

# **Green and Competitive - The Energy, Environmental, and Economic Benefits of Fiber Glass and Mineral Wool Insulation Products**

by

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## **Introduction**

Increasing the energy efficiency of U.S. buildings and industrial facilities is an important part of U.S. energy policy, aiding in the attainment of such national goals as a stronger economy, greater national security and improved environmental health. The primary purpose of this study is to demonstrate the net energy, economic and environmental benefits of fiber glass, rock wool and slag wool insulation products. However, this examination also reveals that the U.S. insulation industry, by manufacturing products whose utilization leads to greater savings in energy and pollution than are used and created through their own production process, is a leading industry. It not only contributes to a strengthened U.S. economy and to increased monetary savings for consumers, but also to an improved state of the national and global environment.

This study begins by assessing the amount of energy used in the manufacture of these insulation products, and then determines the energy that is saved through their application in residential and commercial buildings and other end uses. Also examined is the individual sector with regard to energy use and energy saved annually, as well as the aggregate carbon dioxide emissions avoided through the use of insulation products in the residential, commercial and industrial sectors.

Energy input analysis for the study was determined based upon the amount of energy used in the insulation production process and was obtained by surveying the member companies of the North American Insulation Manufacturers Association (NAIMA). Extraction, refining, transportation and distribution energy used in the manufacturing process was not analyzed. The energy input data was separated by product type, and an average energy use per pound of product was determined from the collected data. Environmental impacts were determined in a similar manner and are based upon air pollution resulting directly from consumption of energy used in the production process.

Building and end-use analysis has been separated into residential, commercial and industrial portions. The residential and commercial analyses were performed using computer simulation models to represent the energy usage of the current building stock. These models were then modified to represent these same buildings containing no insulation, and then again with additional insulation to represent compliance of these buildings with the Model Energy Code (MEC) and ASHRAE 90.1. In order to simplify the analysis to a task that could be reasonably performed, some assumptions were made. A limited number of prototype buildings were selected to represent the residential and commercial building stock for this analysis, and representative cities were chosen in which to run the building model analyses. The individual characteristics, insulation packages, and energy consumption of the existing building stock varies greatly and this study represents the energy usage patterns on average.

The study also analyzes the economic potential for industrial pipe and vessel insulation in the U.S. manufacturing sector. This analysis is based mainly upon an existing database of industrial energy audits. This database was carefully assessed and conclusions were drawn about the potential savings in the industrial sector due to insulation measures. The study conservatively estimates an aggregate economic potential savings. However, the results of an individual plant will vary greatly.

As a whole, this study aims to show that for each sector, insulation is a cost-effective, energy-saving measure. Through improved insulation, residential and commercial consumers do reduce their energy use, and therefore save money through lower energy bills. Insulation also increases manufacturing efficiency by cutting energy losses and production costs in the industrial sector. In addition, insulation improves the comfort levels of buildings year-round while contributing to environmental awareness and strengthened environmental quality. For each and all of these reasons, U.S. insulation manufacturers contribute significantly to support our nation's important economic and environmental goals by remaining an industry that is both green and competitive.

## **Executive Summary**

The need for a strong industrial economy often appears to conflict with environmental goals. However, this view underestimates the power of manufacturers to innovate in response to competitive pressures. Many companies have already shown the ability to use raw materials, energy, and labor resources more productively, thus reducing environmental impacts and bypassing the stalemate between the bottom line and the environment. These companies have found that this enhanced resource productivity makes them more rather than less competitive.

The U.S. insulation industry is an excellent example of a manufacturing sector that reverses the traditional trade-off between the environment and the economy, proving that large industry can be both green and competitive. The industry ships over 5 billion pounds of product annually, made by more than 160 companies in the United States. Fiber glass, rock wool and slag wool insulation manufacturers who are members of the North American Insulation Manufacturers Association (NAIMA) account for more than half of the industry's output, producing over 3 billion pounds of insulation annually valued at \$3.1 billion. NAIMA members employ more than 10,000 people, and support 20,000 to 30,000 additional jobs in the distribution and installation sectors.

