Chemical Sector Profile

The U.S. Chemical Sector converts raw materials into more than 70,000 diverse products essential to modern life and distributes those products to more than 750,000 end users throughout the Nation. Several hundred thousand U.S. chemical facilities—ranging from petrochemical manufacturers to chemical distributors—use, manufacture, store, transport, or deliver chemicals along a complex, global supply chain. End users include critical infrastructure sectors, making the uninterrupted production and transportation of chemicals essential for national and economic security.

Impact on U.S. Economy

The U.S. chemical industry is responsible for more than a quarter of the U.S. GDP, supports the production of almost all commercial and household goods, and is essential to economic growth.

The U.S. chemical industry is a $768 billion enterprise that supports more than 25% of total U.S. GDP.

96% of U.S. goods in 2016 were manufactured using Chemical Sector products.

The U.S. chemical industry is one of the world’s largest chemical producers, with 15% of the world’s chemicals coming from the U.S.

Generation of U.S. Employment

From research and development to manufacturing, the U.S. chemical industry employs nearly 800,000 people, while creating jobs in the many other industries it touches.

The U.S. Chemical Sector directly employs nearly 800,000 employees.

Every job created by the business of chemistry generates 6.8 jobs elsewhere.

6 million U.S. jobs created.

Contribution to U.S. Exports

The business of chemistry is America’s largest exporting sector, supplying an eighth of the world’s chemical needs.

Total value of U.S. chemical exports per year: $174 billion.

Chemicals and related products make up 10 cents of every $1 of U.S. exports.
The U.S. Chemical Sector is made up of five distinct components: agricultural chemicals, basic chemicals, specialty chemicals, consumer products, and pharmaceuticals. Each component supports a specific and integral part of America’s chemical needs.

### Components of the Chemical Sector

- **Agricultural Chemicals**
- **Basic Chemicals**
- **Specialty Chemicals**
- **Pharmaceuticals**
- **Consumer Products**

### Functional Areas of the Chemical Sector

- **Manufacturing Plants**
  - Convert raw materials into intermediate and end products

- **Transportation Systems**
  - Transport chemicals to/from manufacturing plants, warehouses, and end users

- **Warehousing/Storage**
  - Provide downsized repackaging and bulk storage

- **End Users**
  - Typically consume the chemical purchased

- Chemical distributors deliver more than 9 tons of chemical sector products every 8.4 seconds

### The Chemical Sector: Integral to Everyday Life

Nearly all goods in use every day in the U.S. are manufactured using Chemical Sector products. These goods are found in homes, offices, drug stores, and farms across the Nation.

11,114

U.S. chemical manufacturing facilities (2016)

- States with the greatest concentration of facilities: California, Texas, Ohio, Illinois, and Pennsylvania
- *Louisiana and Texas account for about 70% of all primary petrochemicals produced in the U.S.*

34%

- Of chemical manufacturing facilities are owned and operated by small and medium enterprises (employ <500 people)
Agricultural Chemicals

The agricultural chemical industry supplies farmers and home gardeners with fertilizers, herbicides, pesticides, and other agricultural chemicals. The segment also includes companies involved in the formulation and preparation of agricultural and household pest control chemicals, as well as companies responsible for manufacturing and storage.

$29.6 billion in chemical sales to the agriculture industry in 2016
471 facilities
$41.1 billion total value of shipments distributed
35,100 employees

Pesticides
U.S. agricultural producers spent $9 billion on pesticides in 2012
Fungicides $1.4 billion
Fumigants $0.14 billion
Insecticides $2.2 billion
Herbicides $5.1 billion

Fertilizers
U.S. agricultural producers spent $71.8 million on fertilizer in 2016
The U.S. consumed 23.2 million tons of fertilizer in 2014

Consumer Products
Consumer products include packaged products often referred to as “household products.” This includes everything from soaps and detergents to oral hygiene and hair and skin care products to personal care products (e.g., cosmetics, deodorants).

In 2015, the U.S. consumer goods market was the largest in the world

$446 billion total value of shipments distributed
$74.4 billion total value of shipments distributed
$81.65 billion on soaps and detergents

Types of Products
- Soap
- Detergents
- Bleaches
- Toothpaste
- Cosmetics
- Perfume
- Paints

Soap, Cleaning Compounds, and Toilet Preparation

2,268 facilities
108,200 employees

Basic Chemicals

The basic chemicals segment produces both inorganic and organic chemicals. Organic chemicals are used in the production of other chemicals and to make products such as dyes, plastics, and petrochemical products. Inorganic chemicals usually are used to make solid and liquid chemicals and industrial gases; sodium, sulfuric acid, and chlorine are some of the most common. Inorganic chemicals also serve as catalysts in the manufacture of chemicals (used to speed up or aid a reaction).

1,277 facilities
151,700 employees

$271 billion total value of shipments distributed

Petrochemical

More than 230 plants producing petrochemicals in the U.S.

Each day 1.8 billion gallons of crude oil, refined projects, and natural gas liquids and 311 million pounds of plastic resins move through U.S. infrastructure networks.

Petrochemical plants produce resins that are used in a wide variety of products:
- Car parts
- Water bottles
- Medical devices
- Food packaging containers

Sulfuric Acid

41 million tons of sulfuric acid are produced each year in the U.S.

