Using Recycled Materials Is Just the First Step Toward Safeguarding the Environment

A Life-Cycle Approach

Assessing the Environmental Benefits of Fiber Glass and Slag Wool Insulation

The Next Step Is Recognizing That the Processes That Occur During a Product's Life Cycle Can Have a Major Impact on the Environment

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The environmental benefits of a product are a function of many characteristics including: energy efficiency, environmental impact of raw material acquisition, product performance, embodied energy, recycled content, product packaging, transportation and distribution impacts, use and reuse, recyclable characteristics, human health risks and disposal.

Recycled content is the most immediately noticeable, environmentally beneficial feature of a product. Preference for a design, product or service based solely on this one attribute, however, can be misleading. The Environmental Protection Agency (EPA) and other environmental experts recommend that a comparison of the environmental properties of competing products employ a life-cycle analysis.

A life-cycle analysis is an appraisal of the environmental impacts connected with a product or service through an examination of the product's environmental traits during the following stages: pre-manufacturing; manufacturing; distribution/packaging; use, reuse, maintenance; and waste management. In other words, life-cycle is a "cradle to grave" assessment.

Responding to the recommendation of environmental experts, the North American Insulation Manufacturers Association (NAIMA) has developed this brochure outlining the various life-cycle characteristics that specifiers should consider in determining the most relevant attributes of an environmentally preferable insulation product.

Pre-Manufacturing Stage

An analysis of the pre-manufacturing stage should reflect environmental effects associated with all pre-manufacturing activities including raw material acquisition and intermediate processing. For example:

Fiber Glass Insulation Is Made From Sand or Recycled Glass

- Sand is a "rapidly renewable resource," one that will always be in plentiful supply. Thus, the use of sand as a raw material does not impose any impact on a non- renewable natural resource.
- Recycled plate and bottle glass is considered a secondary raw material. When used as a raw material, recycled glass is transformed into a product that saves energy and reduces pollution.

Slag Wool Insulation Is Made from Blast Furnace Slag

- Slag wool insulation uses raw materials derived from a secondary source - blast furnace slag - and does not deplete any natural resources.

Caution: Some Secondary Materials May Indirectly Deplete Natural Resources

When a secondary raw material is used, consideration should be given to whether its use may indirectly accelerate the depletion of a natural resource. For example, by using recycled newsprint for insulation, the manufacturers of cellulose insulation have removed newsprint from the recycling stream and forced printers to rely upon virgin, rather than recycled, newsprint. This translates into a further loss of renewable raw timber resources.

Manufacturing Stage

Energy Consumption vs. Energy Saved

While the production of fiber glass and slag wool insulation is energy-intensive, manufacturers have improved energy efficiency substantially over the last decade using increasingly more sophisticated technology. It is important to note that the energy used in production is immediately replenished through the use of the final product.

An evaluation of the manufacturing process should measure inputs (such as energy consumption) and outputs (such as air and water effluents).

Inputs

- Nearly 33 trillion Btu of energy are consumed by fiber glass and slag wool producers annually to manufacture insulation products. However, insulation produced each year saves about 400 trillion Btu annually.
- All insulation products installed in U.S. buildings save consumers about 12 quadrillion Btu annually or about 42 percent of the energy that would have been consumed with no insulation in place. Twelve quadrillion Btu is almost 15 percent of the total national energy used; it is enough energy to supply the total energy requirements of Florida for 4 years.
- A typical pound of insulation saves 12 times as much energy in its first year in place as the energy used to produce it.

Outputs

Most fiber glass and slag wool manufacturing facilities utilize a closed-loop water recycling system making waste water effluent discharges nonexistent. While manufacturing facilities emit certain air pollutants, both the fiber glass and slag wool industries will soon adopt maximum achievable control technology (MACT) to help limit the amount of air pollutants emitted into the atmosphere.

These new controls will supplement existing controls that already substantially reduce potential air emissions from the manufacturing process.

Packaging and Transportation

Total Product Volume

A life-cycle analysis should consider the total product volume it takes to accomplish an assigned task. For example:

- To insulate a typical 2,500 sq. ft. two-story home with an R-value of R-30 in the attic, and an R-13 in the exterior walls, requires 2.695 pounds of cellulose insulation, which is three times more material per house than fiber glass.
- Because fiber glass insulation products are more compact than other insulation products, the packaging for fiber glass products requires significantly less material. For example, to insulate a typical 2,500 sq. ft. house requires 30 packages of fiber glass compared with 109 cellulose insulation packages.

