



AMMONIUM NITRATE DISASTER TIMELINE





When heated, **ammonium nitrate** decomposes non-explosively into gases of oxygen, nitrogen, and water vapor; however, it can be induced to decompose explosively by detonation into nitrous oxide and water vapor.[1] Large stockpiles of the material can be a major fire risk due to their supporting oxidation, and may also detonate, as happened in the [Texas City disaster of 1947](#) which led to major changes in the regulations for storage and handling.







There are two major classes of incidents resulting in explosions:







- In the first case, the explosion happens by the mechanism of shock to detonation transition. The initiation happens by an explosive charge going off in the mass, by the detonation of a shell thrown into the mass, or by detonation of an explosive mixture in contact with the mass. The examples are [Kriewald](#), [Morgan](#), [Oppau](#), [Tessenderlo](#), and [Traskwood](#).
- In the second case, the explosion results from a fire that spreads into the **ammonium nitrate** (AN) itself ([Texas City](#), [Brest](#), [Tianjin](#), [Beirut](#)), or to a mixture of an **ammonium nitrate** with a [combustible](#) material during the fire. The fire must be confined at least to a degree for successful transition from a fire to an explosion (a phenomenon known as "deflagration to detonation transition", or [DDT](#)). Pure, compact AN is stable and exceedingly difficult to initiate. However, there are numerous cases when even impure AN did not explode in a fire.





Ammonium nitrate decomposes in temperatures above 210 °C (410 °F). Pure AN is stable and will stop decomposing once the heat source is removed, but when catalysts are present, the reaction can become self-sustaining (known as self-sustaining decomposition, or SSD). This is a well-known hazard with some types of [NPK](#) fertilizers and is responsible for the loss of several cargo ships.






Timeline of major disasters - column AN states the amount of **ammonium nitrate** consumed in the disaster in metric tonnes.







Date	Country	City/Location	Deaths	AN (tonnes)	Notes
January 14, 1916	 United States	Gibbstown, New Jersey	1	1.81	In an evaporating pan of the Repauno works, du Pont Co., 4,000 pounds of ammonium nitrate exploded, possibly caused by a clogged air lance leading to overheating of the nitrate. 1 man was killed and 12 were injured.
April 2, 1916	 United Kingdom	Faversham, Kent	115	700	The Great Explosion : On April 2, 1916, a factory in Uplees, Faversham, exploded after a fire spread to a store of 25 tons of TNT and 700 tons of ammonium nitrate . The blast at the Explosives Loading Company killed 115 people and shattered windows in Southend-on-Sea across the Thames Estuary while the tremor was felt in Norwich .
September 15, 1916	 United States	Oakdale, Pennsylvania	6	1.36	An Aetna Chemical Co. plant suffered an explosion of 3,000 pounds of ammonium nitrate , while concentrating it in a pan by evaporation. The speculated cause was impurities within the nitric acid used to produce the ammonium nitrate . Six men were killed and eight injured. The shock wave was felt at 7 miles.
July 26, 1921	 Germany	Kriewald	19	30	On July 26, 1921, in this railway town (now in Poland) workers tried to dislodge 30 tonnes of ammonium nitrate that had aggregated (solidified into one mass) in two



