Incident Title	**LNG Production Plant Partially Destroyed**	
Incident Type	Explosion	
Date	19th January 2004	
Country	Algeria	
Location	Skikda	
Fatalities	**Injuries**	**Cost**
27	74	US$ 841 m (2021) – Ref. 3

Incident Description

Credit: H. Zaourar/AFP via Getty Images

The Skikda Liquified Natural Gas (LNG) complex comprises 6 LNG liquefaction trains (Units 5, 6, 10, 20, 30 and 40). Units 10, 20, 30 and 40 are located parallel to each other on the west side of the LNG storage tank area. Units 5 and 6 are located remotely on the east side of the LNG storage tanks. The administration, maintenance and security buildings are located adjacent to the most westerly unit (Unit 40). Units 10, 20 and 30 (utilising double mixed refrigerant technology) were brought on-line in 1971 – 1973. Units 40, 5 and 6 (utilising single mixed refrigerant technology) were brought on-line in 1981.

On 19-Jan-04 with Unit 40 operating normally, a steam boiler providing high pressure motive steam for the Unit 40 refrigeration compressor turbine driver exploded. The boiler firebox casing was breached, triggering a fireball and a second, much larger, vapour cloud explosion (VCE) which spread outward, completely destroying Units 40, 30 and 20 (43% of the site's production capacity). It also destroyed the administration, maintenance and security buildings, trapping workers under the debris. Damage to Units 10, 5 and 6 and the LNG storage tanks was minimal. However, surrounding facilities and structures including a nearby power plant, an LNG loading berth at Skikda harbour and numerous homes and other buildings in the community were also damaged. The neighbouring refinery was shut down as a precaution. Unit 6 of the LNG Complex was restarted in May 2004. Units 5 and 10 were restarted in September 2004. Units 20, 30 and 40 were eventually rebuilt.

Incident Analysis

Basic cause is believed to be release of mixed refrigerant vapours and/or LNG (probably from a cold box heat exchanger leak – Ref. 3) which were ingested by the air intake of the forced draft combustion air fan at the Unit 40 steam boiler, creating an explosive mixture in the boiler firebox.

Critical factors included: 1) The Unit 40 steam boiler was located very close to the LNG liquefaction and separation sections of the Unit 40 process plant (newer LNG plant designs use gas turbines to drive the refrigerant compressor – these are more efficient, more robust and eliminate the need for a steam boiler), 2) The loss of primary containment (LOPC) at the cold box released hydrocarbon vapour into a congested space between Unit 40, the control room and the boiler (exacerbating the impact of the VCE), 3) Still ambient conditions (no wind to disperse leaking vapours).

Root causes are believed to include: 1) Poor plant layout (proximity of neighbouring LNG liquefaction trains and occupied buildings), 2) Inadequate inspection and maintenance (cold box heat exchanger).

Lessons Learned

1) Escalation impact studies should be carried out to determine the best plant layout and equipment spacing to minimise the risk of a major accident.
2) Land use planning regulations specifying minimum separation distances between high hazard facilities and residential buildings should be enforced.

More Information

1) "The Incident at the Skikda Plant: Description and Preliminary Conclusions", LNG14 Conference Session 1, Doha (Qatar), 21st March 2004.
2) "Deadly LNG Incident Holds Key Lessons For Developers, Regulators", J. Dweck and S. Boutillon, Pipeline and Gas Journal, May 2004.
3) "100 Largest Losses in the Hydrocarbon Industry", Marsh Property Risk Consulting Practice, 27th Edition (2022).

Industry Sector	Process Type	Incident Type
Oil & Gas	LNG Production	Explosion
Equipment Category	**Equipment Class**	**Equipment Type**
Mechanical	Heat Exchanger	Cold Box

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