

Honeywell Enovate® 245fa in LNG Onshore Storage Tank



Safe and Effective LNG Storage

Honeywell

Enovate® 245fa: Improved Energy Efficiency and Tank Protection vs. Traditional Tank Insulation

When natural gas is cooled to -165°C , it becomes a liquid and takes up $1/600^{\text{th}}$ the volume than when it is in the gaseous state. For countries that are not connected to a gas pipeline network, storing LNG through liquefaction is an economical and technically safe solution. However, with common LNG storage tank sizes of $200,000\text{m}^3$ or more, safety is a concern for the general public and the environment. To comply with demanding safety regulations, LNG storage tank designs have evolved from single and double containment designs to full containment designs, which have wide industry acceptance. Membrane-type design tanks have also been developed to enhance safety in LNG storage.

Wall Insulation

The stand-alone fabricated steel inner storage tank is fully enclosed by a pre-stressed concrete outer containment, with insulation material filling the void between the two (annulus space). The concrete outer tank protects people and the environment from a potentially explosive gas-air mix in case of a leak in the inner tank. Insulation materials which can withstand extreme temperature are usually chosen, not only to maintain the temperature of stored liquid, but also to act as an additional protective barrier to the concrete outer tank.

Conventionally, perlite and foam glass have been used widely as the insulation material for LNG full containment storage tanks. However, due to the inefficient

insulation performance, the required thickness of perlite insulation could be a challenge for LNG storage tanks located in populated areas or cities with strict space limits. Polyurethane foam with higher energy efficiency can now be used as the sole insulation component for membrane-type tanks or part of the multilayer insulation for full containment designs. Tanks insulated with polyurethane foam insulation not only requires less land space but also meets the required boil-off rate (BOR) of the tank.

Corner Protection

In addition to the benefits discussed, foam with Enovate® 245fa can be used to protect the corners of LNG onshore tanks, leading to improved containment leakage.

Choose Enovate 245fa

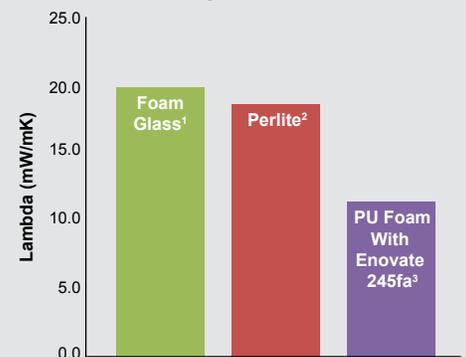
The choice of blowing agent to create the tank insulation plays a significant role in thermal insulation. At cryogenic temperatures, Enovate 245fa, a non-ozone depleting, nonflammable foam blowing agent, produces a significant improvement in insulating efficiency compared to other commercially available blowing agents.

Before investing in your next LNG storage tank, stop to consider the benefits of polyurethane foam and switch to Enovate 245fa.

BENEFITS of using Enovate 245fa

- Efficient thermal protection system for the concrete outer tank
- Efficient corner protection for the inner steel tank
- Enhanced low temperature insulation performance
- Potentially reduced land space requirement
- Non-ozone-depleting
- Nonflammable
- Proven technology in refrigerator/freezer and construction insulation for the past 10 years

Thermal Performance of Foam with Enovate 245fa Vs Next Best Alternatives Mean Temperature @ -160°C



Lower thermal conductivity means better insulating value. LNG storage tanks that use foam insulation formulated with Enovate 245fa foam blowing agent experience 45-50% improved insulating power at -160°C than insulation composed of foam glass and perlite.

¹ <http://www.nomacoinsulation.com/pdf/elastomeric%20faq/TA25%200909.pdf>

² http://www.euoperl.com/fileadmin/downloads/Euoperl/Allgemein/Andere_Sprachen/Cryogenic_Euoperl_englisch_1.4.pdf. Lambda at -160°C estimated using extrapolation.

³ Internal Honeywell data



For more information or technical assistance, please call 1-800-631-8138 (Option 2)

Honeywell Performance Materials and Technologies
101 Columbia Road
Morristown, NJ 07962-1053
www.honeywell-blowingagents.com

All statements, information and data given herein are believed to be accurate and reliable, but are presented without guarantee, warranty or responsibility of any kind, express or implied. Statements or suggestions concerning possible use of products are made without representation or warranty that any such use is free of patent infringement, and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated herein, or that other measures may not be required. The values presented herein are typical values and are not to be interpreted as product specifications. User assumes all liability for use of the information and results obtained.

Enovate is a registered trademark of Honeywell International Inc.

November 2014 Version 2
© 2014 Honeywell International Inc.

Honeywell