MAKING THE CASE FOR SPRAY FOAM:

An In-Depth Look at How Spray Foam Can Maximize Builder and Homeowner Efficiency

EXECUTIVE SUMMARY

Spray polyurethane foam (SPF) insulation has been a tried and tested option since the early 1960s, sought out for its ability to resist heat transfer. But why does it remain such a prominent and ideal solution?

With rising energy costs and environmental concerns, the demand for increased home and building efficiency is higher than ever. While SPF has a higher up-front cost, it offers substantial efficiency over alternative technologies—from R-value per inch to installation process and lifetime energy savings.

Justifying and selling a higher up-front cost presents a significant challenge. This white paper will provide a holistic view of SPF, enabling you to clearly articulate the end-to-end costs and benefits to your clients—builders, homeowners, and building owners.

The Spray Foam Difference

According to the Spray Foam Coalition and the American Chemistry Council, if all of the 113 million single family homes in the United States used SPF, Americans could save up to $33 billion in energy costs each year.[1] Additionally, financial incentives exist to encourage architects, designers, and building owners to reduce energy consumption in their buildings.

If every U.S. single family home used SPF, Americans could **save up to $33 billion in energy costs each year.**

SPF is a foam insulation with blowing agents that enable the foam to expand and harden during application, effectively sealing any cracks, joints, or seams. With an R-value per inch ranging from R-3.7 to R-7+, SPF easily creates air tight barriers with minimal material or space, which is a significant advancement toward reducing the amount of energy used to heat and cool a building and can be directly translated into cost savings. The NIST estimates that reducing annual air infiltration rates by 83% in nonresidential buildings could save more than 40% on gas bills and more than 25% on electricity.[2]

Comparative Thermal Performance

Insulation Material	R-value per inch
Batts and rolls	R-2.9 to R-3.8
Rigid foam board	R-4 to R-6.5
Structured insulated panels (SIPs)	R-3.6 to R-7
Loose fill and blown-in	R-2.2 to R-3.8
SPF	R-3.7 to R-7+

R-values measure the minimum thermal performance (rated by thickness) needed to keep a building warm in winter and cool in summer. The higher the R-value per inch, the more efficient the insulation.

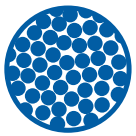
With an R-value per inch ranging from R-3.7 to R-7+, SPF creates air tight barriers that use little material and space, reducing the energy and cost to heat or cool a building.

[1] https://dii.americanchemistry.com/Why-Spray-Foam-Infographic/
[2] http://ws680.nist.gov/publication/get_pdf.cfm?pub_id=914293
http://www.regie-energie.qc.ca/audiences/3677-08/RepDDRInterv_3677-08/C-3-8_GRAME_Rep-Annex4-vsDDR1-HQD_3677_19nov08.pdf

Explaining the SPF Formulation Class Differences

Open Cell SPF

Open cell (low density) SPF is water-based and filled with air, giving the insulation a spongy texture. The use of a water blowing agent means minimal global warming potential (GWP). However, its insulation value is only approximately R-3.7 per inch—requiring more foam to achieve the same R-value as closed cell.



Closed Cell SPF

Closed cell (medium density) SPF uses an insulating gas substitute for the air found in open cell SPF, resulting in R-value ranges from R-6.5 to R-7.0+ per inch and superior energy efficiency. Historically, the downside of these fluorochemical blowing agents has been their higher GWP than water-based, open cell alternatives. But more recent formulations of HFO (hyrdofluoroolefin) and HCFO (hydrochlorofluorooelefin) foams have produced fourth generation closed cell technology with ultra-low GWP. That means closed cell SPF can now offer greater energy savings with a smaller carbon footprint.

