



PROFILE-CUT PIPE INSULATION....THE SHUT-DOWN SAVIOUR

Background

Profile-cut pipe insulation sections have been generally available in Australia for about ten years. The product is cut from a purpose made block of specially formulated stone wool using computer controlled fast wire cutting equipment such as Wintech machines or similar. Quality with some of the sections cut in the mid-90s tended to vary in quality but this product solved problems when clients were faced with short lead times. The varying quality of finished sections created at that time negative perceptions about cut pipe in the minds of contractors. Inconsistent fibre distribution resulted in soft spots and a generally fragile feel with some stock. Since this time a great deal of developmental work has gone into the production of the base block material. When the Roxul Asia plant was upgraded in 2002 a pipe block manufacturing facility was installed. It was based on the proven block material used for a number of years in the North American market by Roxul Canada. After a short commissioning period the plant now produces what is arguably the best pipe block base material in the world.

Issues

The historical problems faced by contractors where pipe insulation is concerned are universal:

- Long lead times for product other than HVAC piping sizes.
- Tendency to over-order due to the long lead times
- High value of left over stock which can be held for years until eventually used
- The “unknown” factor in shut-down work.

Profile cut pipe sections from AIS now offer quality solutions to pipe insulation work and have many benefits:

- Fast response – most small orders can be produced within 48 hours while larger projects can be scheduled according to the requirement at the site and delivered on a “Just In Time” basis.
- Dual layer systems are easier to produce and are more accurately made to fit the pipe compared to standard molded sections.
- Ability to respond to emergency requirements during shut-downs.
- Can be produced in full sections, halves, quarters or lags for large pipe diameter and thickness.
- Can also produce lags to suit the radius of small tanks and equipment.



AIS pipe sections are made from stone wool, are classifiable as “non-hazardous” against NOHSC criteria and in terms of IARC listings is in Group (3) *Not classifiable in terms of carcinogenicity*. All AIS stone wool products have a Green Chem Alert Report as issued by Risk Management Technology, WA.

MOLDED vs PROFILE-CUT PIPE INSULATION

MOLDED PIPE INSULATION

Molded pipe insulation sections are normally made using purpose made steel mandrels. The uncured wet insulation wool known as green wool is wrapped around the circumference of the mandrels and compressed with rollers until the required thickness and density of wrap is achieved. The covered mandrels are then stacked onto trolleys which are then wheeled into curing ovens. For several hours the sections are subjected to up to 250°C to bring the heat-curing resins to their final state within the insulation wool. At this point the mandrels are removed (after cooling) leaving an irregularly shaped cylindrical mass. The sections are then trimmed with saws to provide perfectly square ends and closure joint. To achieve the correct thickness and the required dimensional tolerance the outside surface is sanded or milled leaving a smooth surface.

Advanced production facilities are equipped with automatic forming of molded sections eliminating all of the above stages of production while consistently achieving tighter tolerances and much higher capacity. Sections produced by this method can usually be identified by the marks on the outer surface which can be dimpled or marked with an imprint of fine mesh and do not need sanding. They generally have less free fibre at the surface than sanded sections.

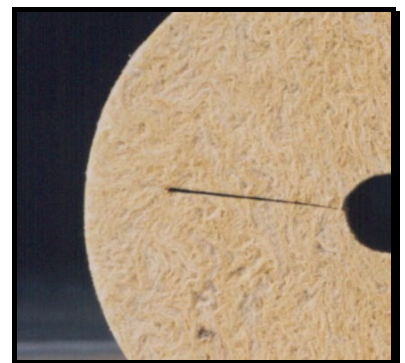
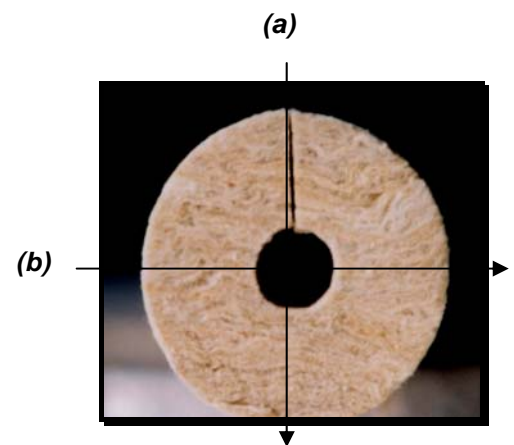
Characteristics of Molded Pipe Insulation

- Fibre lay is generally horizontal to the surface of the pipe to achieve the optimum path of resistance to heat flow through the insulation.
- Horizontal fibre lay is less desirable where higher compression resistance is required. Horizontal fibres tend to collapse under point loads which can impact in a negative way on thermal performance.

PROFILE-CUT PIPE INSULATION

In the early stages of cutting pipe insulation in Australia, attempts were made to cut pipe sections from blocks of standard industrial slab insulation. This approach resulted in a product that was inferior in handling properties and did not stand up to the installation procedure. The constant fibre direction provided variable thermal conductivity depending on the direction of heat flow through the fibre, and variable compression resistance. Through (a) the thermal conductivity is at its best but the product has poor compression resistance. Through (b) the thermal conductivity deteriorates but the compression resistance is better.