Recyclable Packaging

Fiber glass and slag wool manufacturers now use recyclable plastic packaging as a way to conserve resources. Packaging is often coded for material identification, and can be recycled in areas where facilities exist.

Less Energy Used to Transport Materials

Due to the compact nature of fiber glass and slag wool insulation, combined with compression packaging, the actual amount of packaging material has been reduced and the result is less scrap at the job site and in the waste stream. Since fiber glass and slag wool insulation products are so highly compressed, more insulation can be shipped in each truck and the result is a reduction in the energy required for transportation.

Product Characteristics

Judging a Product's Ability to Perform Its Intended Function

An essential attribute for any environmentally preferable product - especially insulation - is the ability of that particular product to perform its intended function. Consideration should be given to ease of application, thermal performance, and lifetime performance.

R-Value

R-value is resistance to heat flow - the higher the R-value, the greater the insulating power. Thickness of insulation is only one factor that determines its R-value. In fact, insulation should always be specified by R-value, not thickness.

Fiber glass and slag wool insulations are high performance products that yield a high R-value per inch, which varies depending on density. The overall R-value installed in the building is the measurement to look for, not the R-value per inch.

Settling

A product's R-value should not deteriorate over time. If an insulation product settles, the installed thermal performance is directly impacted. Therefore, specifiers should consider a product's ability to resist settling and maintain its thermal performance for the life of the building.

Water Absorption

In general, insulation will lose R-value when wet. Some insulation is made of material

that does not wick up and hold water, but other insulations will absorb water and may mat down causing permanent reduction in the thermal performance.

Corrosion and Flame Resistance

Certain chemicals routinely applied as a fire retardant to most cellulose insulations can cause the corrosion of pipes and wires under some conditions. Flame resistance is another performance feature that should be weighted in selecting an insulation material.

- Fiber glass and slag wool insulations are naturally non-combustible and remain so for the life of the product. Fiber glass and slag wool require no additional fire retardant chemical treatments.
- Cellulose insulation is made of ground-up or shredded newspaper, and wood-based products are naturally combustible. To protect against fire hazards, cellulose insulation is heavily treated with fire retardant chemicals prior to installation. Typically, 540 pounds of fire retardant chemicals are added to cellulose insulation used to insulate a 2,500 square foot home. The Consumer Product Safety Commission (CPSC) mandates that cellulose packages carry a fire hazard warning for consumers and users.

Use, Reuse and Maintenance

Fiber Glass and Slag Wool Insulations are Reusable

Most modern buildings are subject to expansion, remodeling, or some other type of renovation during their lifetime. Because of this, the reusable nature of a product is a key factor in the life-cycle analysis. For example:

- Fiber glass and slag wool batt insulation can be removed easily and actually put back in place. In other words, they are reusable. This is not true of all insulation materials. Certain foams or aerated concrete require extensive chiseling to remove the insulation. Such an operation can result in loss of building materials that are damaged in the removal process and loss of the insulation itself.
- Fiber glass and slag wool insulation requires no maintenance. This eliminates the expenditure of energy or natural resources associated with maintenance operations.
- In addition, fiber glass and slag wool insulation lasts for the life of the building if undisturbed. A long life expectancy saves money on replacements and retrofits, and also ensures that no additional material is entering the waste stream.

Recycled Content

High Recycled Content

Not only do fiber glass and slag wool insulation products save energy, they use a high percentage of recycled material which further helps the environment. In addition to reducing demand on virgin resources, using recycled materials saves landfill space by

diverting materials from the solid waste stream, and reduces the energy used, and pollution emitted, during the manufacturing process. Recent surveys on the amount of recycled content in fiber glass and slag wool insulations include the following facts:

Fiber Glass

- The amount of recycled glass used by fiber glass insulation manufacturers in 1996 was over one billion pounds.
- The use of recycled glass resulted in a savings of over 27 million cu. ft. of landfill space at a density of 37 lbs./cu. ft. (semi-crushed glass).
- Many fiber glass insulation products now contain up to 40 percent recycled materials, depending on the plant in which they are produced.
- Fiber glass insulation manufacturers recycle more material by weight than any other type of insulation used in the building and construction sector.
- According to the Glass Packaging Institute, fiber glass insulation is the largest secondary market for recycled glass containers.

Slag Wool

- The amount of recycled blast furnace slag used by slag wool insulation manufacturers in 1996 was more than one billion pounds.
- The use of recycled blast furnace slag resulted in a savings of over 16 million cu. ft. of landfill space.
- The slag wool industry consumes a significant portion - approximately 6 percent - of the blast furnace slag produced in the United States that might otherwise end up in a landfill.
- The industry estimates that over 90 percent of their slag acquisition is new slag purchased directly from manufacturers. The remaining 10 percent is mined from waste disposal sites.