					wagons. When mining explosives were used on this solid mass the wagons exploded and killed nineteen people.
September 21, 1921	 Germany	Oppau	561	450 (out of 4500)	Explosion at BASF plant Oppau : Another attempt at disaggregation of a fertilizer mix with industrial explosives caused the death of 561 people and left more than 2,000 injured. The fertilizer was a 50:50 mixture of ammonium nitrate and ammonium sulphate and the factory had used this method of disaggregation over 20,000 times without incident. It is thought that, on this occasion, poor mixing had led to certain parts of the mass containing more ammonium nitrate than others. Only 450 tonnes exploded, out of 4500 tonnes of fertilizer stored in the warehouse.
March 1, 1924	 United States	Nixon, New Jersey (now Edison Township)	20	2	1924 Nixon Nitration Works disaster : On March 1, 1924, a fire and several large explosions destroyed a warehouse containing 4800 pounds of ammonium nitrate at the Nixon Nitration Works. The explosiveness of the product was perhaps enhanced, as it had been prepared using nitric acid that had previously been used for the production of TNT .
1925	 United States	Muscle Shoals, Alabama	0		On April 4, 1925, and May 3, 1925, two carloads, each containing 220 barrels of ammonium nitrate , were dispatched from Muscle Shoals, Alabama , and caught fire in transportation. The barrels had been stored in a warehouse with varying humidity for 6 years, so it is believed that they were ignited by friction with their nitrate-impregnated manila paper lining. Other shipments were reportedly more successful.
August 5, 1940	 France	Miramas	0	240	240 tonnes of ammonium nitrate in sacks exploded after being hit by a shell from a nearby fire in a munitions train.
April 29, 1942	 Belgium	Tessenderlo	189	150	An attempt to disaggregate a pile of 150 tonnes of ammonium nitrate with industrial explosives killed 189 people and wounded another 900.
April 16, 1947	 United States	Texas City	581	2086 + 870	Texas City disaster : The cargo ship Grandcamp was being loaded on April 16, 1947, when a fire was detected in the hold: at this point, 2,300 tons of ammonium nitrate in sacks were already aboard. The captain responded by closing the hold and pumping in pressurised steam. One hour later, the ship exploded, killing several hundred people and setting fire to another vessel, the <i>High Flyer</i> , which was moored 250 metres away and which contained 1,050 tonnes of sulfur and 960 tons of ammonium nitrate . The Grandcamp explosion also created a powerful earth shock that broke windows as far as 40 miles away and knocked two small planes flying at 1,500 feet (460 m) out of the sky. The <i>Highflyer</i> exploded the next day, after having burned for sixteen hours. 500 tonnes of ammonium nitrate on the quayside also burned, but without exploding,

					probably because it was less tightly packed. All but one member of the Texas City fire department died.
July 28, 1947	 France	Brest	29	3309	The Norwegian cargo ship Ocean Liberty was loaded with 3,309 tonnes of ammonium nitrate and various flammable products when it caught fire at 12:30 July 28, 1947. The captain ordered the hold to be sealed and pressurised steam was pumped in. As this did not stop the fire, the vessel was towed out of the harbour at 14:00 and exploded at 17:00. The explosion caused 29 deaths and serious damage to the port of Brest.
August 26, 1947	 United States	Presque Isle, Maine	0	217	An A.W. Higgins Company plant was destroyed by a spontaneous heating in a pile of mixed fertilizer. Stored in the plant were 240 tons of Ammonium Nitrate .
1947	 Canada	St. Stephen, New Brunswick	0	360	The Summers Fertilizer Company plant suffered a fire, causing 400 tons of stored ammonium nitrate to be consumed by fire. There was no explosion.
1953	-	Red Sea	0	3600	A fire was detected on the Finnish cargo ship Tirrenia on January 23, 1953, while it was carrying approximately 4,000 tons of ammonium nitrate . Attempts to extinguish the fire with steam were unsuccessful, and the ship was abandoned before it exploded later in the night.
August 7, 1959	 United States	Roseburg, Oregon	14	4.1	The Roseburg Blast: A truck carrying dynamite and 4.5 tons of ammonium nitrate caught fire early in the morning of August 7, 1959. When it exploded it killed 14 people and injured 125 more. Several blocks of downtown Roseburg were destroyed. The accident is locally referred to as "The Blast".
December 17, 1960	 United States	Traskwood., Arkansas	0	140-180	On December 17, 1960, a 96-freight car train suffered partial derailment, in which the last 23 cars were derailed. The derailed cars included: four fuel oil tank cars, two tank cars of gasoline, three tank cars of petroleum oil, four cars of lube oil drums, three cars of liquid fertilizer, one car of fuming nitric acid and two cars of fertilizer grade ammonium nitrate . In this particular accident, neither car of ammonium nitrate exploded. However, the nitric acid reacted with the fuel oil, possibly creating nitrated aromatic compounds, whose explosion resulted in the spread of the ammonium nitrate material around the incident site.
August 30, 1972	 Australia	Taroom, Queensland	3	12	A truck carrying 12 tons of ammonium nitrate experienced an electrical fault and caught fire north of Taroom . After the driver stopped and parked the burning truck, two brothers from a nearby cattle property who saw the fire rode up on motorbikes to assist. The three men were killed when the truck exploded. The explosion burnt out more than 800 hectares (2,000 acres) of surrounding bushland and left a deep crater

