The Contributions of Insulation to the U.S. Economy in 2022

Economics & Statistics Department
American Chemistry Council
August 2023

TABLE OF CONTENTS

EXECUTIVE SUMMARY

- The use of insulation in U.S. homes and businesses saves energy by reducing the heating and cooling loads of buildings, and therefore, reducing heating and cooling costs for home and business owners. In addition, by saving energy, the use of insulation helps reduce greenhouse gas emissions otherwise associated with the heating and cooling of buildings.

- Beyond the benefits of the use of insulation, the insulation industry—including the manufacture, distribution, and installation of insulation—supports more than 1.8 million jobs in the U.S. and nearly $97 billion in payrolls that support families and local communities around the country.

- Insulation materials manufacturing is a $24.9 billion business, and directly employs more than 40,000 people across 45 states. Further downstream, more than 6,000 jobs are supported through the manufacturing of accessories and fabricated insulation panels.

- Indirectly, through its purchases of supplies, raw materials, equipment, and services, insulation manufacturing supports an additional 73,000 jobs in supply-chain industries. Through the household spending of the wages and salaries paid to workers in insulation manufacturing and its suppliers, an additional 74,800 payroll-induced jobs are supported.

- The combined direct and indirect economic activity from U.S. insulation materials manufacturing supports more than 188,000 jobs. These jobs generate payrolls of $13.9 billion. In addition, the combined economic activity supported by insulation materials manufacturing contributes $2.4 billion to state and local governments and $3.3 billion in federal tax revenues.

THE INSULATION INDUSTRY IN THE U.S.

Insulation is installed in homes and businesses around the country to help keep buildings comfortable, hot water in pipes hot, and reduce the cost of ownership by lowering utility costs. There are various applications of insulation, including:

- **Residential insulation** – attics, walls, floors, crawl spaces, foundations, roofs, doors and windows are insulated to reduce air leaks and increase energy efficiency.

- **Nonresidential insulation** – in commercial and industrial buildings, insulation of roofs, floors, foundations, doors, windows and exterior walls (building envelope) can save on heating and cooling costs.

- **Equipment/Mechanical** – insulated pipes, ducts, tanks, and other mechanical systems help reduce energy consumption, promote employee and public safety, minimize environmental impacts otherwise associated with increased energy production, and contribute to the competitiveness of U.S. industry by lowering operating and production costs.

Insulation Materials

There are many types of insulation. Insulation types used vary depending application, location, and other factors. Insulation is made from a variety of materials, each with a unique set of properties (i.e., R-value,[1] density, ability to air seal, ability to control moisture transfer, and ease of installation). The most commonly used materials in insulation products are (in alphabetical order):

- **Cellulose** – plant fibers often made from recycled newspapers, paperboard, and paper. The cellulose source is shredded and mixed with other ingredients to enhance product use and performance. It is installed as loose fill or mixed with water to be spray applied.

- **Fiberglass** – a fluffy, wool-like material made from spun fibers of molten glass. The intertwined fibers of fiberglass insulation can be installed as loose fill or rolled into blankets or batts. It can also be made into board formed into shapes like pipe insulation.

- **Mineral wool** – a wool-like material made from spun fibers of molten minerals (including rock and blast furnace slag). It can be installed as loose fill, pressed into blankets, boards or batts, or formed into specific shapes intended for applications like pipe/equipment insulation.

[1] An insulating material's resistance to conductive heat flow is measured or rated in terms of its thermal resistance or R-value -- the higher the R-value, the greater the insulating effectiveness. The R-value depends on the type of insulation, its thickness, and its density. When calculating the R-value of a multilayered installation, add the R-values of the individual layers. Installing more insulation in your home increases the R-value and the resistance to heat flow. (U.S. Department of Energy)

- **Polyisocyanurate (polyiso) foam** – a foam plastic made from the combination of several chemicals reacted to generate a closed-cell, rigid foam. It is often manufactured in boards with a variety of facing materials or encapsulated in panels or fabricated from large buns into pipe/equipment insulation.

- **Expanded Polystyrene (EPS) Foam** - a closed-cell foam plastic, made from an expandable polystyrene resin using low global warming potential blowing agent pentane. Post-consumer and post-industrial material can be used to produce EPS with recycled content. EPS is commonly molded in large blocks which are cut into sheets or shapes to suit various applications.

