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Impact of the 11 March, 2011, Tohoku earthquake and tsunami on the chemical industry

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An earthquake of magnitude 9.0 occurred off the Pacific coast of Tohoku, Japan, on March 11, 2011, at 14:46:23 Japan Standard Time (5:46:23 UTC). It generated a tsunami 130 km off the coast of Miyagi Prefecture in northeast Japan, which inundated over 400 km2 of land. The death toll has reached >15,800 according to the Japan National Policy Agency with over 3,700 still missing as of 26 October 2011. Significant damage to or complete collapse of houses also resulted. The earthquake generated strong ground motion; nevertheless most damage was caused by the tsunami, which is a tribute to the effectiveness of Japan's earthquake damage reduction measures in saving lives and property. Nonetheless, the direct losses amount to more than 200 billion US dollars (not counting the costs of the accident at the Fukushima nuclear power plant).

The earthquake and tsunami had a significant impact on all types of industry, and in particular on the petrochemical and chemical industry in the affected areas, resulting in hazardous-materials releases, fires and explosions and forcing businesses to interrupt production. These so-called Natech accidents pose an immediate or even long-term threat to the population and the environment, and can also interrupt the supply chain.

Overall, the earthquake and tsunami took over 30% of Japan's oil production offline, and two refineries are still not or only partially in operation to repair the damage caused by the fires and explosions. The fire-fighting efforts could only be started 4 days after the disaster due to the absence of personnel that had been evacuated and because of the continuing tsunami alerts. In one of the affected refineries the fires could only be extinguished 10 days after the disasters. Many petrochemical and chemical companies reported problems either due to damage to facilities or because of power outages. In fact, in facilities that suffered no or only minor damage the resuming of operations was hampered by continuous aftershocks, tsunami alerts, the evacuation of personnel, a lack of utilities (water, electricity), damage to infrastructures (berths, roads etc.) and the shortage of raw materials.

The Tohoku disaster showed that even prepared countries are at risk and consequently many lessons can be learned for future Natech prevention and mitigation. An in-depth analysis is required to single out the main reasons for the widespread industrial damage and downtime. This analysis, based on information from companies and authorities, in addition to a field visit to the affected areas, is presented.