



Ammonia

Introduction, Applications Review of Iran's production status and Global Market Analysis, Production complexes and projects in Iran

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1. Introduction

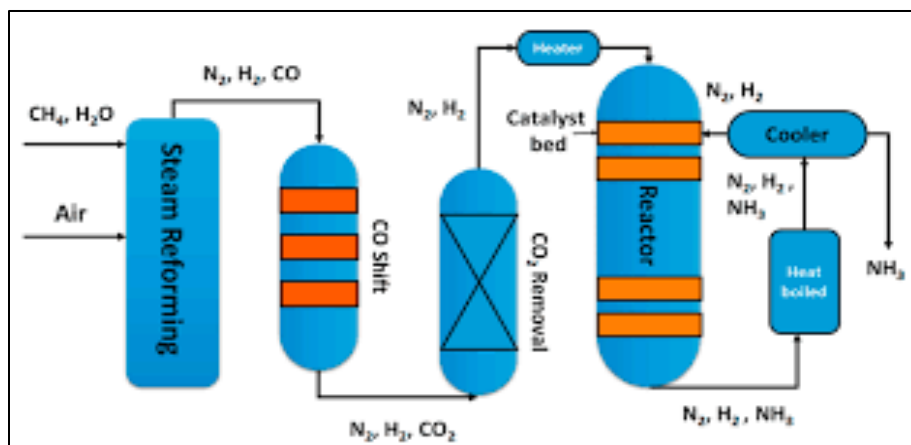
Ammonia is a colorless, reactive gas that is lighter than air—approximately half as heavy—and readily dissolves in water. It has a strong, pungent odor similar to urine, detectable even in small concentrations. While ammonia gas is non-flammable, it can become explosive when mixed with air at certain concentrations and exposed to an ignition source. Consequently, it is treated as a flammable substance. Ammonia solutions, which are alkaline and can be corrosive in high concentrations, are commonly referred to as ammonium hydroxide or aqueous ammonia.

2. Industrial and Commercial Importance

Ammonia is a naturally occurring compound that serves as a vital chemical building block in various industries. It is extensively used in the production of fertilizers, plastics, synthetic fibers, dyes, explosives, and pharmaceuticals. In households, ammonia is commonly found in cleaning products and garden fertilizers. Additional applications include its role as a refrigerant, stabilizer, neutralizer, and purifier—particularly in food transport and water treatment processes.

3. Production Process

Industrial ammonia production relies on the Haber-Bosch process, in which atmospheric nitrogen reacts with hydrogen derived from fossil fuels under high temperature and pressure. This energy-intensive reaction yields ammonia with a nitrogen content of 82.2%.



4. Ammonia Uses

4.1. Ammonia in Fertilizer

Ammonia is a fundamental component in the production of ammonium nitrate fertilizer, which releases nitrogen—an essential nutrient for plant growth, including farm crops and lawns. Approximately 90% of the ammonia produced worldwide is used in fertilizers to support global food production. The cultivation of food crops naturally depletes soil nutrients, requiring farmers to apply fertilizers to maintain soil productivity. Fertilizers also help increase the levels of essential nutrients such as zinc, selenium, and boron in crops.

4.2. Ammonia in Industrial/Manufacturing Uses

As a refrigerant gas in air-conditioning systems, ammonia can absorb significant amounts of heat from its surroundings. It is also used to purify water supplies and serves as a foundational ingredient in the production of plastics, explosives, fabrics, pesticides, and dyes. Additionally, ammonia plays a crucial role in waste and wastewater treatment, cold storage, rubber, pulp and paper, and food and beverage industries, functioning as a stabilizer, neutralizer, and nitrogen source. It is also an important compound in pharmaceutical manufacturing.



4.3. Ammonia in Household Cleaning Products

Ammonium hydroxide, commonly known as household ammonia, is a key ingredient in many cleaning products designed for use on tubs, sinks, toilets, countertops, and tiles. It is highly effective in breaking down household grime and stains caused by animal fats and vegetable oils, such as cooking grease and wine spills. Due to its rapid evaporation, ammonia is frequently used in glass cleaning solutions to prevent streaking.

5. Global Market Analysis and Industry Economics

5.1. Market Consumption

Urea accounts for the largest share of ammonia consumption, utilizing 56.6% of the global ammonia supply. Nitrates rank as the second-largest consumer, holding 13% of worldwide ammonia demand.