- **Extruded Polystyrene (XPS) Foam –** a cellular foam plastic manufactured in a one-stage process by extrusion and expansion of the base polymer in the presence of blowing agent(s) resulting in a rigid closed cell board product, with high compressive strength, and moisture resistance for the prevention of mold and mildew.

- **Polyurethane foam** – a plastic foam created through a reaction of several chemicals. This material is available in open and closed cell form. For insulation, the chemicals are sprayed on site where the foaming process can fill cavities and gaps. These characteristics provide air sealing benefits and a moisture barrier. The foam can also be molded into shapes or poured into cavities to insulate appliances and other equipment.

- **Other materials** – including phenolic cellular foams, cellular glass, ceramic fiber, needled glass, elastomeric, polyethylene/polyolefin and granular materials (calcium silicate, expanded perlite, and flexible aerogel and microporous mineral materials) that are used predominantly in mechanical insulation applications.

ENVIRONMENTAL AND ECONOMIC BENEFITS OF INSULATION PRODUCTS

The insulation industry plays an important role in the fight against climate change and the quest for energy independence. It helps reduce energy consumption and energy-related greenhouse gas emissions. By lowering energy consumption, and thus energy bills, insulation helps make businesses more competitive and can give households more spending power. In addition, insulation can reduce the intrusion of outside noise, pollen and insects, allows for better humidity control, lowers the chance for ice dams in cold climates, and promotes occupant health and wellbeing. While these benefits are plentiful, they are difficult to quantify. The savings from insulation accrue to individual projects and businesses and depend on climate and the R-value (or resistance to conductive heat flow) which makes it

difficult to aggregate across the economy. Some of the estimated benefits of insulation include:

- The U.S. Environmental Protection Agency's (EPA) Energy Star program estimates that air leakage alone accounts for 25-40% of energy used for heating and cooling in a typical residence.[2] By adding insulation and sealing air leaks, the average household could save up to 20% on heating and cooling costs.[3]
- In a 2009 analysis by McKinsey that examined multiple chemistry-enabled technologies to reduce emissions,[4] the authors concluded "insulation alone accounted for 40% of the total identified CO_2 savings."
- According to the Department of Energy, "Space heating and cooling account for almost half of a home's energy use, while water heating accounts for 18%, making these some of the largest energy expenses in any home."[5]
- The heating and cooling of commercial buildings, e.g., office, retail, educational, health-care buildings and lodging, accounts for nearly 10% of all energy consumed in the U.S.[6]
- According to the Business of Council for Sustainable Energy, U.S. energy productivity grew 17.6% over the past decade.[7] The use of insulation products across the economy is a key contribution to energy productivity growth.
- In 2009, the National Insulation Association (NIA), in collaboration with the Department of Energy estimated that $4.8 billion in energy savings and a reduction of 43 million metric tons of CO_2 emissions was possible through increased use of insulation in industrial and commercial buildings.[8]
- Regardless of fuel source, improvements to the building envelope (the parts of a building that separate the indoors from the outdoors, including exterior walls, foundations, roof, windows, etc.), like improved insulation and air sealing, reduce the energy needs of the building and enable more efficient and right-sized HVAC equipment and renewable energy generation.
- High-performing envelopes are described as the most effective way to reduce the thermal needs of buildings. Compared to other solutions, the selection of envelope structure and materials is particularly important given the long lifetime of buildings and the cost of construction.[9]
- Improvements in building envelope performance have been found to help reduce space heating intensities by 7% on average globally since 2015. [10]

[2] New air sealing fact sheet (energystar.gov)
[3] https://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_methodology
[4] McKinsey, "Innovations for Greenhouse Gas Reductions: A life cycle quantification of carbon abatement solutions enabled by the chemical industry." July 2009.
[5] https://energy.gov/energysaver/heat-and-cool
[6] http://aceee.org/sector/commercial
[7] https://www.bcse.org/factbook/
[8] http://www.insulation.org/io/articles/mechanical-insulation-can-save-4-8-billion-in-energy-costs-and-43-million-metric-tons-of-co2-emissions-and-create-89000-green-jobs-per-year/
[9] https://www.iea.org/energy-system/buildings/building-envelopes#tracking
[10] http://www.insulation.org/io/articles/mechanical-insulation-can-save-4-8-billion-in-energy-costs-and-43-million-metric-tons-of-co2-emissions-and-create-89000-green-jobs-per-year/