Common Performance Advantages of SPF:

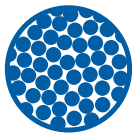
- Enhanced indoor comfort, with better temperature and humidity regulation, sound proofing, allergen and pest control, and improved air quality.
- Superior water sealant and mold prevention qualities
- Added structural integrity and strength

Where and Why Each SPF Makes Sense

Open Cell Applications

While closed cell is an optimal choice for many insulation projects, open cell is commonly used in milder, more humid climates. Open cell has a higher vapor permeability, which means it transmits water vapor and reduces the condensation problems that can occur with seasonal changes in weather or from humid air in warmer climates.

Open cell also has a slight edge over closed cell regarding sound proofing; however, building design can counteract this differential. Additionally, if cost is a primary concern, open cell is less expensive to install; however, the R-value is lower and extra installation steps are required, creating hidden costs.



Closed Cell Applications

Across structure and application types, closed cell spray foams offer consistent performance benefits. It shines in tight spaces that require the greatest R-value insulation per inch possible. Also, medium-density foam is often used for continuous insulation, interior cavity fill, and unvented attic applications. It can provide a high tensile and bond strength, offers low vapor permeance, and is not generally affected by moisture, such as wind-driven rains, and closed cell SPF is the only insulation type listed as "acceptable flood resistant material" by FEMA.[3]

Although the material is much denser than open cell foam and it can be more expensive to install, closed cell offers a complete, single solution. While open cell may appear far less expensive at face value, it requires additional steps and costs, such as air sealing, vapor control, and framing materials.

Climate

If the structure is located in a warm climate, the R-value recommendation will be lower.

Insulation Location

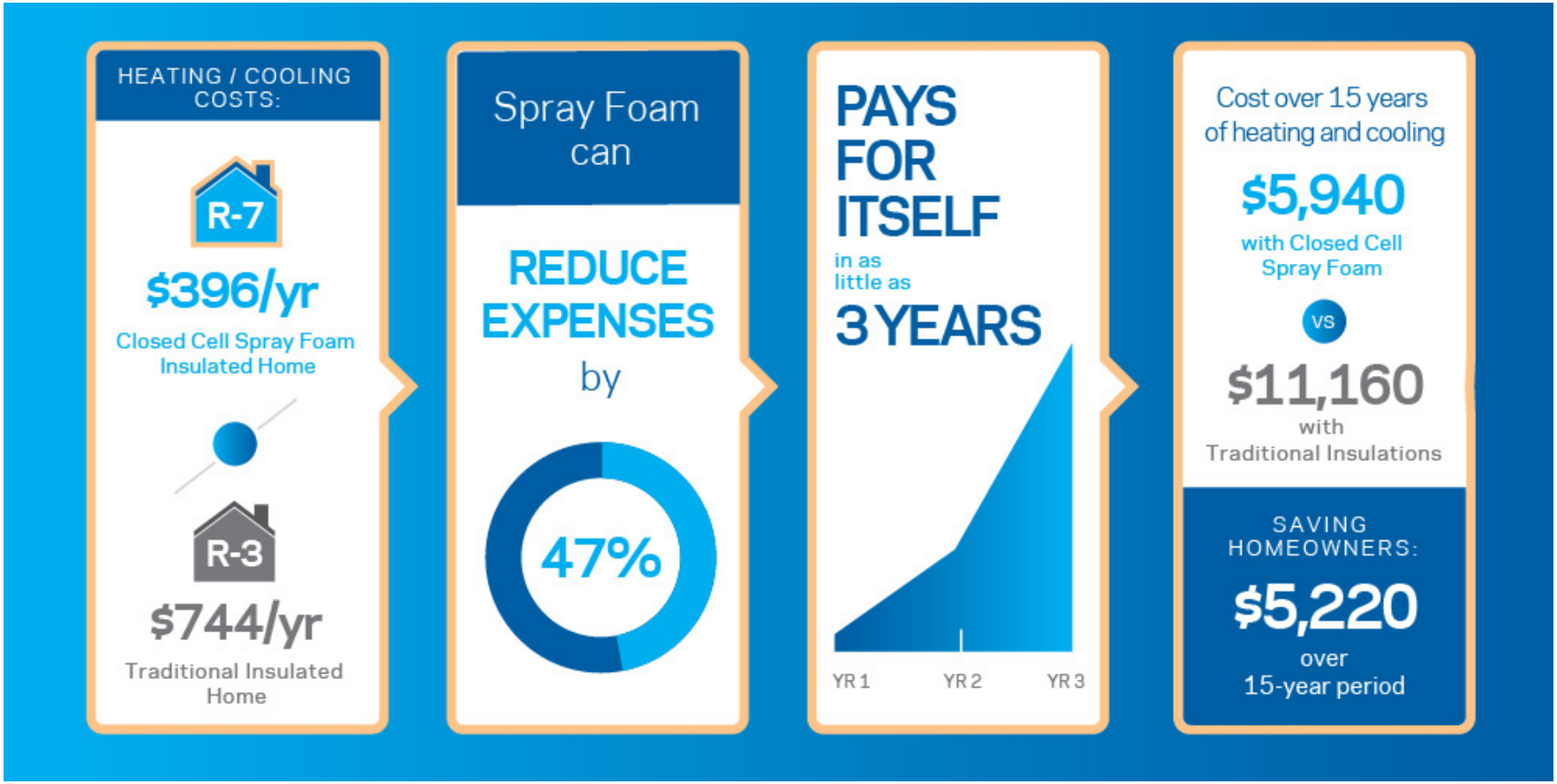
Areas within the structure such as wood-framed walls and crawl-spaces with walls require lower R-values than attics, for example.

