= Zyklon B =

Zyklon B (German pronunciation : [tsyklo?n ?be?] ; anglicized / ?za?kl?n ?bi? / or translated Cyclone B) was the trade name of a cyanide @-@ based pesticide invented in Germany in the early 1920s . It consisted of hydrogen cyanide (prussic acid) , a cautionary eye irritant , and one of several adsorbents such as diatomaceous earth . The product is infamous for its use by Nazi Germany during the Holocaust to murder a million people in gas chambers installed at Auschwitz @-@ Birkenau , Majdanek , and other extermination camps .

Hydrogen cyanide , a poisonous gas that interferes with cellular respiration , was first used as a pesticide in California in the 1880s . Research at Degesch of Germany led to the development of Zyklon (later known as Zyklon A) , a pesticide which released hydrogen cyanide upon exposure to water and heat . It was banned after a similar product was used by Germany as a chemical weapon in World War I. In 1922 , Degesch was purchased by Degussa , where a team of chemists that included Walter Heerdt and Bruno Tesch developed a method of packaging hydrogen cyanide in sealed canisters along with a cautionary eye irritant and adsorbent stabilizers . The new product was also named Zyklon , but it became known as Zyklon B to distinguish it from the earlier version . Uses included delousing clothing and disinfecting ships , warehouses , and trains .

In early 1942 , Zyklon B emerged as the preferred killing tool of Nazi Germany for use in extermination camps during the Holocaust . Around a million people were killed using this method , mostly at Auschwitz . Tesch was executed in 1946 for knowingly selling the product to the SS for use on humans . Hydrogen cyanide is now rarely used as a pesticide , but still has industrial applications . Firms in several countries continue to produce Zyklon B under alternative brand names , including Detia @-@ Degesch , the successor to Degesch , who renamed the product to Cyanosil in 1974 .

= = Mechanism = =

Hydrogen cyanide is a poisonous gas that interferes with cellular respiration . Cyanide prevents the cell from producing adenosine triphosphate (ATP) by binding to one of the proteins involved in the electron transport chain . This protein , cytochrome c oxidase , contains several subunits and has ligands containing iron groups . The cyanide component of Zyklon B can bind at one of these iron groups , heme a3 , forming a more stabilized compound through metal @-@ to @-@ ligand pi bonding . As a result of this new iron @-@ cyanide complex , the electrons that would situate themselves on the heme a3 group can no longer do so . Instead , these electrons destabilize the compound ; thus , the heme group no longer accepts them . Consequently , electron transport is halted , and cells can no longer produce the energy needed to synthesize ATP . In a human weighing 68 kilograms (150 lb) , death occurs within two minutes of inhaling 70 milligrams (0 @.@ 0025 oz) of hydrogen cyanide .

= = History = =

Hydrogen cyanide , discovered in the late 18th century , was used in the 1880s for the fumigation of citrus trees in California . Its use spread to other countries for the fumigation of silos , goods wagons , ships , and mills . Its light weight and rapid dispersal meant its application had to take place under tents or in enclosed areas . Research by Fritz Haber of the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry led to the founding in 1919 of Deutsche Gesellschaft für Schädlingsbekämpfung mbH (Degesch) , a state @-@ controlled consortium formed to investigate military use of the chemical . Chemists at Degesch added a cautionary eye irritant to a less volatile cyanide compound which reacted with water in the presence of heat to become hydrogen cyanide . The new product was marketed as the pesticide Zyklon (cyclone) . As a similar formula had been used as a weapon by the Germans during World War I , Zyklon was soon banned .

Deutsche Gold- und Silber @-@ Scheideanstalt (German Gold and Silver Refinery ; Degussa) became sole owners of Degesch in 1922 . There , beginning in 1922 , Walter Heerdt , Bruno Tesch ,

and others worked on packaging hydrogen cyanide in sealed canisters along with a cautionary eye irritant and adsorbent stabilizers such as diatomaceous earth . The new product was also labelled as Zyklon , but it became known as Zyklon B to distinguish it from the earlier version . Heerdt was named the inventor of Zyklon B in the Degesch patent application (number DE 438818) dated 20 June 1922 . The German Patent Office awarded the patent on 27 December 1926 .

= = Corporate structure and marketing = =

In 1930 , Degussa ceded 42 @.@ 5 per cent ownership of Degesch to IG Farben and 15 per cent to Th . Goldschmidt AG , in exchange for the right to market pesticide products of those two companies through Degesch . Degussa retained managerial control .

