

The Contributions of Insulation to the U.S. Economy in 2018

**Economics & Statistics Department
American Chemistry Council
May 2019**

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EXECUTIVE SUMMARY

- The use of insulation in U.S. homes and businesses saves energy, putting more money in the pockets of home and business owners. In addition, by saving energy, the use of insulation directly reduces greenhouse gas emissions.
- Beyond the benefits of the use of insulation, the insulation industry—including the manufacture, distribution, and installation of insulation—generates more than 550,000 jobs in the U.S. and \$33 billion in payrolls that support families and local communities around the country.
- Insulation materials manufacturing is a \$16.0 billion business, and directly employs more than 39,000 people across 45 states.
- Indirectly, through its purchases of supplies, raw materials, equipment, and services, insulation manufacturing supports an additional 57,400 jobs in supply-chain industries. Through the household spending of the wages and salaries paid to workers in insulation manufacturing and their suppliers, an additional 65,000 payroll-induced jobs are supported.
- The combined direct and indirect economic activity from U.S. insulation manufacturing supports nearly 162,000 jobs. These jobs generate payrolls of \$8.7 billion. In addition, the combined economic activity supported by insulation manufacturing contributes \$1.3 billion to state and local governments and \$2.4 billion in federal tax revenues.

THE INSULATION INDUSTRY IN THE U.S.

Insulation is installed in homes and businesses around the country to keep hot things hot and cold things cold. There are various applications of insulation, including:

- **Residential insulation** - attics, walls, floors and crawl spaces, roofs, doors and windows are insulated to reduce air leaks and increase energy efficiency.
- **Nonresidential insulation** - in commercial and industrial buildings, insulation of roofs and walls (building envelope) saves on heating and cooling costs.
- **Appliances** - refrigerators, freezers, ovens, dishwashers, and hot water heaters are constructed with insulation to reduce thermal transfer.
- **Motor Vehicles** - insulation in body panels, roof, floor, trunk, hood, and door panels is used to dampen noise, heat, and sound.
- **Equipment/Mechanical** - insulating pipes, tanks, and other mechanical systems reduces energy consumption, promotes employee and public safety, minimizes environmental impacts, and contributes to the competitiveness of U.S. industry by lowering operating and production costs.

Insulation Materials

Insulation comes in many forms, depending on what is being insulated, where it is located, and other factors. Insulation is made from a variety of materials, each with a unique set of properties (i.e., R-value,¹ ability to create complex shapes, 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 a water to be applied in a spray.
- **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 shapes like pipe/equipment insulation.
- **Polyisocyanurate (polyiso) foam** - a plastic foam made from the combination of several chemicals reacted to generate a closed-cell, rigid foam. It is often manufactured in boards

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)

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 recycled content product. EPS is commonly molded in large blocks which are cut into sheets or shapes to suit various applications.
- **Extruded Polystyrene (XPS) Foam** - a cellular plastic product manufactured in a one stage process by extrusion and expansion of the base polymer in the presence of blowing agent(s) resulting in a product which is rigid with closed cellular structure, well suited for compressive strength, moisture resistance and the prevention of mold, mildew and corrosion.
- **Polyurethane foam** - a plastic foam generated by a reaction among several chemicals. For insulation, the chemicals are sprayed on site where the foaming process fills cavities and gaps. 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 is essential to the quest for energy independence because its products help reduce energy consumption and energy-related greenhouse gas emissions. By lowering energy consumption, and thus energy bills, insulation helps make businesses more competitive and gives households more spending power. In addition, insulation reduces intrusion of outside noise, pollen and insects, allows for better humidity control, lowers the chance for ice dams in snowy climates, and promotes employee and public safety. While these benefits are enormous, 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 by adding insulation and sealing air leaks, the average household could save 15% on heating and cooling costs.²
- In a 2009 analysis by McKinsey that examined multiple chemistry-enabled technologies to reduce emissions,³ the authors concluded "insulation alone accounted for 40% of the total identified CO₂ savings."

