THE ICING’S ON THE CAKE, NOT ON THE PLANT

When building an onshore regasification terminal, the cost to insulate the cryogenic piping and equipment is typically only 1 – 3% of the overall construction budget. However, the labour-intensive nature of cryogenic insulation means that the physical work can span up to 30% of the construction schedule. Furthermore, because of the necessity of waiting for the pipe to be installed, welded, inspected, and released, this work is always compressed toward the end of the project. Whether construction is stick-built or modular, cryogenic insulation will always be on the critical path.

3% of the cost, 30% of the time

Decisions about insulation are made early in a project, and are usually based on what is most familiar and least expensive. But at 3% of the cost, and 30% of the time, the choice of insulation has a far greater impact on schedule than on budget. Put another way, just one week of up-time in a typical regas terminal is worth more than the total installed cost of the insulation. Yet it is easy to lose a week in an installation schedule that can span months.

When it comes to making decisions about cryogenic insulation, perhaps the industry should start thinking less about ‘how much?’, and more about ‘how long?’.

Cryogel insulation

For this type of cryogenic service, there have historically only been two major options: Cellular glass, or polyurethane/polyisocyanurate foams. In 2007, a third option became available – flexible aerogel blanket. Known by the tradename Cryogel, this material is thin, versatile, and installs more quickly, and more simply than the traditional, rigid products.

Comprised of fibre-reinforced amorphous silica aerogel – essentially puffed-up sand – Cryogel provides the lowest thermal conductivity, or K-value, of any cryogenic insulation material in the world today. As a result, it is generally 25 – 50% thinner than competing materials, while providing the same or better levels of thermal performance. It is also capable of performing multiple functions within a plant, including acoustic insulation, cold-splash protection, and passive fire protection against both pool and

John Williams, Aspen Aerogels, USA, discusses a recent case study in Southeast Asia for insulating an LNG import terminal with flexible aerogel blanket materials.
jet-fire hazards. Since its first introduction, Cryogel has been used successfully in dozens of LNG facilities, and has an installed base of over 3 million m².

Implications for schedule savings

Much of Cryogel's usage has been driven by specific needs around space (mechanical clashes) or schedule. The space benefit is easily understood: Lower K-value = thinner insulation = better fit in areas with tight clearances. The schedule benefit is the culmination of many things:

- Easier to work in tight spaces: Thinner, and easily handled and transported, Cryogel lends itself to the jumbled, congested spaces typical of an industrial construction site (see Figure 1).
- No expansion-contraction joints: Because the material remains flexible at cryogenic temperatures, there is no need to install expansion-contraction joints within the insulation. This feature alone reduces labour by 10 – 15%.
- No breakage: During shipment and in the field, rigid products break, necessitating repair work, and unplanned movements of people and replacement materials. As a flexible blanket material, Cryogel never breaks.
- Reduced material handling: Cryogel's thinness and form factor reduce shipping and storage volumes by 60 – 90% compared to competing materials. This reduces the staff required to dispatch and courier material during a project.
- Less packing waste: Rigid products are bagged, boxed, and palletised, whereas Cryogel is shipped in bulk rolls. Hours spent picking up poly bags and breaking down boxes are better spent installing material.
- One SKU covers all piping and equipment: Rigid insulation products must be custom made to fit every combination of pipe size and insulation thickness, requiring enormous effort to plan, fabricate, ship, and inventory enough material to guarantee no work stoppages. In contrast, one roll of 10 mm thick Cryogel can insulate any piece of piping or equipment in the plant. As long as there is a roll in inventory, there should never be a work stoppage.

Results from the field

Recently, Cryogel was awarded a contract for the expansion of an existing LNG import terminal in Southeast Asia. The original construction schedule, which was based on rigid insulation materials, allotted four months to insulate more than 8000 m of cold and cryogenic piping ranging from 0.5 – 42 in. in diameter. Due to various schedule delays, the insulation contractor was not called in until two months after the original mobilisation date, placing the project's start-up timing at risk.

To make up some of the time, Aspen Aerogels worked with the contractor to train extra workers, supervision, and inspection staff. The rest of the time was recovered by Cryogel's superior labour productivity, which the contractor reported as being 40% faster to install than the originally specified rigid materials. As a result of the contractor's extra staffing, and Cryogel's speed of installation, the main insulation work was completed in half the expected time. The 60-day recovery allowed the project to get back on schedule and proceed to an on-time startup.

Summary

While the material costs for Cryogel are often a little higher than that of rigid insulation products, this is always at least partially offset by the reduction in labour costs, accessories, storage, and logistics. But this narrow focus on material cost misses the larger picture – Cryogel's biggest benefit is the gift of time. For this particular terminal, the four-month insulation timeline was shortened by 60 days. The resulting earlier startup covered the incremental cost of upgrading to Cryogel within the first day of operations. The next 59 days of recovered schedule were just the icing on the cake.