- With building operations accounting for an estimated 30 percent of greenhouse gas emissions in the United States, installing air sealing and insulation is a critical first step toward decarbonizing the U.S. building sector and enables efficient use and sizing of higher-performance, lower-carbon HVAC equipment, like heat pumps. [11]
- Commercial buildings are reportedly responsible for 20% of our energy use and air leakage responsible for 6% of buildings' energy use.[12]
- Upgrading roof insulation on an existing commercial building could save building owners more than $65 billion in energy costs over a 30-year period and eliminate nearly 338 million metric tons of CO_2 emissions.[13]
- In 2018 space heating accounted for at least 2/3rds of end-use consumption of natural gas, district heat and fuel oil. [14]

In addition to creating economic and environmental benefits through its use, the manufacture, distribution, and installation of insulation also generates economic activity and supports jobs in the U.S.

[11] https://cdn.ymaws.com/www.polyiso.org/resource/resmgr/report/commercial_insulation_indust.pdf
[12] https://www.energy.gov/sites/prod/files/2014/02/f8/BTO_windows_and_envelope_report_3.pdf
[13] https://cdn.ymaws.com/www.polyiso.org/resource/resmgr/report/pima_-_insulation_fact_sheet.pdf
[14] U.S. Energy Information Administration, Commercial Buildings Energy Consumption Survey

ECONOMIC SNAPSHOT OF THE INSULATION INDUSTRY

Table 1 – Economic Snapshot of the Insulation Industry (2022)

	Employment	Payroll ($ billion)
Insulation Manufacturing	40,564	$2.6
Distribution/Wholesale	1,257,700	$57.5
Installation	527,576	$36.9
Total	**1,825,840**	**$96.9**

ECONOMIC CONTRIBUTIONS OF THE U.S. INSULATION INDUSTRY

The insulation manufacturing industry takes raw materials such as glass, rock, slag, isocyanates, polyols, recycled paper and other products and converts these materials into energy-saving insulation products. This analysis examines seven basic classes of insulation materials: polystyrene, polyurethane, polyisocyanurate (polyiso), fiberglass, mineral wool, cellulose, and other materials, predominantly used in mechanical insulation applications. In 45 states around the country, more than 40,000 workers are engaged in this essential economic activity. Table 2 presents the direct employment, payroll, and output associated with these main segments of insulation manufacturing. In addition to the manufacture of insulation products, the manufacture of accessories for mechanical insulation and laminated metal building insulation also creates jobs and economic activity.

Table 2 – Insulation Materials Manufacturing (2022)

	Employment	Payroll ($ billions)	Output ($ billions)
Polystyrene (EPS & XPS)	6,792	$0.4	$3.1
Polyurethane/Polyiso	13,153	$0.8	$9.3
Fiberglass/Mineral wool	16,895	$1.1	$9.9
Cellulose	900	$0.0	$0.3
Other*	2,824	$0.2	$2.3
Total Manufacturing	**40,564**	**$2.6**	**$24.9**
Addenda (2019)			
*Additional Insulation Products***	*6,290*	*$0.5*	*$1.3*

* includes materials not listed above that are used predominantly in mechanical insulation applications, including phenolic cellular foams, cellular glass, ceramic fiber, needled glass, elastomeric, polyethylene/polyolefin and granular materials (calcium silicate, expanded perlite, and flexible aerogel and microporous mineral materials).
** includes accessories for mechanical insulation systems, laminated metal building insulation and structural insulated panels

The value and contributions of insulation manufacturing do not just accrue to the manufacturers. Economic activity is supported both upstream (through supply chain impacts) and downstream as manufactured insulation products move through distribution/wholesale channels to the contractors whose business includes installing insulation.

Upstream Economic Impact

Direct Impacts

- Employment, wages and output of the industry being analyzed; in this case, the manufacture of insulation materials.

Indirect Impacts

- Jobs, wages and output created by the supply-chain businesses that provide goods and services essential to the industry.
- These businesses range from suppliers of raw materials, supplies, utilities, equipment, transportation, and other services.

Induced Impacts

- The result of the spending of wages and salaries of the direct and indirect employees on items such as food, housing, education, transportation and medical services.
- This spending creates induced employment in nearly all sectors of the economy, especially service sectors.