Heating and Cooling System

Whether the structure operates with a furnace, central air conditioner, or heat pump determines how low of an acceptable R-value can be utilized.

Closed Cell Return-on-Investment

While traditional blown-in insulation may cost less at install, an upgrade to energy efficient closed cell spray foam quickly provides a return-on-investment, paying for itself in as little as three years. Homeowners can see up to a 47% reduction in annual heating and cooling expenses and save thousands of dollars throughout their home ownership tenure.[4] Additionally, lowering the temperature in attics—where HVAC equipment is often located—extends the life of HVAC equipment by increasing efficiency and reducing system strain.



[3] https://www.fema.gov/media-library-data/20130726-1627-20490-6534/how2025_build_4_11.pdf
[4] http://www.brainstuffshow.com/blogs/how-insulation-works-what-r-value-means-and-how-to-calculate-heat-lossgain-for-your-house.htm
https://www.eia.gov/outlooks/steo/tables/pdf/wf-table.pdf

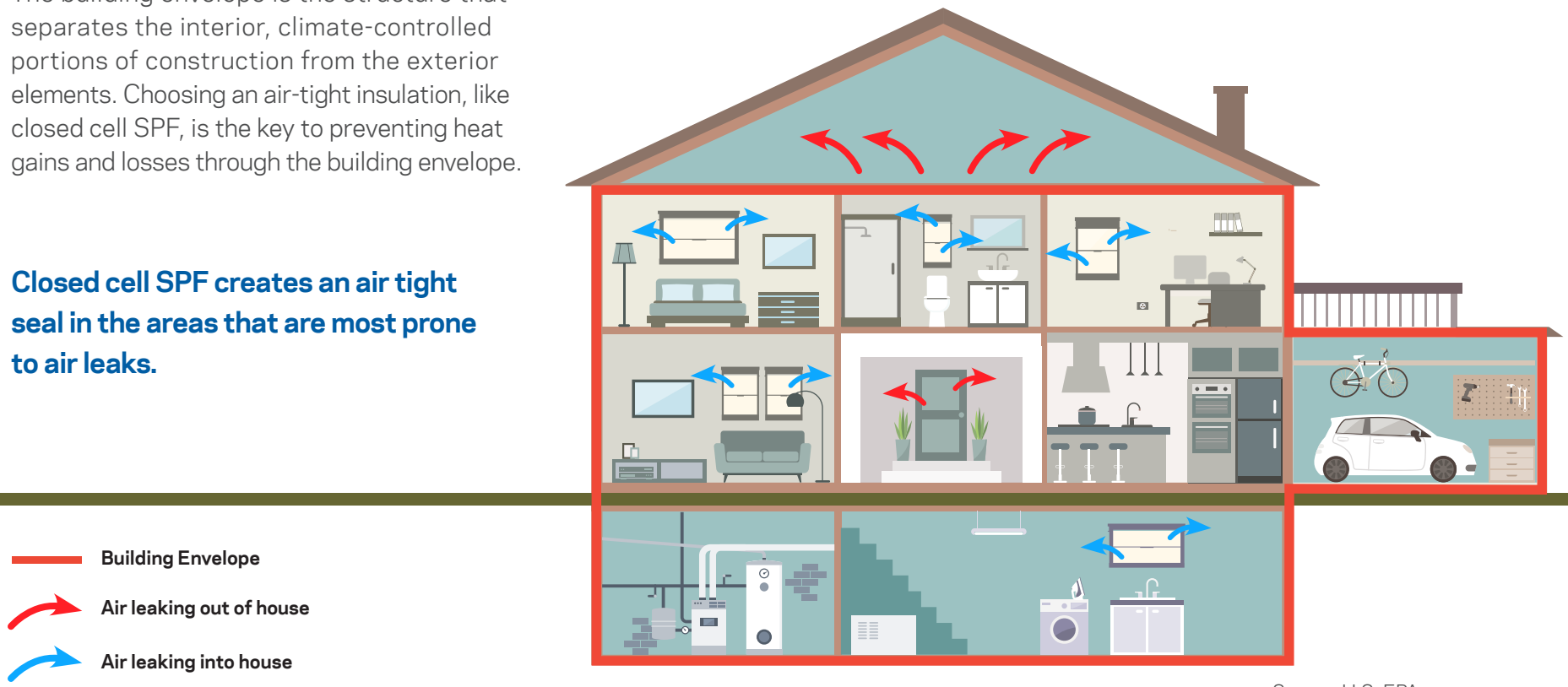
Meeting Energy Codes with Closed Cell Spray Foam