5.2. Role in Sustainable Energy

Ammonia is gaining attention as a potential alternative fuel for power generation and transportation, especially in the maritime sector. In global efforts to decarbonize, conventional gas- and coal-based ammonia production is expected to transition toward blue and green ammonia, driven by the increasing demand for eco-friendly fertilizers and fuels.

5.3. Safety Considerations

Exposure to ammonia can irritate the skin, eyes, and respiratory system. To prevent hazardous fumes, ammonia should never be mixed with other chemicals, particularly chlorine bleach, as this reaction produces toxic gases.

6. Ammonia Trade (Supply and Demand)

6.1. Transportation

Industrial ammonia is transported via road tankers, rail wagons, gas carriers at sea, or cylinders. Among these, 17–20 million tons are traded internationally each year through ocean-going vessels.



6.2. Capacity

As of 2023, global ammonia production capacity was estimated at 190 million tons. China led with 55 million tons, while the CIS and Indian subcontinent followed with 25 million tons and 22 million tons, respectively. China's production capacity represented 29% of the global market, with most of its facilities utilizing coal as feedstock—an approach less cost-effective than natural gas.

6.3. Production

Worldwide ammonia production increased from 145 million tons in 2013 to 156 million tons in 2023. Given the anticipated annual capacity growth to 230 million tons by 2028 and an operating rate of 82%, production is projected to reach 190 million tons per year by 2028.

6.4. Market Size

The global ammonia market was valued at USD 67 billion in 2020, rising to USD 72 billion in 2023, and is expected to grow to USD 110.93 billion by 2028, reflecting a compound annual growth rate (CAGR) of 6.4%.

Top Importers (2024): Leading ammonia importers include:

United States (\$1.37B)

India (\$1.23B)

Morocco (\$878M)

South Korea (\$524M)

Turkey (\$433M)

6.5. Consumption

China remains the largest ammonia consumer, accounting for 32.3% of global consumption, followed by the Indian subcontinent with 13% in 2023. According to the CEH report, China's share is expected to decline to 27% by 2028, while Western Europe's consumption will rise from 5.5% in 2023 to 15% by 2028.