² https://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_methodology

³ McKinsey, "Innovations for Greenhouse Gas Reductions: A life cycle quantification of carbon abatement solutions enabled by the chemical industry." July 2009.

- 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.”⁴
- 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. ⁵
- According to the Business of Council for Sustainable Energy, U.S. energy productivity grew 14% between 2009 and 2018.⁶ 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’s Industrial Technologies Program and Oak Ridge National Laboratory (ORNL) documented benefits of mechanical insulation in the industrial maintenance market and examined the difference a modest increase in insulation would make in the industrial and commercial building industries and estimated \$4.8 billion in energy savings, a reduction of 43 million metric tons of CO₂ emissions was possible. ⁷

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.

ECONOMIC SNAPSHOT OF THE INSULATION INDUSTRY

Table 1 - Economic Snapshot of the Insulation Industry (2018)

	Employment	Payroll (\$ billion)
Insulation Manufacturing	39,224	\$2.2
Distribution/Wholesale	47,108	\$3.1
Installation	467,784	\$27.7
Total	554,115	\$33.0

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,

⁴ <https://energy.gov/energysaver/heat-and-cool>

⁵ <http://aceee.org/sector/commercial>

⁶ <https://www.bcse.org/factbook/>

⁷ <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/>

polyisocyanurate (polyiso), fiberglass, mineral wool, cellulose, and other materials, predominantly used in mechanical insulation applications. In 45 states around the country, more than 39,000 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 create jobs and economic activity.

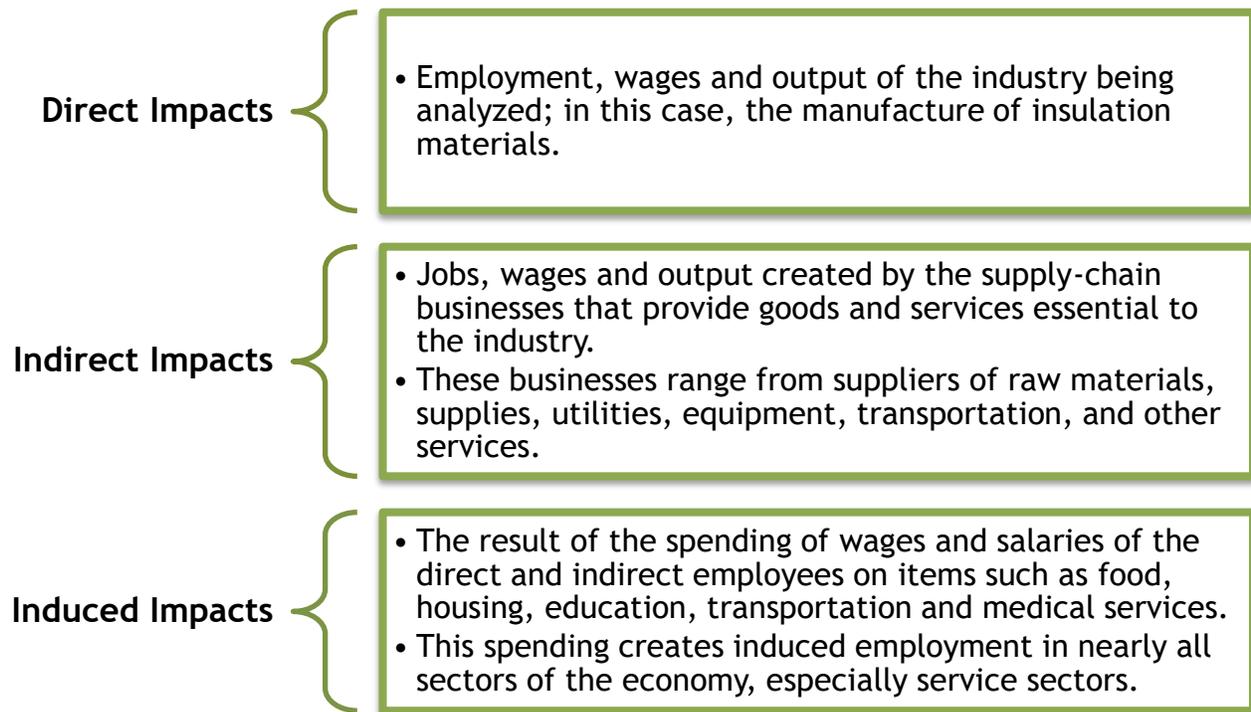
Table 2 - Insulation Materials Manufacturing (2018)