The economic contributions of the insulation manufacturing were analyzed using an economic input-output model, IMPLAN.[15] This method estimates the total contributions of an industry to the economy at the state and national levels for a given year. The economic

[15] IMPLAN (IMpact analysis for PLANning) is a complete economic assessment package providing economic resolution from the National level down to the zip code level; MIG Inc. is the sole licensor of IMPLAN.

contributions analyzed in this report are employment, payroll and output in the U.S. for the year 2022.

The manufacture of insulation materials directly generates $24.9 billion in industry shipments and directly employs more than 40,000 workers across 45 states. Insulation manufacturers purchase goods and services from their suppliers and their suppliers do the same. The economic impact generated by the insulation supply chain supports an additional 73,000 indirect jobs. Finally, the wages paid by insulation manufacturers and their suppliers support more than 74,800 payroll-induced jobs, jobs supported by the household spending of workers in the direct and indirect (supply-chain) segments. Thus, the economic activity from U.S. insulation manufacturing supports more than 188,000 jobs which generate payrolls of $13.9 billion.

In addition, the combined economic activity supported by insulation manufacturing contributes $2.4 billion to state and local governments and $3.3 billion in federal tax revenues.

Table 3 – Upstream Economic Impact of Insulation Manufacturing (2022)

	Employment	Payroll ($ billions)	Output ($ billions)
Direct Impact (Manufacturers)	40,564	$2.6	$24.9
Indirect Impact (Supply Chain)	72,999	$6.5	$24.3
Payroll-Induced Impact	74,778	$4.9	$15.2
Total Impact	**188,341**	**$13.9**	**$64.4**

Downstream Economic Impact

Looking downstream, nearly 52,000 wholesalers and 1.2 million retailers distribute insulation products to contractors/installers and homeowners around the country. More than 527,000 workers are engaged in drywall and insulation installation, nonresidential roofing, framing and mechanical insulation installation. Payrolls in those sectors amount to $57.5 billion and $36.9 billion, respectively. The paychecks from these workers help support families and local economies throughout the U.S.

Table 4 – Downstream Employment and Payrolls (2022)

	Employment	Payroll ($ billions)
Distribution/Wholesale		
Roofing, Siding, and Insulation Wholesalers	43,274	$3.6
Building Materials Retailers (excl. paint)	1,205,851	$53.2
Mechanical Insulation Distributors	8,575	$0.7
Total Distribution/Wholesale	**1,257,700**	**$57.5**
Installation/Contractors		
Drywall & Insulation Contractors	246,695	$16.6
Roofing Contractors - Nonresidential	109,381	$7.9
Framing Contractors	71,029	$3.8
Mechanical Contractors	100,471	$8.5
Total Installation/Contractors	**527,576**	**$36.9**

CONCLUSION

The insulation industry, including manufacturers, distributors, and installers, makes vital contributions to the U.S. economy. The products that they make, distribute, and install conserve precious energy resources, reducing heating and cooling costs for households and businesses. The use of insulation also has large environmental benefits as lower energy consumption helps reduce emissions of greenhouse gases, which helps fight climate change. In addition, through supply chain and payroll-induced impacts, the economic activity generated by American insulation manufacturing is broad and helps support local economies across the U.S. Moving through the economy, there are huge contributions in terms of jobs and payrolls generated by those businesses that distribute insulation products from manufacturers to where they will be installed. Finally, hundreds of thousands of workers make a living installing insulation in homes and businesses around the U.S.

APPENDIX – INSULATION JOBS IN THE STATES

Insulation manufacturing occurs in 45 states while distribution/wholesale and installation activities occur across all 50 states. Appendix Table 1 presents the top 10 states in each of the three main segments.

Appendix Table 1 – Top 10 States for Insulation Employment by Industry Segment (2022)

Manufacturing		Distribution/Wholesale		Installation/Contractors	
Ohio	5,604	California	120,834	California	90,335
Texas	3,457	Texas	105,541	Texas	43,106
California	2,738	Florida	90,663	Florida	39,565
Indiana	2,449	New York	60,310	New York	26,970
Pennsylvania	2,164	Ohio	50,215	Washington	21,079
Michigan	2,102	North Carolina	47,725	Illinois	17,424
Georgia	1,876	Illinois	44,855	Ohio	15,784
North Carolina	1,742	Pennsylvania	43,342	Arizona	14,727
Tennessee	1,146	Georgia	42,393	Nevada	14,259
Kansas	1,069	Michigan	41,268	Pennsylvania	14,199
Other States	15,787	Other States	610,554	Other States	230,129
Total	40,134	Total	**1,257,700**	**Total**	**527,576**
Top 10 as % of Total	61%	*Top 10 as % of Total*	51%	*Top 10 as % of Total*	56%

