

# BASIC INSULATION COURSE

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## Introduction to the Insulation Industry

Industrial Insulation is a thermal material used for high and cold temperature pipes and equipment, most commonly used in petrochemical, oil refinery, power plant, paper mill, and similar types of manufacturing. In this lesson, we will be discussing all about it, benefits and other things most insulators aren't aware of.

# Introduction to the Insulation Industry

Architects, engineers, specifiers, and general or commercial building insulation contractors all need reliable, accessible information on insulation products. Consider this your go-to resource for comprehensive facts on commercial insulation—so you can make informed decisions on the job.

This lesson will give you an overview of the insulation industry, including how and why insulation is used and safety factors related to insulation.

## Different types of Industrial Insulation



What is the difference between [Cryogenic](#) Insulation and Thermal Insulation?

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**Cryogenic** — Cryogenic insulation is mainly used in process units of liquefaction of gases, always involving very low temperature range (15 celsius to -75 celsius) and elevated pressure. In addition to the risk of water and ice forming at this cryogenic temperature. Refineries use aluminum and stainless steel for the cold section of the plant to avoid embrittlement problems encountered with carbon steel on pipes and tanks. Cold Insulations like cellular glass/foam-glass, polyurethane, and cryo-gel are mainly used for cold systems. Cold work is a major design problem on low temperature installations are moisture penetration and operating efficiency.

**Thermal Insulation** is the way of reducing heat transmission between objects in thermal contact. This type of insulation consists of low thermal conductivity materials mixed to carry out an even lower system thermal electricity. Also, it can be achieved with specifically engineered processes, as well as with suitable object shapes and materials.

**What is insulation?**





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An Insulator is any material that forestalls the entry of electricity, heat, or sound, starting with one territory then onto the next. Below, we're going to discuss how each of these kinds of insulations works and what they're utilized for in our lives.

1. Mechanical Insulation
2. Cryogenic Insulation
3. **Thermal Insulation** – is the reason why pipes and tanks in the plant stay corrosion free, protecting hot surfaces from personnel, and energy saver to operate the process system at a low cost.. These are substances or materials used, which are very low in thermal conductivity. It controls the movement of the heat from one place to another. Fiberglass, wool, rock wool, polyurethane, polystyrene, and goose feather etcetera are conventional thermal insulation. Materials like these are very poor conductors of heat and are, therefore, good thermal insulations.

## Insulation Types



Generally, insulation materials are divided into three (3) main types:

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**Cellular Insulation – is an insulation material composed of small individual cells isolated from one another. The cell material might be glass or plastic, like, polyurethane, polystyrene, polyisocyanurate, or elastomeric.**

## Fibrous Insulation

is an insulation material composed of small-width fibers that finely separate the air space. Silica, slag wool, rock wool, and alumina silica fibers are used. The widely utilized insulations of this type are mineral wool and glass fiber. Mineral wool and glass fiber products usually have their fibers bond with each other with organic binders that supply the limited structural integrity of the products.

## Granular Insulation

is an insulation material composed of small nodules that contain hollow spaces. This type of insulation material may be produced as a loose material, or combined with a binder and fibers to make a rigid insulation. The material used might be diatomaceous earth, calcium silicate, extended vermiculite, cellulose, perlite, or microporous protections.

## Insulation Forms

Insulations are made in a variety of forms suitable for specific functions and applications. The consolidated structure and type of insulation decide its proper technique for installation. The forms most widely used are:

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- Rigid boards, sheets, blocks, and preformed shapes like curved segments, pipe insulation, lagging, etc. Cellular, fibrous, and granular insulations are made in these forms.
- Preformed shapes and flexible sheets. Fibrous and cellular insulations are made in these forms.
- Cements (in both insulating and finishing). Made from granular and fibrous insulations and cements, they might be of air drying type or hydraulic setting.
- Foams. Froth foam or poured used to fill areas that are irregular and voids.
- Flexible blankets. Fibrous insulations are made in flexible blankets.

## Difference Between Hot and Cold Insulation Materials

When it comes to industrial insulation between working with cryonic cold systems and hot thermal process systems is the procedure in installing insulation. While it is an easier staggered method to cover hot pipes and tanks. Cryogenic pipe insulation requires three times more process in, installing per layer, vapor barrier all seams, vapor stop all layers butts joining, and each layer in staggered position. The metal jacket around the insulation must be detail-oriented waterproof at every angle, cut-out, and cocky each seams to prevent ingress of water and water vapor tight system.