Today, changing building codes and regulations routinely emphasize the need for greater efficiency and energy conservation. States and local jurisdictions have passed legislation for more energy-efficient building codes. SPF is an essential tool in helping architects and builders meet the changing codes to effectively seal the building envelope.

Sealing the Building Envelope

The building envelope is the structure that separates the interior, climate-controlled portions of construction from the exterior elements. Choosing an air-tight insulation, like closed cell SPF, is the key to preventing heat gains and losses through the building envelope.

Closed cell SPF creates an air tight seal in the areas that are most prone to air leaks.



Source: U.S. EPA

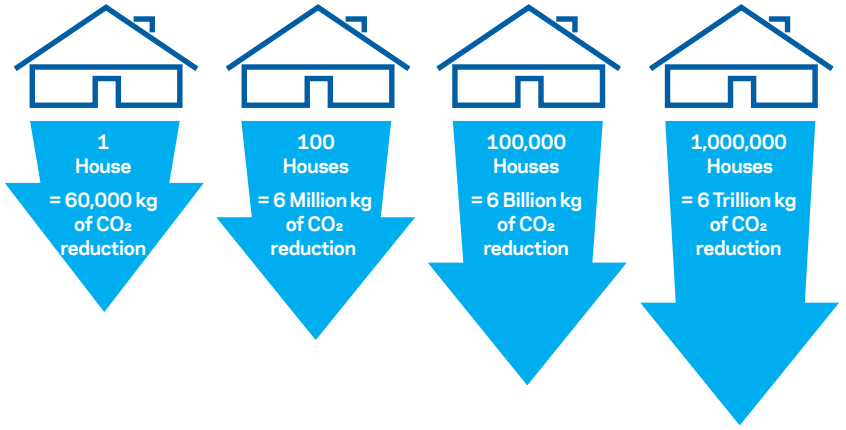
The Role of Closed Cell Spray Foam in Sustainable Energy Savings

Zero Energy Ready

A Zero Energy Ready Building combines extreme energy efficiency with renewable energy systems that "offset all or most of its annual energy consumption."[5] It represents a whole new level of sustainable building performance for energy savings, comfort, health, and durability.