					where the truck had been parked. A memorial to the three men was unveiled at the accident site in 2013. [16][17][18][19]
November 29, 1988	 United States	Kansas City, Missouri	6	23 (ANFO)	On November 29, 1988, at 4:07 AM two trailers containing approximately 50,000 lb (23,000 kg) of the explosive ANFO (ammonium nitrate with fuel oil) exploded at a construction site located near the 87th street exit of Highway 71 in Kansas City, Missouri . The explosives were to be used in the blasting of rock while constructing Highway 71. The result of the explosions were the deaths of six firemen from the Kansas City Fire Department's Pumper Companies 30 and 41. Both companies were dispatched after 911 calls indicated that a pickup truck located near the trailers had been set on fire. The responding companies were warned that there were explosives on-site; however, they were unaware that the trailers were essentially magazines filled with explosives. At 4:07 AM one of the "magazines" caught fire and a catastrophic explosion occurred, killing all six firemen instantly — only sparing remains were found. A second blast occurred 40 minutes later, although all fire crews had been pulled back at this time. The blasts created two craters, each approximately 100 feet (30 m) wide and 8 feet (2.4 m) deep. The explosions also shattered windows within a 10-mile (16 km) area and could be heard 40 miles (64 km) away. It was later determined that the explosions were acts of arson , set by individuals embroiled in a labour dispute with the construction company contracted to build the highway.
August 2, 1994	 Papua New Guinea	Porgera Gold Mine	11	80 (ANE)	At 9:45 am, 2 August 1994, 11 workers were killed when the sensitised AN emulsion plant they were working on exploded at the Porgera Gold Mine . The fatal explosion involved at most a few tonnes of explosive. A larger explosion of about 80 tonnes of emulsion (Ammonium Nitrate Emulsion, ANE, UN 3375) was caused by fires under storage facilities at the site at 11:02 AM. There were no fatalities in the second explosion because the site had been evacuated. A mushroom cloud was seen to rise. ANE is an emulsion of ammonium nitrate , fuel, and water.
December 13, 1994	 United States	Port Neal, Iowa	4		Port Neal fertilizer plant explosion : At about 6:06 AM on December 13, 1994, two explosions rocked the Port Neal, Iowa, ammonium nitrate processing plant operated by Terra Industries. Four people were killed and 18 injured. Approximately 5,700 tons of anhydrous ammonia were released, and releases of ammonia continued for six days after the explosions. Groundwater under the processing plant was contaminated by chemicals released because of the blast. The timing of the explosion occurred prior to the start of the arrival of the 8:00 AM shift personnel, or the death toll might have been larger.
January 6, 1998	 China	Xingping, Shaanxi	22	27.6	At midnight on January 6, 1998, the Xinghua Fertilizer company had a series of explosions in the plant. About 27.6 tons of ammonium nitrate liquor was in a

					container there. The explosion claimed 22 lives, with a further 56 wounded. The explosion was officially announced as an accident.
September 21, 2001	 France	Toulouse	31	200-300	On September 21, 2001, at 10:15 AM, in the AZF (Azote de France) fertiliser factory in Toulouse , France, an explosion occurred in a warehouse where the off-specification granular AN was stored flat, separated by partitions. About 200–300 tonnes were said to be involved in the explosion, resulting in 31 people dead and 2,442 injured, 34 of them seriously. The blast wave shattered windows up to 3 km away, and the resulting crater was 10 m deep and 50 m wide. The exact cause remains unknown. The material damage was estimated at 2.3 billion euros . France's Environment Minister initially suggested the explosion "may have been a terrorist attack" as it occurred soon after the September 11 attacks and one worker may have had militant views.
January 2003	 Spain	Cartagena, Murcia	0		The fertilizer storage facility of Fertiberia held a self-sustained decomposition (SSD) fire in January 2003. The fire was controlled after most of the material was removed by mechanical means.
October 2, 2003	 France	Saint-Romain-en-Jarez	0	3-5	A fire broke out in Saint-Romain-en-Jarez (Loire) in a barn, which at the time of the accident contained a gasoline-powered forklift, a battery charger, two 13-kg gas bottles, miscellaneous farm machinery, 500 kg of quicklime, 500 wooden crates, 6,000 to 7,000 plastic crates, and between 3 and 5 tonnes of ammonium nitrate packaged in big bags. Bales of hay and straw were being stored on the mezzanine and ≈500 kg apples kept in the cold storage rooms. The fire started around 3 PM, and fire-fighters were notified of the blaze at 4:02 PM. They arrived on the scene at 4:23 and started to extinguish the fire. At 5:12 PM the explosion occurred. Twenty-six people were injured from the blast, most of them fire-fighters.
March 9, 2004	 Spain	Barracas	2	25	A truck carrying 25 tonnes of ammonium nitrate fertilizer exploded half an hour after a traffic accident on March 9, 2004, killing two people and injuring five others. The explosion, which could be heard at a distance of several kilometres caused a crater five metres deep.
May 24, 2004	 Romania	Mihăilești, Buzău	18	20	Mihăilești explosion : A truck carrying 20 tonnes of ammonium nitrate tipped over on the European road E85 near Mihăilești at 4:57 AM on May 24, 2004. Shortly afterwards, a fire started in the cabin. Two reporters got to the site of the accident and started filming while firemen were trying to stop the fire. Around 5:50 AM the truck exploded, killing 18 and wounding 13 people. A crater 6.5 meters deep and 42 meters in diameter was formed by the explosion.

