



Insulation

Temperature rise through an insulated pipeline

May be determined from the following formula:

$$T_e = \frac{(\theta_w - \theta_\alpha)}{e_x} + \theta_\alpha$$

where

- T_e = exit temperature °C
- θ_w = input temperature °C
- θ_α = ambient air temperature °C
- C_p = specific heat J/kg
- M = mass flow rate kg/s
- L = length of pipeline m
- Q = heat gain or loss W/m

$$x = \frac{L.Q}{M.C_p(\theta_w - \theta_\alpha)}$$

Insulation Thickness

The following table details what insulation thickness is normally available in the Insapipe range. Other thicknesses are available for specific applications.

Pipe nb	Casing Size																			
	80	100	110	125	145	150	160	175	185	200	213	225	250	300	320	325	350	375	400	425
15	29	39																		
20	26	36	41	49																
25	23	33	38	45																
32		28	34	41	51	54														
40		26	31	38	48	51														
50		20	25	32	42	45														
65				24	34	37	42	49												
80					28	30	35	43	48	55										
100							23	30	35	43	49	55								
125										30	36	42	55	80						
150												30	41	66						
200														40	50	52	65			
250																	38	51	63	
300																			38	51



Insulation

System design

When designing an insulated pipeline system, do not design the process pipe first and then consider insulation. Take insulation into account from the outset in order to achieve the full benefits of overall economy, speed of construction, long life and integrity. Consider insulated, heat-traced pipe as a single module. Insulation comes "free" with Insapipe, when you purchase the process pipe system.

PHYSICAL PROPERTIES

Thermal conductivity	(BS 874 rigid, MDI based polyurethane foam.)
-mean 19.7°C	thermal resistance 2.3 m ² °K/W
	thermal conductivity 0.022 W/m°K
-mean 80.2°C	thermal resistance 2.1 m ² °K/W
	thermal conductivity 0.024 W/m°C
Shear strength (BS 4370:1968 Method 6)	205 kPa
Closed cell	93% by volume
Friability (ASTMC-421/C-367)	13% wt/10 mins
Average in-place density	65 kg/m ³
Compressive strength	320 kPa.

ACTION OF FUNGI AND BACTERIA (ISO/R846)

Insulation is inert to test organisms. Will not support growth nor suffer mould damage.

'K' FACTOR (COMPARATIVE) (at 20°C mean temperature)

Rigid Polyurethane	Polystyrene	Fibreglass	Foam Rubber	Foam Glass
0.022	0.038	0.035	0.038	0.047

COMPRESSIVE STRENGTH kPa

Rigid Polyurethane	Polystyrene	Fibreglass	Foam Rubber	Foam Glass
*320	175	35	-	690

* At densities incorporated in Insapipe system

COMPARATIVE INSULATION THICKNESS

The following are insulation thicknesses necessary to limit heat gain to 10W/m in an outdoor ambient of 35° C on an 80 nb pipeline at -20°C.

Insapipe	43mm
Fibreglass sectional	75mm
Foamed PVC	90mm
Foamed polystyrene	90mm
Calcium silicate	125mm
Foamed glass	125mm