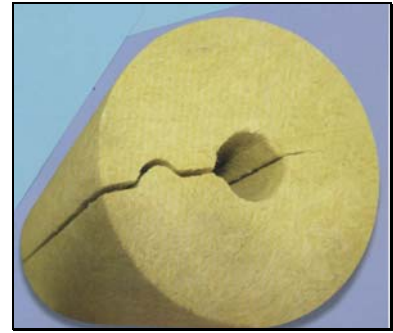
The base block material developed by Rockwool Group for pipe insulation manufacture has optimized fibre laying with a random fibre orientation to achieve the ultimate combination of good thermal performance, high compression resistance and robust handling characteristics. Most importantly, at elevated temperatures the integrated random fibre structure mechanically binds together much better than horizontal, mandrel wound fibre which is prone to de-lamination.



Precision Cut Pipe Sections

One of the great advantages of profile-cut sections is that they are not limited by the availability of mandrels. Sections can be made to fit exactly, any outside diameter pipe dimension. This can be a great problem solver when insulating heat-traced pipe, rigid PVC piping, or making allowance for inner wraps on standard sized steel or copper pipe.

Profile-cut pipe insulation provides a great deal of versatility when providing dual layered systems or simulating dual layers with discontinuous closure joints to reduce heat loss through joints (see photograph). Sections can also be made to accommodate continuous attachments on the pipe such as heat tracing elements and any other obstructions.



Discontinuous closure joint

Large Pipe and Vessels

When exceeding 600mm nominal bore pipe size, most manufacturers have very limited capability when called on to supply rigid pipe insulation. Similarly, small cylindrical vessels and tanks usually mean a switch to flexible blankets and wired mats. The unique capability of profile-cut systems enables the use of highly compression-resistant insulation lags even on large vessels.

Thermal Performance

Profile-cut pipe sections have been accepted as thermally equal to molded sections for many years. The slight difference in thermal conductivity at some mean temperatures is insignificant and in fact the profile cut material with its unique fibre structure outperforms molded product at elevated temperatures when similar density material is compared within the Rockwool Group range. Following is a comparison of the thermal performance of two products over a range of pipe diameters and operating temperatures. It can be clearly demonstrated that overall there is no compromise in thermal performance when selecting a profile cut pipe section.

Ambient- 23°C

Wind-0

Surface Coefficient Model-VDI 2055 1994

Galvanized cladding

Molded product – Lapinus Pipe 850

Profile Cut Pipe – Roxul Pipe C11

Pipe NB.	Section Type	Operating Temperature (°C)																	
		150			200			250			300			350			400		
		Thick.	Q	T _s	Thick.	Q	T _s	Thick.	Q	T _s	Thick.	Q	T _s	Thick.	Q	T _s	Thick.	Q	T _s
25	PCP	40	30	35	50	41	37	50	57	41	50	75	46	75	80	42	100	88	41
	Molded	40	29	35	50	39	36	50	55	41	50	74	46	75	80	42	100	90	41
50	PCP	40	43	37	50	57	39	50	79	44	50	105	50	75	108	46	100	117	44
	Molded	40	41	36	50	54	38	50	77	44	50	103	50	75	108	46	100	119	44
100	PCP	40	67	39	50	88	42	50	122	48	50	162	55	75	159	50	100	168	48
	Molded	40	64	38	50	84	41	50	118	47	50	160	54	75	160	50	100	172	48
150	PCP	40	92	41	50	118	44	50	163	50	50	217	57	75	208	52	100	216	50
	Molded	40	86	40	50	113	43	50	158	49	50	215	57	75	211	52	100	220	50
200	PCP	40	113	41	50	145	44	50	203	51	50	267	59	75	256	54	100	260	51
	Molded	40	108	40	50	139	44	50	197	51	50	265	59	75	255	54	100	266	52

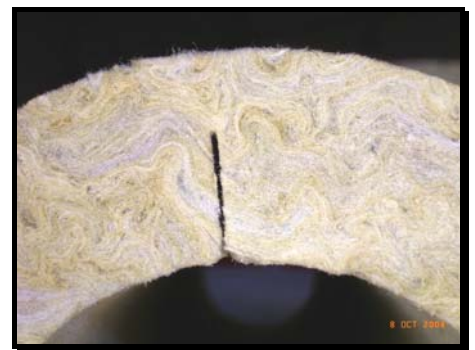
This series of pictures helps to demonstrate the differing fibre orientation and appearance of the two types of pipe section. Sections cut from modern pipe block materials offer a range of benefits over molded sections:

- *Short lead times for sections*
- *Greater flexibility of form – sections, halves, pipe lags, equipment lags etc.*
- *Higher compression resistance compared to molded without compromise on thermal performance*
- *Accommodates non-standard pipe sizes and purpose made sections*
- *Enables a variety of different joint closure seals for better thermal performance*
- *Retains more of its strength at high temperatures compared to molded*

(a) Molded section clearly shows fibre running horizontal to the pipe surface



(b) Profile cut section shows random fibre orientation to achieve optimum thermal conductivity and compression resistance.



(c) Molded sections produced by automated pipe lines do not need sanding and display indentations from the presses that come in contact with the fibre during the curing stage.



For further information and technical advice on insulation contact:

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