NOTES ON METHODOLOGY AND SOURCES

Data on direct employment and payrolls are based on data from the Bureau of Labor Statistics (Covered Employment and Wages program). In addition, for insulation manufacturing, employment estimates were also based on results from a March 2023 survey of insulation manufacturers. Payrolls were estimated using average annual pay for industries and states multiplied by the employment estimates.

For insulation manufacturing, where data on shipments was estimated as a portion of a larger NAICS code, employment was estimated using output-to-employment ratios for that particular NAICS code supplemented with data from the survey of insulation manufacturers. Employment data on mechanical insulation manufacturers was provided by the National Insulation Association (NIA). Payrolls for each segment were estimated by multiplying employment by the average annual wage for that industry.

With the exception of fiberglass/mineral wool insulation manufacturing, insulation made from other materials falls within broader NAICS codes and is not easily pulled out of existing government data. As a result, data on shipments/output of manufactured insulation products was derived from multiple sources, including the Census Bureau, Bureau of Labor Statistics, the Center for the Polyurethanes Industry (CPI), Polyisocyanurate Insulation Manufacturers Association (PIMA), North American Insulation Manufacturers Association (NAIMA), Cellulosic Insulation Manufacturers Association (CIMA), EPS Industry Alliance, Extruded Polystyrene Foam Association, Structural Insulated Panel Association (SIPA) and NIA.

Data on employment and payroll for distributors/wholesalers is based on NAICS 42333 (Roofing, Siding, and Insulation Wholesalers) and NAICS 4441 (excluding 44412) (Building Material Retailers, excluding paint). In addition, data for distributors of mechanical insulation were provided by the NIA.

Data on employment and payroll for installers and contractors is based on the following NAICS codes in addition to data from NIA on mechanical insulation installers:

NAICS 23831 – Drywall & insulation contractors (residential & nonresidential)

NAICS 238162 – Nonresidential roofing contractors

NAICS 238131 – Framing Contractors

It was determined that these NAICS classifications include many activities that could involve insulation installation. Many of the contracting firms in these NAICS codes are involved in multiple lines of business and likely include insulation installation. In addition, it should be noted that insulation is also installed by self-employed handymen and homeowners that are not included in industry employment data. Because roofs are a significant source of energy losses in commercial buildings, most roofing contractors are also engaged in insulation

installment as part of a commercial roofing project. Though likely significant, installers of insulation in appliances, industrial equipment, mechanical systems, transportation equipment, etc. are not included due to a lack of data.

DISCLAIMER

The American Chemistry Council (ACC) has made reasonable effort to ensure the information contained in this report is complete and accurate. However, ACC expressly disclaims any warranty or guaranty, whether express or implied, associated with this reference book or any of the data contained herein.

This report and the information contained herein are owned and protected by the ACC. Data published in this book are based on various sources as well as ACC estimates. ACC disclaims any liability associated with the accuracy or completeness of the information presented, or its suitability for any particular use. Users of this reference book are solely responsible for any consequences, including any liability that arises from such use.

ECONOMICS AND STATISTICS DEPARTMENT

The Economics & Statistics Department provides a full range of statistical and economic advice and services for ACC and its members and other partners. The group works to improve overall ACC advocacy impact by providing statistics on American Chemistry as well as preparing information about the economic value and contributions of American Chemistry to our economy and society. They function as an in-house consultant, providing survey, economic analysis and other statistical expertise, as well as monitoring business conditions and changing industry dynamics. The group also offers extensive industry knowledge, a network of leading academic organizations and think tanks, and a dedication to making analysis relevant and comprehensible to a wide audience. The primary author of this report is Martha Gilchrist Moore.

Martha Gilchrist Moore
Chief Economist and Managing Director
martha_moore@americanchemistry.com

Dr. Keith Belton
Senior Director, Policy Analysis & Statistics

Heather Rose-Glowacki
Senior Director, Industry Intelligence & Analysis

David Lan
Director, Economics & Statistics

Emily Sanchez
Director, Surveys & Statistics