April 22, 2004	 North Korea	Ryongchŏn	162		Ryongchon disaster: A freight train carrying ammonium nitrate exploded in this important railway town near the Chinese border on April 22, 2004, killing 162 people and injuring over 3,000 others. The train station was destroyed, as were most buildings within 500 metres, and nearly 8,000 homes were destroyed or damaged. Two craters of about ten metres in depth were seen at the site of the explosion. The authorities blamed "human error" for the explosion, although rumours persist that it was in fact an attempt to assassinate the North Korean leader Kim Jong-Il , who was due to be passing through the station at the time.
2007	 Spain	Estaca de Bares	0	400	The NPK fertilizer cargo of the ship Ostedijk sustained a self-sustained decomposition (SSD) fire for 11 days. The ship carried a total of 6012 tonnes of NPK. Cargo hold 2, where the decomposition occurred, contained 2627 tonnes of fertilizer. NPK fertilizer contains about 15% ammonium nitrate . The fire plume reached 10 m in diameter and several hundred meters in length. Special water spears were inserted inside the cargo to extinguish the fire.
September 10, 2007	 Mexico	Monclova, Coahuila	40	22 (ANFO)	On September 10, 2007, near Monclova, Coahuila, México, a pickup truck lost control and crashed into a trailer loaded with 22 tons of ammonium nitrate and fuel oil explosives (ANFO) leaving three occupants in the pick-up truck dead in the crash. A fire then started in the trailer's cabin and approximately 40 minutes after that, a huge explosion occurred, resulting in 37 deaths and around 150 more people injured. A crater 9 m (30 ft) wide and 1.8 m (6 ft) deep was created due to the explosion.
July 30, 2009	 United States	Bryan, Texas	0		A plant in Bryan, Texas (El Dorado Chemical Company), which processes ammonium nitrate into fertilizer, caught fire at about 11:40 AM on July 30, 2009. Over 80,000 residents in the Bryan/College Station area were asked to evacuate south of town due to the toxic fumes this fire generated. Texas A&M University provided shelter at Reed Arena, a local venue on campus. Only minor injuries were reported.
April 17, 2013	 United States	West, Texas	15	240	West Fertilizer Company explosion: A fertilizer company in West, Texas , caught fire. Around 20 minutes later, ammonium nitrate stored there exploded, levelling roughly 80 homes and a middle school. 133 residents of a nearby nursing home were trapped in the ruins. In all, 15 were killed, and about 200 injured. There were reports that the facility had stored more ammonium nitrate than it was allowed to, without regulation by the Department of Homeland Security.
September 6, 2014	 Australia	Wyandra, Queensland	0	56	A truck carrying 56 tonnes rolled on a rural road, exploding shortly after the driver was rescued. The explosion was heard 30 km away with debris being thrown 2 km, it destroyed a highway bridge. The driver and six firemen were injured.

August 12, 2015	 China	Port of Tianjin	173	800	<p>2015 Tianjin explosions: Nitrocellulose stored at a hazardous goods warehouse spontaneously combusted after becoming overly hot and dry, resulting in a fire that 40 minutes later triggered the detonation of about 800 tonnes of ammonium nitrate stored nearby. 110 emergency personnel and 55 residents and employees were killed, while eight are missing^[needs update]. 798 people were injured. There was extensive damage to structures and goods at the port, damage to surrounding apartment blocks, and severe damage to a railway station.</p>
August 4, 2020	 Lebanon	Beirut	135+	2750	<p>2020 Beirut explosions: On August 4, a major fire broke out in a Port of Beirut warehouse and spread to 2,750 tonnes of ammonium nitrate which had been impounded and stored for six years after it was seized from an abandoned ship in 2014. It then detonated, causing immense damage throughout the entire city from the shockwave that was reportedly so intense it was felt in Cyprus, an island about 240 km (150 miles) north-west of Lebanon. A giant orange cloud was seen following the detonation. Currently, there are at least 5,000 confirmed injuries and 135 confirmed deaths. Up to 300,000 people have lost their homes according to Beirut's city governor.</p>