Health Issues

Tested vs. Untested Products

An important feature of a life-cycle analysis is whether a product or service poses human health risks. The EPA has listed carcinogenicity and irritancy as attributes that justify labeling a product as a human health risk. Consumer products of all kinds currently carry these labels. Just because one product has been thoroughly tested for carcinogenicity and irritancy (e.g., fiber glass and slag wool insulations) and another has not (e.g., cellulose insulation), should not imply environmental preference for the non- tested product. Indeed, the failure of a manufacturer to adequately test its product should be a critical factor in determining that a product is not environmentally preferable.

When evaluating alleged health hazards of a product, specifiers should distinguish a) between products that may pose potential risks in the manufacturing process, but not in use of the final product and b) between those products which pose risks in both the manufacturing process and in the final use of the product.

Fiber Glass and Slag Wool Are Safe to Manufacture, Install and Use

Fiber glass and slag wool manufacturers have funded over 50 million dollars of research at leading independent laboratories and universities in the United States and abroad. In the past ten years, there have been a number of comprehensive reviews of research on the health aspects of fiber glass and slag wool by U.S. and international organizations. These reviews have concluded that fiber glass and slag wool have not been shown to cause cancer or nonmalignant disease in humans. Indeed, the weight of scientific evidence demonstrates that fiber glass and slag wool insulations are safe to manufacture, install and use when practical recommended work practices are followed.

Waste Management

Recyclable

Another factor of importance in a life-cycle analysis is whether the product is recyclable. As mentioned previously, fiber glass and slag wool insulations are reusable after the initial installation and, therefore, are recyclable. Fiber glass also has the capacity to be reclaimed from demolition debris and recycled into new product. In fact, fiber glass trimming at manufacturing facilities is routinely placed back into the mix and converted into usable products. Not all insulation products possess such a characteristic.

FIBER GLASS AND SLAG WOOL INSULATION

Safeguarding the Environment

Fiber glass and slag wool insulation products make buildings more energy efficient, reducing the amount of fossil fuel combustion needed to heat and cool homes, businesses, and factories, which in turn decreases the amount of sulfur dioxide and carbon dioxide emitted into the atmosphere.

Because carbon dioxide is one of the principal "greenhouse gases" contributing to global warming, and sulfur dioxide is the major component of acid rain, insulation plays a significant role in protecting the environment. For example, insulation currently in place in U.S. buildings reduces the amount of carbon dioxide emissions by 780 million tons each year.

The fiber glass and slag wool industries are also safeguarding the integrity of the ecological balance by manufacturing products whose components may be recovered and reused at the end of the product's useful life. Fiber glass and slag wool insulations sustain the energy life-cycle by transforming what might otherwise be waste products into insulation material that can be used over and over again.

Indeed, from a life-cycle perspective, fiber glass and slag wool insulation offer tremendous benefits to the environment and complement policies which promote environmentally preferred products.

INDUSTRY COMMITTED TO ENVIRONMENTAL PRESERVATION

NAIMA member companies have a long-standing commitment to the promotion of energy efficiency and environmental preservation. They provide builders with information on Department of Energy thermal recommendations and Energy Efficient Mortgages. They endorse the EPA ENERGY STAR Homes Program which creates

partnerships between the Environmental Protection Agency and builders to significantly reduce the $110 billion spent annually by homeowners on energy bills - while promoting energy efficiency and environmental preservation. The Edison Electric Institute's E-Seal certified home program is also backed by NAIMA members. Each E-Seal certified home program must meet stringent efficiency criteria, as well as incorporate important environmental aspects like indoor air quality, water quality and conservation, home waste management, and construction waste reduction.

About NAIMA

NAIMA is the association for North American manufacturers of fiber glass, rock wool, and slag wool insulation products. Its role is to promote energy efficiency and environmental preservation through the use of fiber glass, rock wool, and slag wool insulation, and to encourage the safe production and use of these materials.

In May 1999, NAIMA began implementing a comprehensive voluntary work practice partnership with the U.S. Occupational Safety and Health Administration (OSHA). The program, known as the Health and Safety Partnership Program, or HSPP, promotes the safe handling and use of insulation materials and incorporates education and training for the manufacture, fabrication, installation and removal of fiber glass, rock wool and slag wool insulation products.

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PUB# NO16 10/97