While Degesch owned the rights to the brand name Zyklon and the patent on the packaging system , the chemical formula was owned by Degussa . Schlempe GmbH , which was 52 per cent owned by Degussa , owned the rights to a process to extract hydrogen cyanide from waste products of sugar beet processing . This process was performed under license by two companies , Dessauer Werke and Kaliwerke Kolin , who also combined the resulting hydrogen cyanide with stabilizer from IG Farben and a cautionary agent from Schering AG to form the final product , which was packaged using equipment , labels , and canisters provided by Degesch . The finished goods were sent to Degesch , who forwarded the product to two companies that acted as distributors : Heerdt @-@ Linger GmbH (Heli) of Frankfurt and Tesch & Stabenow (Testa) of Hamburg . Their territory was split along the Elbe river , with Heli handling clients to the west and south , and Testa those to the east . Degesch owned 51 per cent of the shares of Heli , and until 1942 owned 55 per cent of Testa .

Prior to World War II Degesch derived most of its Zyklon B profits from overseas sales , particularly in the United States , where it was produced under license by Roessler & Hasslacher prior to 1931 and by American Cyanamid from 1931 to 1943 . From 1929 , the United States Public Health Service used Zyklon B to disinfect freight trains and clothes of Mexican immigrants entering the United States . Uses in Germany included delousing clothing (often using a portable sealed chamber invented by Degesch in the 1930s) and disinfecting ships , warehouses , and trains . By 1943 , sales of Zyklon B accounted for 65 per cent of Degesch 's sales revenue and 70 per cent of its gross profits .

= = Use in the Holocaust = =

In early 1942 , Zyklon B emerged as the preferred killing tool of Nazi Germany for use in extermination camps during the Holocaust . The chemical claimed the lives of roughly one million people in gas chambers installed in extermination camps at Auschwitz @-@ Birkenau , Majdanek , and elsewhere . Most of the victims were Jews , and by far the majority killed using this method died at Auschwitz . Zyklon B was supplied to concentration camps at Mauthausen , Dachau , and Buchenwald by the distributor Heli , and to Auschwitz and Majdanek by Testa . Camps also occasionally bought Zyklon B directly from the manufacturers . Of the 729 metric tons of Zyklon B sold in Germany in 1942 ? 44 , 56 metric tons (about 8 per cent of domestic sales) were sold to concentration camps . Auschwitz received 23 @.@ 8 tons , of which 6 tons were used for fumigation . The remainder was used in the gas chambers or lost to spoilage (the product had a shelf life of only three months) . Testa conducted fumigations for the Wehrmacht and supplied them with Zyklon B. They also offered courses to the SS in the safe handling and use of the material for fumigation purposes . In April 1941 , the German agriculture and interior ministries designated the SS as an authorized applier of the chemical , and thus they were able to use it without any further training or governmental oversight .

Rudolf Höss , commandant of Auschwitz , said that the use of Zyklon @-@ B to kill prisoners came about on the initiative of one of his subordinates , SS @-@ Hauptsturmführer (captain) Karl Fritzsch , who used the substance to kill some Russian POWs in late August 1941 in the basement of Block 11 in the main camp . The experiment was repeated on more Russian POWs , with Höss

watching , in September . Block 11 proved unsuitable for mass killings , as the basement was difficult to air out afterwards and the crematorium (Crematorium I , which operated until July 1942) was some distance away . The site of the killings was moved to Crematorium I , where more than 700 victims could be killed at once . By the middle of 1942 , the operation was moved to Auschwitz II ? Birkenau , a nearby satellite camp which had been under construction since October 1941 .

The first gas chamber at Auschwitz II ? Birkenau was the " red house " (called Bunker 1 by SS staff) , a brick cottage converted to a gassing facility by tearing out the inside and bricking up the windows . It was operational by March 1942 . A second brick cottage , the " white house " or Bunker 2 , was converted some weeks later . According to Höss , Bunker 1 held 800 victims and Bunker 2 held 1 @,@ 200 victims . These structures were in use for mass killings until early 1943 . At that point , the Nazis decided to greatly increase the gassing capacity of Birkenau . Crematorium II , originally designed as a mortuary , with morgues in the basement and ground @-@ level incinerators , was converted into a killing factory by installing gas @-@ tight doors , vents for the Zyklon B to be dropped into the chamber , and ventilation equipment to remove the gas afterwards . Crematorium III was built using the same design . Crematoria IV and V , designed from the start as gassing centers , were also constructed that spring . By June 1943 , all four crematoria were operational . Most of the victims were killed using these four structures .

The Nazis began shipping large numbers of Jews from all over Europe to Auschwitz in the middle of 1942 . Those who were not selected for work crews were immediately gassed . The group selected to die , about three @-@ quarters of the total , included almost all children , women with small children , all the elderly , and all those who appeared on brief and superficial inspection by an SS doctor not to be completely fit . The victims were told they were to undergo delousing and a shower . They were stripped of their belongings and herded into the gas chamber .