### ***Insulation Creates Enormous Net Energy Savings***

Insulation manufacturing uses a substantial amount of energy. Yet a typical pound of insulation saves twelve times as much energy in its first year in place as the energy used to produce it. Nearly 33 trillion Btu of energy are consumed by NAIMA members annually to manufacture insulation products. But the insulation produced each year saves about 400 trillion Btu annually; the ratio of these two figures is about 12 to 1. That's just in the first year; over its lifetime, insulation saves hundreds of times the energy used to make it.

The cumulative 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. 12 "Quads" is almost 15% of total national energy use; it's enough energy to supply the total energy requirements of Florida for 4 years.

### ***Energy Savings Translate into Dollar Savings***

These energy savings add up to big dollar savings. Current insulation levels save consumers nearly \$84 billion dollars a year in heating and cooling costs. That means U.S. homeowners are avoiding approximately \$74 billion dollars in energy costs every year, or about \$780 per household. Homeowners in the U.S. typically spend \$1,200 on energy each year; without insulation they would spend about \$2,000. Current insulation levels have therefore helped cut residential energy bills by forty percent. Commercial building owners are also saving money on their heating and cooling bills – over \$9.6 billion dollars a year nationwide, or about \$2,100 a year per building.

### ***Insulation is Good News for the Environment***

The energy savings from insulation products is also good news for the environment. By reducing the energy needed to heat and cool homes and commercial buildings, insulation avoids carbon dioxide emissions, which contribute to global climate change. Other air pollutants, such as sulfur dioxide and nitrogen oxides, are also avoided. Energy use by the insulation industry emits 4.74 billion pounds of carbon dioxide during a year's insulation production; however, the insulation produced in that same year avoids twelve times that amount, or about 57 billion pounds.

Cumulatively, installed insulation in U.S. buildings prevents the emission of over 1.56 trillion pounds of carbon dioxide annually. Since pollution avoidance parallels energy savings, that means that total U.S. carbon dioxide emissions would be almost 15% higher without insulation. Over its lifetime, this insulation will avoid more pollution than it creates by several hundred fold.

The insulation industry's record of achievement on resource conservation is also visible in its substantial and growing use of recycled materials. Fiber glass insulation manufacturers currently average about 30% recycled glass (cullet) content. That percentage is reported to be increasing; some manufacturers already use up to 40%. Using recycled materials not only reduces production costs, it also saves space in landfills. In 1994, the use of recycled materials in the insulation industry saved over 33 million cubic feet of landfill space.

### ***Insulation Producers Invest in Energy Efficiency***

Insulation manufacturers make a product that saves many times the energy used in production. However, to become more competitive and make better use of resources, these companies have also invested in their own internal energy efficiency. Using advanced production techniques, controls, and modern energy management methods, in the last decade mineral insulation producers have reduced the amount of energy needed to produce a pound of insulation by an average of 17%. The 10,000 Btu needed to make a pound of product today is the lowest it has ever been.

### ***Further Energy Savings Can Be Achieved Through Insulation***

Though existing insulation is saving enormous amounts of energy and pollution, there remains substantial potential for cost-effective investments in building and industrial insulation. This study shows that it is possible to save an additional 2.2 quadrillion Btu of energy and avoid an additional 294 billion pounds of carbon dioxide annually. That's almost 3% of total national energy use.

For example:

- If all residential buildings were insulated according to the latest version of the Council of American Building Officials' Model Energy Code, 2 quadrillion Btu in additional annual energy savings would be realized.
- If commercial buildings were insulated to ASHRAE Standard 90.1, an additional energy savings of 260 trillion Btu annually could be realized.
- Finally, if industrial plants installed insulation everywhere it was economically cost-effective for them to do so, approximately 51 trillion Btu of energy could be saved annually.

These energy savings would avoid substantial amounts of air pollution as well.

Obviously, insulation has been a great investment for the U.S. economy and for individual consumers in terms of energy savings, dollar savings, and pollution reduction, and should be considered a key resource in the cause to increase our energy efficiency and improve our environment.