16% of the world's production (255 million tons)

Used to make hundreds of compounds needed by almost every industry; uses of sulfuric acid include:
- 50% Phosphate fertilizers
- 2% Hydrofluoric acid
- 10% Metal processing
- 2% Paints, pigments
- 6% Phosphates
- 1% Pulp, paper
- 5% Fibers
- 24% Others

Chlorine

10 million tons of liquid chlorine + 2 million tons of chlorine gas = 12 million tons of chlorine produced annually

$8 billion+ in annual sales

20,000 employees

Uses of Chlorine
- 30% PVC
- 24% Solvents
- 13% Organics
- 13% Inorganics
- 5% Water sanitation
- 5% Pulp and paper industry
- 10% Other

Industrial Gases

$12.2 billion worth of products produced annually

Each job generates 2.1 more jobs elsewhere in the economy, contributing $24.3 billion to the U.S. economy

Industrial gases are used in a wide variety of applications, including:
- Medical
- Electronics
- Industrial
- Food & beverage
- Manufacturing

Pharmaceuticals

The pharmaceutical industry includes the manufacture, extraction, processing, purification, and packaging of chemical materials to be used as medications. Pharmaceutical facilities primarily engage in one or more of the following: manufacturing of biological and medical products; processing of botanical drugs and herbs; isolating active medical principles from botanical drugs and herbs; and/or manufacturing of pharmaceutical products intended for internal and external consumption in forms such as tablets, capsules, ointments, powders, and solutions.

2,366 facilities  $202 billion total value of shipments distributed  247,270 employees

Pharmaceutical Preparation

1,315 facilities  $152 billion total value of shipments distributed  147,510 employees

Biological Products

301 facilities  $26 billion total value of shipments distributed  43,410 employees

Diagnostic Substances

234 facilities  $12 billion total value of shipments distributed  27,490 employees

Medicines

516 facilities  $12 billion total value of shipments distributed  28,860 employees

Top 10 pharmaceutical manufacturing states by number of facilities

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Specialty Chemicals

Specialty chemicals are individual molecules or mixtures of molecules (i.e., formulations) that are manufactured on the basis of a unique performance or function. Many other sectors rely on specialty chemicals for their products, including automotive, aerospace, agriculture, and cosmetics and food, among others.

The market share for specialty chemicals in North America is significantly higher than the global average.

$89.6 billion total value of shipments distributed

Adhesives and Sealants

- **Acrylates/anaerobic adhesives**: Adhesive used to keep nuts tight on bolts
- **Casein**: Labels on bottles that stay on in ice water and are recyclable
- **Natural rubber**: Self-adhesives (e.g., envelopes)
- **Paints**: Vehicle paint, traffic marking paint, food paints
- **Polyolefin/ethylene copolymer**: Hot melts
- **Polyurethane**: Bonding soles to the bodies of shoes; food packaging
- **Polyvinyl acetate**: Book bindings and labels
- **Starch**: Corrugated cardboard bonding

Food Additives

The Food and Drug Administration currently lists 3,000 food additives approved for food use in the U.S.

- **Preservatives** (e.g., propionic acid, nitrates, benzoates)
- **Flavorings** (e.g., fruit flavors, sweeteners, butter flavors)
- **Processed food additives** (e.g., potassium sorbate, propylene)

Flavors and Fragrances

$1.4 billion in annual sales in 2002

Explosives

- 4.5 billion tons of explosives used in the U.S. in 2015
- Fragmenting rock formations for oil and gas extraction
- Blasting during mining and quarry processes
- Inflation devices such as vehicle airbags
Regulatory

As the majority of Chemical Sector assets are privately owned and operated, effective security and resilience planning requires a shared commitment between the public and private sectors to implement the most effective risk management strategies throughout the sector.

Federal Agencies

Federal agencies regulate the manufacturing, storage, processing, transportation, and use of chemicals* through the following mechanisms:

**Department of Homeland Security**

Cybersecurity and Infrastructure Security Agency

- Chemical Facility Anti-Terrorism Standards
- **3,355** facilities regulated (as of 2018)

**Department of Transportation**

Pipeline and Hazardous Materials Safety Administration

- **13,829** shippers covered by the security plan and training requirements (as of 2017)

**Transportation Security Administration**

Rail Transportation Security Final Rule

- **46** key urban areas covered by secure chain-of-custody inspections

**Department of Health and Human Services**

Food and Drug Administration

- **$1 trillion** worth of products regulated per year including drugs, cosmetics, and medical and consumer products

**U.S. Coast Guard**

Maritime Transportation Security Act of 2002

- **3,200** facilities of all types covered (as of 2013)

**Department of Labor**

Occupational Safety and Health Administration

- **700** enforcement inspections of chemical manufacturing facilities in 2017

**Environmental Protection Agency**

800,000 regulated facilities (as of 2018)

**Department of Justice**

Bureau of Alcohol, Tobacco, Firearms and Explosives

- **9,815** licensee/permittees are subject to security rules (as of 2017)

*The regulatory scope of these agencies/programs extends beyond the domain of the Chemical Sector.

In addition to Federal regulations, the chemical industry is subject to any regulations states might impose on facilities doing business within their boundaries.