing design consists of two concentric tubes joined by welding (the smaller-diameter tube is enclosed within the larger-diameter tube), with thermal insulation placed in the annular space. Insulated tubes are assembled into strings using threaded connections.

INSULATED TUBING TYPES

1.

Vacuum insulated tubing (VIT). Multi-layer insulation

DESIGN FEATURES

Annular space:

- Layers of foil and basalt fiber fabric (including getters)
- Vacuum in the annular space
- Fluoroplastic thermal insulation in the coupling
- Pretensioned internal tubes to withstand high temperatures

APPLICATIONS

Operating temperature: up to +350 °C*

Tubing is used to:

- prevent wellbore soil thawing in the cryolithosphere
- inject superheated steam into the reservoir to heat high-viscosity oil
- produce oil by huff-and-puff methods
- prevent asphaltene and paraffin deposition.

2.

Non-vacuum insulated tubing. Non-organic thermal insulation

DESIGN FEATURES

Annular space:

- Layers of foil and basalt fiber fabric
- Fluoroplastic thermal insulation in the coupling

APPLICATIONS

Operating temperature: up to +180 °C*

Tubing is used to:

- prevent wellbore soil thawing in the cryolithosphere
- inject superheated water into the reservoir to heat high-viscosity oil
- produce oil by huff-and-puff methods.

* Numbers are obtained at RusNITI by numerical calculations

KEY PERFORMANCE AND TECHNICAL PARAMETERS OF INSULATED TUBING

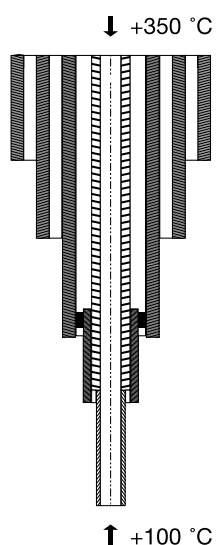
Performance parameters	Limit value
Operating temperature, °C	Up to +350
String length, max, m	Calculated individually, depending on the selected threaded connection
Thermal conductivity of the coupling insert, max, W/(m·K)	0.25

Parameter	Non-vacuum insulated tubing		Vacuum insulated tubing	
Operating temperature, °C	up to +50	up to +180	up to +220	up to +350
Thermal conductivity, max, W/(m·K)	0.03	0.06	0.012	0.02

Technical parameters	Limit value
Vacuum level in the annular space, max, Pa (mm Hg)	$8 \cdot 10^{-2}$ ($6 \cdot 10^{-4}$)
Pipe length, m	10–11.7*
Heat treatment of weld seams	+
Hydrostatic testing	Insulated tubing with a made-up coupling undergoes hydrostatic testing at $R = 0.8 \sigma$
Grades	Carbon (55–110 ksi); 13Cr (80 ksi)
Charpy impact test	At least 50 J/cm ² at –60 °C

* 6–10 m lengths can also be produced on request.