The Zyklon B was delivered by ambulance to the crematoria by a special SS bureau known as the Hygienic Institute . The actual delivery of the gas to the victims was always handled by the SS , on the order of the supervising SS doctor . After the doors were shut , SS men dumped in the Zyklon B pellets through vents in the roof or holes in the side of the chamber . The victims were dead within 20 minutes . Johann Kremer , an SS doctor who oversaw gassings , testified that the " shouting and screaming of the victims could be heard through the opening and it was clear that they fought for their lives " .

Sonderkommandos (special work crews forced to work at the gas chambers) wearing gas masks then dragged the bodies from the chamber . The victims ' glasses , artificial limbs , jewelry , and hair were removed , and any dental work was extracted so the gold could be melted down . If the gas chamber was crowded , which they typically were , the corpses were found half @-@ squatting , their skin discolored pink with red and green spots , with some found foaming at their mouths , or bleeding from their ears . The corpses were burned in the nearby incinerators , and the ashes were buried , thrown in the river , or used as fertilizer . With the Soviet Red Army approaching through Poland , the last mass gassing at Auschwitz took place on 30 October 1944 . In November 1944 , Reichsführer @-@ SS Heinrich Himmler , head of the SS , ordered gassing operations to cease across the Reich .

= = Legacy = =

After World War II ended in 1945 , Bruno Tesch and Karl Weinbacher of Tesch & Stabenow were tried in a British military court and executed for knowingly providing Zyklon B to the SS for use on humans . Gerhard Peters , who served as principal operating officer of Degesch and Heli and also held posts in the Nazi government , served two years eight months in prison as an accessory before being released due to amendments to the penal code .

Use of hydrogen cyanide as a pesticide or cleaner has been banned or restricted in some countries . Most hydrogen cyanide is used in industrial processes , made by companies in Germany , Japan , the Netherlands and the US . Degesch resumed production of Zyklon B after the war . The product was sold as Cyanosil in Germany and Zyklon in other countries . It was still produced as of 2000 . Degussa sold Degesch to Detia @-@ Freyberg GmbH in 1986 . The company is now called Detia

@-@ Degesch . A fumigation product similar to Zyklon B is also in production by Lu?ební závody Draslovka of the Czech Republic , under the trade name Uragan D2 . Uragan means " hurricane " or " cyclone " in Czech .

Subsequent use of the word " Zyklon " in trade names has prompted angry reactions in English @-@ speaking countries . The name " Zyklon " on portable roller coasters made since 1965 by Pinfari provoked protests among Jewish groups in the U.S. in 1993 , 1999 , and 2011 . In 2002 , British sportswear and football equipment supplier Umbro issued an apology and stopped using the name " Zyklon " , which had appeared since 1999 on the box for one of its trainers , after receiving complaints from the Simon Wiesenthal Center and the Beth Shalom Holocaust Centre . Also in 2002 , Siemens withdrew its application for an American trademark of the word " Zyklon " , which their subsidiary BSH Bosch und Siemens Hausgeräte had proposed to use for a new line of home appliances in the United States . (The firm was already using the name in Germany for one of their vacuum cleaners .) Protests were lodged by the Simon Wiesenthal Center after the trademark application was reported to BBC News Online by one of their readers . French company IPC 's product names used " Cyclone " for degreasers and suffix " B " for biodegradable : " Cyclone B " was renamed " Cyclone Cap Vert " (" green cap ") in 2013 after protests from Jewish groups . A rabbi said the name was " horrible ignorance at best , and a Guinness record in evil and cynicism if the company did know the history of the name of its product . "

Holocaust deniers claim that Zyklon B gas was not used in the gas chambers , relying for evidence on the research of Fred A. Leuchter , who found low levels of Prussian blue in samples of the gas chamber walls and ceilings . Leuchter attributed its presence to general delousing of the buildings . Leuchter 's negative control , a sample of gasket material taken from a different camp building , had no cyanide residue . In 1999 , James Roth , the chemist who had analyzed Leuchter 's samples , stated that the test was flawed because the material that was sent for testing included large chunks , and the chemical would only be within 10 microns of the surface . The surface that had been exposed to the chemical was not identified , and the large size of the specimens meant that any chemical present was diluted by an undeterminable amount . In 1994 , the Institute for Forensic Research in Kraków re @-@ examined Leuchter 's claim , stating that formation of Prussian blue by exposure of bricks to cyanide is not a highly probable reaction . Using microdiffusion techniques , they tested 22 samples from the gas chambers and delousing chambers (as positive controls) and living quarters (as negative controls) . They found cyanide residue in both the delousing chambers and the gas chambers but none in the living quarters .

= = = Explanatory notes = = =