Closed-Cell Pipe Insulation for Refrigeration — Choosing Wall Thickness by Line Size and Duty

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How to choose elastomeric insulation wall thickness (9, 13, 19, 25 or 32 mm) for refrigeration suction lines by pipe size and operating temperature, why condensation control sets the minimum, and the catalogue's size matrix from 1/4 inch to 3 inch with continuous-coil and 2 m length formats.

What the insulation must do

On a refrigeration suction line, insulation performs two jobs: it limits heat gain (which costs compressor capacity and raises discharge temperature) and it keeps the outer surface above the dew point so the line does not stream condensate — or, below 0 °C, grow an ice jacket that crushes the insulation and wets the building. Closed-cell elastomeric foam does both because the closed cells resist water-vapour diffusion; but only if the wall is thick enough that the surface stays warm, and only if every joint and seam is glued vapour-tight.

Choosing the wall

The required wall rises with colder line temperature, higher ambient humidity and larger pipe diameter. As working practice for indoor plant-room conditions in Northern Europe ("H 25 °C / 70 % RH design ambient):

Line temperature | Typical duty | Wall |

+5…" 10 °C | Medium-temp suction, chilled water | 13 mm (small bores 9 mm) |

" 10…" 25 °C | Cold-store suction | 19 mm |

" 25…" 40 °C | Freezer suction, low-temp CO2 | 25–32 mm |

High-humidity spaces (marine engine rooms, galleys, process halls) and outdoor runs move each duty one step thicker. These are starting values: for contractual work run the condensation calculation for the actual ambient — the insulation manufacturers' calculators implement EN ISO 12241.

The catalogue matrix

Tubes are stocked per bore from 1/4" (6 mm) to 3" (89 mm) in walls of 9, 13, 19, 25 and 32 mm, supplied either as 2 m lengths or as continuous tubing in cartons for the small bores. Examples across the range: 3/8" × 9 mm, 1/2" × 13 mm (168 m carton), 3/4" × 19 mm (60 m), 7/8" × 19 mm (56 m), 1 1/8" × 19 mm, 1 3/8" × 25 mm, 1 5/8" × 32 mm, 2 5/8" × 19 mm and 3" × 19 mm. Flat sheet for vessels, headers and duct fittings is carried in 13–32 mm, plain and self-adhesive (13 mm self-adhesive sheet, 19 mm self-adhesive, 32 mm sheet).

Workmanship rules that decide the result

Slide, don't slit, where possible. Thread tube insulation over the pipe before brazing the next joint; use a splitting knife only where retrofit forces it, and glue the slit fully.

Glue every butt and seam with the system contact adhesive (applied with an 11 mm brush); a dry-pushed butt joint is a vapour leak.

No compression. Support the line through insulated pipe clamps with load-bearing inserts (see the clamp guide) — bare clamps crush the foam and create a cold bridge that drips.

Seal the ends at valves and components; taped-only terminations wick moisture under the foam.

Outdoors, UV-protect with cladding or system paint; unprotected elastomeric foam erodes within a few seasons.

Verifying an installation

Inspect at the first humid-weather plant run: any seam showing droplets or frost lines is a vapour-barrier breach and will only get worse. On surveys, check insulation at clamps, at valve bonnets and on the first metre out of the evaporator — the three places installers run out of patience. Keep the wall consistent through penetrations, and record bore/wall per line section in the plant documentation so later repairs order the right tube from the matrix above.

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