APPLICATIONS OF INSULATED TUBING



+350 °C **

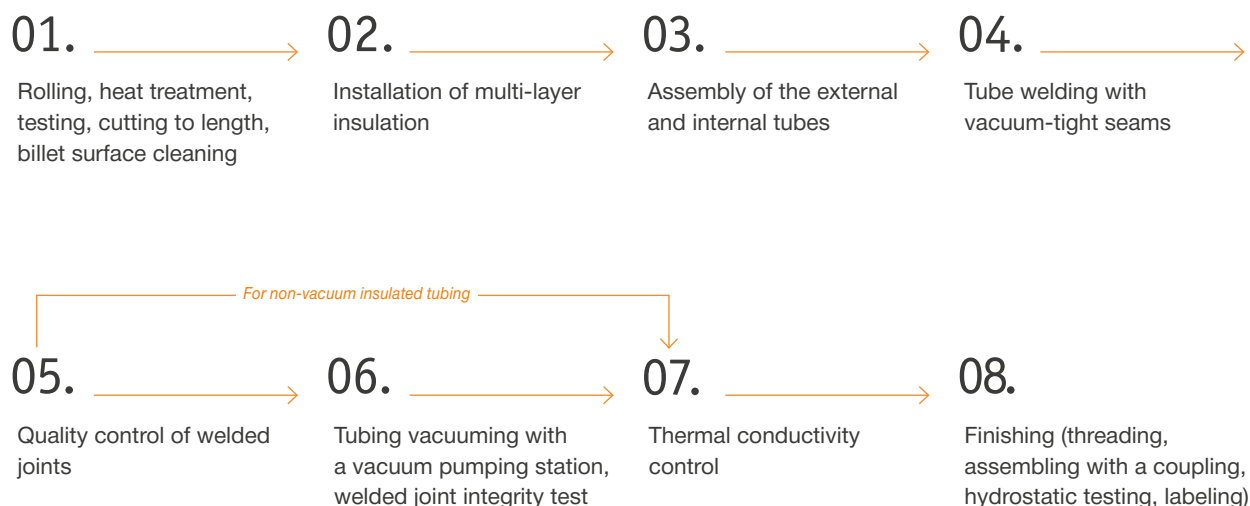
- Injection of high-temperature fluids into the reservoir to heat high-viscosity oil; hydrocarbon production involving thermal cycling (including cyclic steam stimulation and steam assisted gravity drainage)

+100 °C **

- Prevention of wellbore soil thawing in the cryolithosphere
- Prevention of gas hydrate or asphaltene and paraffin deposition

** Numbers are obtained at RusNITI by numerical calculations

PRODUCTION PROCESS OF INSULATED TUBING



SIZE RANGE

Insulated tubing size class	External bearing tube		Internal tube	
	Outside diameter, mm	Wall thickness, mm	Outside diameter, mm	Wall thickness, mm
245 x 10.03 – 168 x 8.94	244.48	10.03	168.28	8.94
178 x 8.05 – 140 x 7.72	177.80	8.05	139.70	7.72
178 x 10.36 – 127 x 7.52	177.80	10.36	127.00	7.52
178 x 9.19 – 127 x 7.52	177.80	9.19	127.00	7.52
168 x 8.94 – 127 x 7.52	168.28	8.94	127.00	7.52
168 x 8.94 – 114 x 7.37	168.28	8.94	114.30	7.37
168 x 8.94 – 114 x 6.88	168.28	8.94	114.30	6.88
168 x 8.94 – 102 x 6.65	168.28	8.94	101.60	6.65
168 x 8.94 – 102 x 5.74	168.28	8.94	101.60	5.74
146 x 9.5 – 102 x 6.65	146.05	9.50	101.60	6.65
146 x 9.5 – 102 x 5.74	146.05	9.50	101.60	5.74
140 x 9.17 – 102 x 6.65	139.70	9.17	101.60	6.65
140 x 9.17 – 102 x 5.74	139.70	9.17	101.60	5.74
140 x 9.17 – 89 x 6.45	139.70	9.17	88.90	6.45
127 x 9.19 – 89 x 6.45	127.00	9.19	88.90	6.45
127 x 7.52 – 89 x 6.45	127.00	7.52	88.90	6.45
114 x 6.88 – 89 x 6.45	114.30	6.88	88.90	6.45
114 x 6.88 – 73 x 5.51	114.30	6.88	73.02	5.51
114 x 6.35 – 89 x 6.45	114.30	6.35	88.90	6.45
114 x 6.35 – 73 x 5.51	114.30	6.35	73.02	5.51
102 x 6.65 – 73 x 5.51	101.60	6.65	73.02	5.51
102 x 5.74 – 73 x 5.51	101.60	5.74	73.02	5.51
89 x 6.50 – 60 x 5.00	88.90	6.50	60.32	5.00
89 x 6.45 – 60 x 4.83	88.90	6.45	60.32	4.83
89 x 6.50 – 48 x 4.00	88.90	6.50	48.26	4.00

BASIC INSULATED TUBING DESIGN

Vacuum insulated tubing

Non-vacuum insulated tubing



KEY CONTACTS



COMMERCIAL CONTACTS