SPF is an ideal insulation for achieving an airtight building envelope to create a net zero energy structure. Low global warming potential (GWP) blowing agents, such as Opteon™ 1100, make enhanced energy efficiency possible. It provides a lower carbon footprint, significantly reducing greenhouse gases in the blowing agent's manufacturing and usage lifecycle.

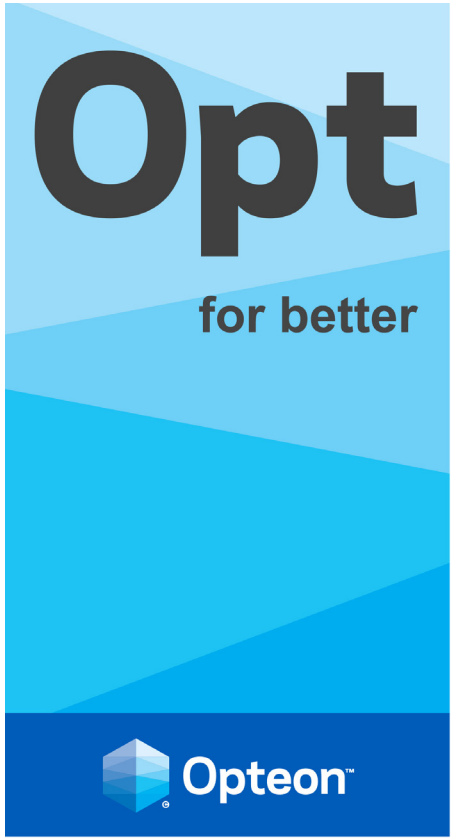
HFO-based closed cell SPF, like Opteon 1100, reduces the carbon dioxide (and CO_2 equivalent) emissions of a house by approximately 60,000 kilograms compared to traditional HFC-based spray foam insulation.[6]



Based on assumption that each house is 2,400 sq-ft, over a 60 year period.

[5] https://energy.gov/eere/buildings/zero-energy-ready-home
[6] https://www.chemours.com/Formacel/en_US/assets/downloads/20120924_CPI_paper.pdf

About Opteon™ 1100 Foam Blowing Agent



Opteon™ 1100, formerly Formacel™ 1100, is a foam blowing agent that offers superior thermal performance and energy efficiency compared to other blowing agents.

Named the **2017 Center for the Polyurethane Industry Innovation Award**, Opteon™ is addressing the growing need for high-performance products with reduced environmental impact. Opteon™ 1100 is a nonflammable, sustainable alternative for the polyurethane foam industry with ultra-low global warming potential (GWP) and low ozone depletion potential.

Closed cell SPF with Opteon™ 1100 foam blowing agent is the optimal choice due to its many benefits:

Low GWP Solution:
Sustainable choice for the environment.

Superior Air Seal:
Ideal air and moisture barrier, improving indoor air quality, keeping out pollen, dust, insects, and preventing mold growth.

High R-Value:
Superior thermal performance and lower energy costs.

Greater Chemical Stability:
Outstanding application performance, both under extreme conditions (hot or cold) and one-pass installations relative to other spray foam products.

Meets Changing Regulatory Requirements:
Ultra-low global warming potential with improved insulating performance.

For more information, please visit Opteon.com/WhySprayFoam or contact an Opteon™ 1100 technical expert at 1-866-205-1664.

Chemours™