## Hot Insulation Materials



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Removable insulation is specifically designed to insulate piping systems transporting gas and substances at high temperatures. Below are 3 common materials used during circumstances that require hot insulation:

- Resin Bonded RockWool: it is utilized in both cold and hot insulation, it has a chemical, high thermal, and heat resistance with unmatched dimensional stability.
- Cray Flex: This material features a high thermal, heat, and chemical resistance, while still produced from high-quality raw materials.
- Spiral-wrap Fiberglass: This type of fiberglass is challenging to install but extremely inexpensive for your hot insulation needs. It both keeps the contents being transported at the right temperature while ensuring the surplus heat remains within the piping system.

Remember, that understanding the maximum temperature the insulation will be covering is the most important part about picking a hot insulation material.

## Cold Insulation Materials

Much the same as hot insulation materials, a portion of the materials used to deliver cold insulation differ upon the system of pipes they are insulating. Along these lines, the materials utilized in either hot or cold protection are subject to the customization of the specific piping system. There are two common materials used in cold insulation:

- Polyurethane Foam: Perfect for taking care of low thermal conductivity and substances with beneath frigid temperatures. Polyurethane foam likewise takes into account low smoke emanation and low water vapor permeability.
- Rubber Foam: It is likewise regularly suggested for buildup control as the shut cell innovation is highly resistant to moisture vapor.



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Keeping the cold in is as important as keeping the heat out in chilled insulation. There are many types of insulation used on chilled water pipes. The two most popular are rubber insulation and foam glass.

## What is the difference?

The difference between hot and cold insulation material is as follows: First, the material used in hot insulation does not require a water vapor barrier as in cold insulation for it to function properly. This barrier helps prevent metal degradation that may occur at any time.

Condensation build-ups occur within cold systems, which require flexible or flexible insulation to deal with this issue. Therefore, the types of foam, metal, fiberglass and other materials used for thermal bridging in cold insulation are more flexible and formed than those found in hot insulation materials.

Finally, closed cell structure is required in cold insulation to help prevent wicking. The material in high-temperature insulation if-allows water to enter the heat will cause the evaporation of moisture. But the water does not evaporate in a cold insulation device. The closed cell structure of the cold insulation material helps prevent this problem.

## How Does Insulation Work? Why is it important?



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## How Does Insulation Work?

Pipe insulation plays an important role for safety, where pipe temperatures can range from 0°F to 1000°F (-18°C to 538°C) in iron, copper, and PVC. Heat normally flows from hotter territories to cooler ones. Throughout the winter, heat moves legitimately from warm spaces (for example, your home!) to outdoors and unheated areas. Throughout the late spring months, heat moves from the warm outdoors to the cooler inside of your home.

Insulation works by easing back the movement of heat from a hot space to a cooler space. Insulation helps increment your home's vitality proficiency by containing the heat and keeping the house warm and shielding it from getting excessively warm in the mid-year months.

When introduced appropriately, insulation can build your home's solace levels by keeping up a stable, uniform temperature from one room to another. Insulation will likewise develop your home's vitality proficiency, altogether bringing down warming and cooling bills.

It's very important to follow and meet industry standards for best results in energy conservation, condensation control, and performance.

## Why is it important?

Proper pipe insulation is one of the essential facets of any infrastructure, not only because insulation boosts the performance and life of your plumbing but also protects them against damage from extreme temperatures or weather.

## Insulation benefits

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1. Safety and protection of personnel
2. Enhances process and performance
3. Prevent moisture condensation
4. Reduce noise level
5. Reduce energy cost
6. Fire protection
7. Improve Appearance
8. Reduces capacity and size of new mechanical equipment

Insulation provides a healthier work environment. Noise control whether in an indoor or outdoor facility, can increase productivity, improved air quality and maintained insulation system can provide short- and long-term benefits that exceed expectations.

Mechanical insulation helps ensure maximum efficiency to protect personnel, equipment, and system. Protecting workers from contact with hot or cold surfaces. Insulation systems are needed to maintain a process system's surface temperature above the dew-point temperature of the ambient air. Condensation is a real-world problem that if not corrected can lead to other serious problems. If designed, installed, and maintained properly, insulation can minimize condensation damage, including damage to surrounding surfaces and equipment; mold growth, which affects indoor air quality; and corrosion under insulation.

## Other Topics: References

1. [Quadrant Shop](#)
2. [Osha.com](#)
3. [Insulation.Org](#)
4. [Insulation Institute](#)
5. [Thermal-Engineering.Org](#)