	Employment	Payroll (\$ billions)	Output (\$ billions)
Polystyrene (EPS & XPS)	4,717	\$0.3	\$2.0
Polyurethane/Polyiso	11,234	\$0.6	\$6.1
Fiberglass/Mineral wool	17,678	\$1.1	\$6.1
Cellulose	1,836	\$0.1	\$0.3
Other*	3,759	\$0.2	\$1.4
Total Manufacturing	39,224	\$2.2	\$16.0
<i>Addenda</i>			
<i>Accessories for Mechanical Insulation Systems</i>	4,529	\$0.3	\$0.7
<i>Laminated Metal Building Insulation</i>	2,812	\$0.2	\$0.5

* 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).

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



The economic contributions of the insulation manufacturing were analyzed using an economic input-output model, IMPLAN.⁸ This method estimates the total contributions of an industry to the economy at the state and national levels for a given year. The economic contributions analyzed in this report are employment, payroll and output in the U.S. for the year 2018.

The manufacture of insulation products directly generates \$16.0 billion in industry shipments and directly employs more than 39,200 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 57,000 indirect jobs. Finally, the wages paid by insulation manufacturers and their suppliers support more than 65,000 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 nearly 162,000 jobs which generate payrolls of \$8.7 billion.

In addition, the combined economic activity supported by insulation manufacturing contributes \$1.3 billion to state and local governments and \$2.4 billion in federal tax revenues.

⁸ 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.

Table 3 - Upstream Economic Impact of Insulation Manufacturing (2018)

	Employment	Payroll (\$ billions)	Output (\$ billions)
Direct Impact (Manufacturers)	39,224	\$2.2	\$16.0
Indirect Impact (Supply Chain)	57,422	\$3.6	\$18.3
Payroll-Induced Impact	65,068	\$2.8	\$11.0
Total Impact	161,714	\$8.7	\$45.3

Downstream Economic Impact

Looking downstream, nearly 47,000 wholesalers distribute insulation products to contractors/ installers and retailers around the country and nearly 468,000 workers are engaged in the drywall and insulation installation, nonresidential roofing, and mechanical insulation installation. Payrolls in those sectors amount to \$3.1 billion and \$27.7 billion, respectively. The paychecks from these workers help support families and local economies throughout the U.S.

Table 4 - Downstream Employment and Payrolls (2018)

	Employment	Payroll (\$ billions)
<u>Distribution/Wholesale</u>		
Roofing, Siding, and Insulation Wholesalers	38,543	\$2.6
Mechanical Insulation Distributors	8,564	\$0.6
Total Distribution/Wholesale	47,108	\$3.1
<u>Installation/Contractors</u>		
Drywall & Insulation Contractors	251,918	\$13.6
Roofing Contractors - Nonresidential	112,054	\$6.0
Mechanical Contractors	103,812	\$8.0
Total Installation/Contractors	467,784	\$27.7

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, saving money for households and businesses. The use of insulation also has large environmental benefits as reduced energy consumption translates directly into lower emissions of greenhouse gases. 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 2 presents employment by segment for all states.

