

How to implement process thermal insulation

Hot processes lose heat from the surfaces of equipment and from open tanks. With the right insulation, you can cut heat loss by as much as 90% and protect staff from burns and scalds.

Fitting insulation is usually simple enough for your own maintenance staff or a regular maintenance contractor to carry out. And you'll usually recoup the cost within a couple of years.

The business case

Take a single shift process heating system operating at 80°C. Fitting insulation to 100mm pipework would cost around £20/m, but would save £20/m, assuming a gas price of 2.5p/kWh. The work would pay for itself in just one year. Insulating 100mm flanged valves would also save around £20 per valve, at a cost of around £80 – giving a payback period of four years.

Insulating hot tank contents by covering the surface with a ball blanket could save you around £450 a year. This is based on a 24-hour heating system, a gas price of 2.5p/kWh and a single layer of 38mm balls. You'd recover the cost in just six months.

The technology

Insulating materials have different properties and varying resistance to heat damage.

- Straight pipework is usually insulated with preformed lengths fixed with metal bands or high temperature tape.
- Valves are best insulated using flexible jackets fixed with quick release fastenings.
- Heat loss from open tank surfaces can be cut by 75% by using a layer of balls on the surface.

Applications

The following table summarises the insulation materials available and their typical applications.

Table 1

| Insulation | Maximum temperature °C | Application |
|--|-------------------------------|--|
| For hot services | | |
| Glass mineral fibre, aluminium foil faced, preformed | 230 | Internal, concealed surfaces |
| Glass mineral fibre, aluminium clad | 230 | Surfaces exposed to damage and external surfaces open to the weather (joints sealed) |
| Rock mineral fibre aluminium foil faced, preformed | 830 | Internal, concealed surfaces |
| Rock mineral fibre aluminium foil faced, preformed, aluminium clad | 830 | Surfaces exposed to damage and external surfaces open to the weather (joints sealed) |
| For services at ambient temperature or below – non- absorbent (closed cell) | | |
| Polyethylene | 80 | Internal and external locations (joints sealed) |
| Synthetic rubber | 105 | Internal and external locations (joints sealed) |

Table 2

| Ball blankets | Maximum temperature °C | Application |
|----------------------------|-------------------------------|---|
| Polypropylene | 110 | Metal treatment tanks |
| High density polypropylene | 230 | External freezing prevention, UV stabilised |

Specification checklist

With ball blankets, you need to check that the ball material is compatible with the tank fluid and the temperature of the liquid.

The following table outlines the points to consider when deciding on the type and thickness of equipment insulation.

Table 3

| Considerations | Comments |
|----------------------|---|
| Pipework diameter | 110 |
| Surface temperature | 230 |
| Insulation type | Use commercial preformed fibrous or closed cell (non-absorbent) sections on pipes, and jackets on valves and flanges. |
| Insulation thickness | Use a minimum of 25mm thick insulation on hot pipes. BS5422 describes the method for specifying insulating materials for pipes, tanks, vessels, ductwork and equipment operating between -40°C and +700°C. BS5970 applies to insulation for pipework and equipment between -100°C and +870°C. |

The following table shows the type of guidance given in BS5422 for energy saving insulation depending on pipe size and temperature. This example assumes the insulating material is mineral fibre.

Table 4

| Pipe diameter (mm) | Service temperature (°C) | Recommended insulation thickness (mm) |
|--------------------|--------------------------|---------------------------------------|
| 32 | 0 | 15 |
| 32 | 75 | 38 |
| 32 | 100 | 54 |
| 32 | 150 | 67 |
| 100 | 0 | 29 |
| 100 | 75 | 46 |
| 100 | 100 | 64 |
| 100 | 150 | 81 |

Commissioning procedure

After installation, you should check that insulation and any waterproof coverings completely cover the pipework and are securely fastened. Also check that insulating balls aren't being carried away with the process material.

Common problems

There are rarely problems, providing you check the insulation after installation. Remember, though, that:

- actuators fitted to motorised valves shouldn't be insulated.
- external pipework should be fully weatherproofed.
- immersing metal products in tanks can trap balls. Modify transport equipment to move balls out of harm's way – an upside-down basket to collect balls, for example.

Finding a supplier

Insulation comes under the Government's Enhanced Capital Allowances scheme. You can see a list of ECA approved suppliers at www.eca.gov.uk

Ball blanket suppliers are likely to be plastic ball stockists who have experience of supplying this type of product for industrial use. The internet is the easiest way to find them.

Your own staff should be able to carry out small insulation jobs. For larger jobs, though, it could be more economical to use a contractor. You may already know of a good contractor; if not, contact a trade association.

The Heating and Ventilating Contractors' Association (HVCA)

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