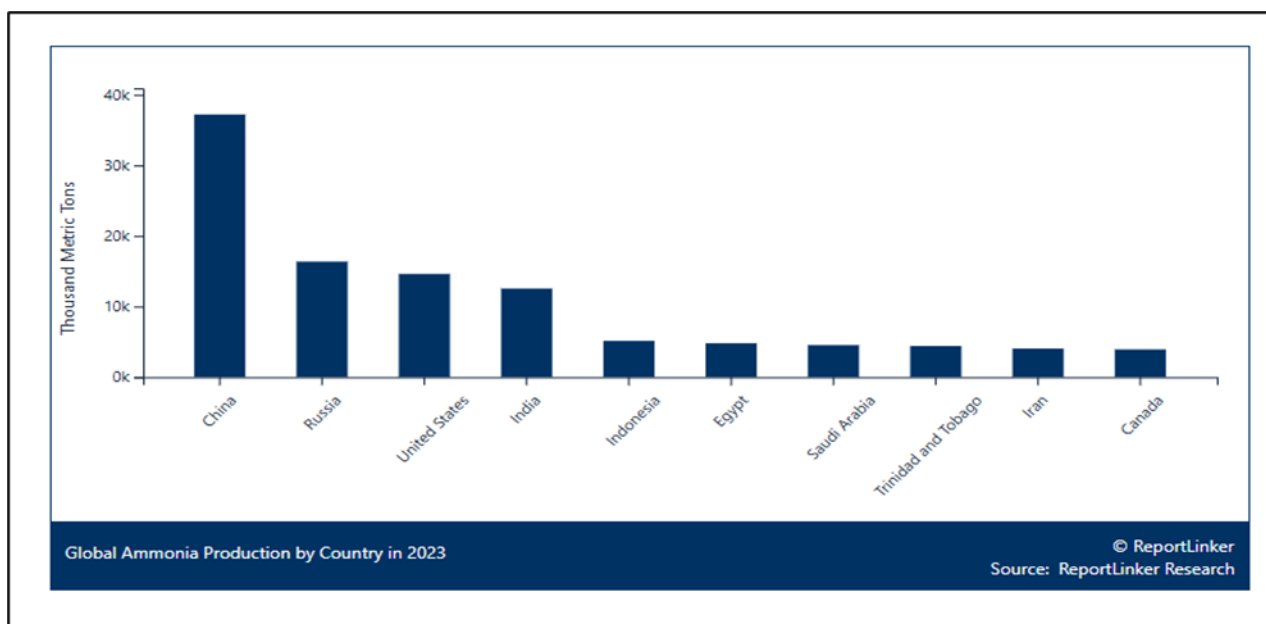
6.6. Import

Western Europe was the largest ammonia importer in 2023, accounting for 26% of global imports, followed by the Indian subcontinent at 13%. By 2028, Western Europe is projected to retain its leading position, increasing its import share to 28%, while the Indian subcontinent (Southwest Asia) is expected to hold 10.3% of global imports.

6.7. Export

The Middle East was the largest exporter of ammonia in 2023, representing 25% of global exports, followed by South and Central America with 22%. By 2028, the Middle East is expected to increase its export dominance to 35%, while South and Central America's share is forecasted to decline to 13%. Africa is also anticipated to experience export growth, rising from 11% in 2023 to 13% in 2028.

Global Ammonia production (2023)





7. Iran's Ammonia production complexes and projects in Iran

Iran's petrochemical industry accounts for 28% of the region's petrochemical capacity and 2.7% of the global total.

Due to abundant natural resources and methane gas reserves in the Middle East, ammonia capacity is expected to grow at a 6.5% annual rate, increasing from 19 million tons in 2023 to 26.5 million tons in 2028. Saudi Arabia and Iran are the largest ammonia producers in the Middle East, followed by Qatar and Oman in third and fourth place.

Iran's ammonia production capacity reached 6.5 million tons in 2023. With an operating rate of 76%, actual production amounted to 5 million tons. Based on ongoing development projects, Iran's ammonia capacity is projected to reach 8 million tons by 2030.

Approximately 87% of Iran's ammonia output is used to meet domestic demand, while 13% is exported. Currently, seven ammonia production units operate in Iran, with a combined capacity of 6.5 million tons. Pardis and Shiraz Petrochemical Companies dominate production, accounting for 62% of the country's ammonia output in 2023.



Ammonia Status in Iranian Petrochemical Complexes and Projects

No	Logo	Petrochemical Complex	Production Capacity (KTY)	License	Year of Op.	Website
1	 شرکت پتروشیمی پردیس Pardis Petrochemical Co.	Pardis Petrochemical Company	Phase1: 680 Phase2: 680 Phase3: 680	M.W. Kellogg	2009 2009 2017	www.paupc.ir
2	 Shiraz.P.C	Shiraz Petrochemical Company	Ammonia2: 396 Ammonia3: 676.5	ICI Casale	1985 2015	www.spc.co.ir
3	 شرکت پتروشیمی خراسان	Khorasan Petrochemical Company	330	M.W. Kellogg	1996	www.khpc.ir
4	 K.P.I.C	Kermanshah Petrochemical Company	396	M.W. Kellogg	2007	www.kpic.ir
5	 شرکت پتروشیمی مسجد سلیمان	Masjed Soleiman Petrochemical Company	680	Casale	2020	www.misipcc.com
6	 شرکت پتروشیمی رازی	Razi Petrochemical Company	Phase1: 330 Phase2: 330 Phase3: 676.5	M.W. Kellogg M.W. Kellogg Casale	1970 1977 2007	www.razip.com
7	 شرکت پتروشیمی لوردهگان شرکت توسعه پتروشیمی و پارسایی لوردهگان (تاسیس ۱۳۸۵)	Lordegan Petrochemical Company	680	Casale	2020	www.lufc.ir
8	 شرکت پتروشیمی هنگام Hengam Petrochemical Company Co. P O F I C شرکت پتروشیمی هنگام (تاسیس ۱۳۸۵)	Hengam Petrochemical Company	725	Haldor Tapsoe	2023	www.hengampc.net



No	Logo	Petrochemical Projects	Production Capacity (KTY)	License	Estimated Op. Date	Website
1		Kermanshah Petrochemical Company (phase 2)	396	Collage	2026	www.kpic.ir
2		Petro Armand Lordegan Chemical Industries	30	Euro Technica Italy 3 rd . Generation	2027	www.lufc.ir
3		Lavan Industry Development Co.	300	Haldor Tapsoe	2027	www.lid-co.com
4		Zanjan Agricultural and Fertilizer Industries	677	Casale	2028	https://znpic.ir