Appendix Table 1 - Top 10 States for Insulation Employment by Industry Segment (2018)

Manufacturing		Distribution/Wholesale		Installation/Contractors	
Ohio	4,965	Texas	4,374	California	65,998
Georgia	3,547	Florida	3,702	Texas	44,412
Texas	3,364	California	2,739	Florida	32,740
California	2,364	New York	2,343	New York	27,433
Indiana	2,101	Illinois	2,201	Washington	15,926
Pennsylvania	2,075	Virginia	2,147	Illinois	15,896
Illinois	1,652	Pennsylvania	2,111	Ohio	14,747
Florida	1,586	North Carolina	1,826	Pennsylvania	14,171
Wisconsin	1,216	Wisconsin	1,793	North Carolina	12,215
Kentucky	1,198	Georgia	1,764	Georgia	11,887
Other States	15,155	Other States	22,107	Other States	212,358
Total	39,422	Total	47,108	Total	467,784
<i>Top 10 as % of Total</i>	<i>61%</i>	<i>Top 10 as % of Total</i>	<i>53%</i>	<i>Top 10 as % of Total</i>	<i>55%</i>

Appendix Table 2 - Insulation Employment by Industry Segment (2018)

	Manufacturing	Distribution/ Wholesaler	Installation/ Contractors		Manufacturing	Distribution/ Wholesaler	Installation/ Contractors
Alabama	584	336	4,693	Montana	50	272	1,330
Alaska	68	39	619	Nebraska	226	339	3,225
Arizona	885	559	11,672	Nevada	567	207	7,406
Arkansas	106	315	3,492	New Hampshire	-	184	2,029
California	2,364	2,739	65,998	New Jersey	436	1,456	8,594
Colorado	486	1,355	11,179	New Mexico	118	92	2,738
Connecticut	379	593	4,177	New York	903	2,343	27,433
Delaware	-	253	1,432	North Carolina	1,135	1,826	12,215
Dist. of Columbia	-	-	788	North Dakota	18	95	915
Florida	1,586	3,702	32,740	Ohio	4,965	1,540	14,747
Georgia	3,547	1,764	11,887	Oklahoma	600	473	4,622
Hawaii	50	168	2,052	Oregon	159	362	7,556
Idaho	251	178	2,482	Pennsylvania	2,075	2,111	14,171
Illinois	1,652	2,201	15,896	Rhode Island	-	92	1,585
Indiana	2,101	1,195	10,016	South Carolina	702	741	5,350
Iowa	221	910	5,579	South Dakota	60	130	1,250
Kansas	1,006	486	4,250	Tennessee	429	1,210	8,092
Kentucky	1,198	762	5,845	Texas	3,364	4,374	44,412
Louisiana	236	437	4,926	Utah	1,064	486	6,745
Maine	38	34	2,227	Vermont	-	55	878
Maryland	100	669	10,806	Virginia	336	2,147	10,802
Massachusetts	297	1,091	11,630	Washington	486	701	15,926
Michigan	951	1,148	10,797	West Virginia	845	110	1,365
Minnesota	151	1,201	8,544	Wisconsin	1,216	1,793	8,445
Mississippi	633	345	2,798	Wyoming	-	63	869
Missouri	579	1,428	8,563	U.S.	39,224	47,108	467,784

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 January 2017 survey of insulation manufacturers. Survey results for some segments were updated in February 2019. 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 manufactures. 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, IHS Chemical, the Center for the Polyurethanes Industry, Polyisocyanurate Insulation Manufacturers Association (PIMA), Cellulosic Insulation Manufacturers Association (CIMA), EPS Industry Alliance, Extruded Polystyrene Foam Association and NIA.

Data on employment and payroll for distributors/wholesalers is based on NAICS 42333 (Roofing, Siding, and Insulation Wholesalers). 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

It was determined that these NAICS classifications represent a large share of the insulation installation segment. Drywall installation is included in NAICS 238311 and 238312. While no data exists to separate insulation contractors from drywall contractors, it is likely that a majority of these contractors are engaged in both lines of business. 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.

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ECONOMICS AND STATISTICS DEPARTMENT

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