

# Honeywell Enovate® 245fa (HFC-245fa) in LNG Carrier



**The lowest BOR for membrane-type  
LNG carriers: 0.09%/day**

**Honeywell**

# Lowest LNG Boil-Off Rate: Insulate LNG Carriers With Enovate® 245fa

**Lost liquefied natural gas (LNG)** during transportation is a significant problem for industry, accounting for millions of dollars in lost value per ship during its lifetime.

During ocean transportation of LNG, shippers experience varying degrees of **boil-off rate (BOR)** due to the temperature difference between the sea water, ambient air and LNG, and to turbulence that occurs with the movement of the ship. Some of the boil-off gas can be used to fuel the ship, but since the ship does not run at peak speed all the time and engines are getting more efficient, excess gas is created, which has to be incinerated or reliquefied.

Some ship builders are investing substantially in on-board re-liquefaction plants. Others incinerate excess gas, leading to lost cargo and therefore revenue. Gas incineration also contributes to greenhouse gas creation.

The choice of blowing agent used to create the vessel's insulation plays a significant role in minimizing losses of LNG in transit. LNG vessels have historically used foam insulation formulated with HCFC-141b as the foam blowing agent. **Enovate® 245fa**, a non-ozone depleting HFC foam blowing agent, produces a significant improvement in insulating efficiency compared to HCFC-141b.

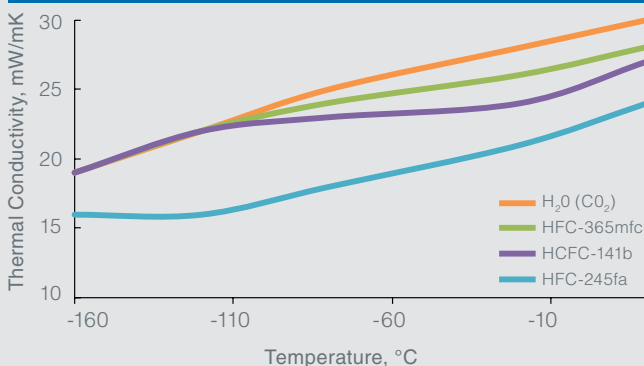
Before investing in your next LNG ship, stop to consider the potential savings by making the switch to Enovate 245fa.

## BENEFITS of using Enovate 245fa

- The lowest BOR for membrane-type LNG carriers: 0.09%/day
- Reduce loss of cargo
- Enhance low temperature insulation performance
- Potentially avoid costly re-liquefaction equipment
- Non-ozone-depleting
- Nonflammable
- No modification in manufacturing and assembly of existing insulation
- Proven technology in refrigerator/freezer and construction insulation for the past 10 years

Insulating power **IMPROVED** up to **15%**

### 4 Months Aging Thermal Conductivity



Lower thermal conductivity means better insulating value and, in turn, lower BOR. Ships that use foam insulation formulated with HFC-245fa foam blowing agent experience up to 15% improved insulating power at -160 °C than foams formulated with HCFC-141b, HFC-365mfc or water.

## Mechanical Strength

LNG transport ships often encounter significant stress due to wave and wind action, indicating a need for high mechanical strength of the glass fiber reinforced rigid polyurethane foam. Studies comparing Enovate 245fa with 141b show that panels made with both have comparable mechanical strength.



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

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