

Gorlovka Chemical Plant: Addressing a Piece of the Toxic Soviet Legacy

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Introduction

In the Donetsk region of southeastern Ukraine sits an abandoned chemical and explosives facility known as State Enterprise Gorlovka (also spelled Horlivka) Chemical Plant. During the Soviet era, this region of the Ukraine was an important coal and mercury-mining center and supported many related industries. The Gorlovka chemical plant produced several chemicals, including the carcinogen mononitrochlorobenzene (MNCB) and explosive trinitrotoluene (TNT), until production at the plant was halted in 2001. The facility was not decommissioned appropriately and large volumes of both of these toxic compounds were left inadequately stored at the site. In some buildings, the production was stopped mid-process and the compounds were left in the production equipment and piping.

The factory is in the middle of the city of Gorlovka, a city of about

Background. The Gorlovka chemical plant is an abandoned industrial complex in the Donetsk region of Ukraine. The facility produced toxic mononitrochlorobenzene (MNCB) and explosive trinitrotoluene (TNT) until it was abruptly abandoned in 2001. The plant is now the subject of a cleanup project coordinated by a broad group of stakeholders, including the government of Ukraine, regional and municipal authorities, the international not-for-profit Blacksmith Institute, institutional and private sector donors, and local contractors.

Objectives. Remediation efforts at the Gorlovka chemical plant complex aim to reduce environmental health risks to the local community by removing remaining stocks of MNCB and TNT, and analyzing soil and groundwater for potential contamination.

Discussion. The Gorlovka Chemical Plant is one of many toxic sites left from Soviet industrial activities. Throughout Russia, Eastern Europe and Central Asia, former Soviet states are discovering and trying to deal with polluted sites that pose extraordinary risks to human health. Because many of these sites and facilities were secret under Soviet rule, the governments that emerged after the fall of the USSR are still not fully aware of the location and characteristics of sites within their borders.

Conclusions. A successful remediation project at the Gorlovka Chemical Plant could serve as a model for future efforts to engage local, national and international stakeholders in the cleanup of complex legacy pollution sites in the former Soviet Union and around the world.

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300,000. Residents of the city are routinely exposed to fumes from the leaking MNCB storage facility. As of April 2011, the site contained approximately 2,350 tons of MNCB, much of which was stored in leaking drums and tanks, and 30 tons of TNT stored in aboveground equipment and underground tanks. Early in 2011, MNCB could be seen spilling out of drums and running off of the site through surface waters. A senior technical advisor with 20 years of explosives experience with the U.S. Army Environmental Center estimated that each year there was a 5% chance of a massive TNT explosion at the site.

The Gorlovka chemical plant was the only known facility in the former

Soviet Union to produce MNCB, a chemical not widely produced in western countries. The compound was used as a chemical feedstock for the production of dyes, paints, cleaning products and pharmaceuticals. MNCB is a known carcinogen produced by the nitration of chlorobenzene through the introduction of a mixture of nitric and phosphoric acids. The lethal dose of MNCB for a human is believed to be approximately one teaspoon. When the plant was in operation, the facility attempted to incinerate the remaining MNCB in an on-site incinerator. This incinerator could not reach temperatures required to adequately destroy the material and instead the incineration process produced unacceptably high levels



Figure 1 — Deteriorating storage drums containing toxic mononitrochlorobenzene

of dioxins. The Ukraine government has since identified an appropriate high-temperature incinerator facility to receive the MNCB outside of the country.

Discussion

In 2009, Blacksmith Institute learned of the Gorlovka chemical plant as part of the organization’s effort to investigate polluted sites in low- and middle-income countries and build a global inventory of toxic hotspots. Blacksmith Institute partnered with the municipal and national government to begin repackaging MNCB from 400 of the most deteriorated drums and reduce ongoing soil and groundwater contamination. Since then, Blacksmith Institute has further addressed the problem by creating a local stakeholder group, designing a remediation

Abbreviations		
MNCB	mononitrochlorobenzene	Chemical abstract number 88-73-3
TNT	trinitrotoluene	Chemical abstract number 118-96-7

plan, and securing funding from governments, bilateral and multilateral organizations, industry groups and foundations.

The government of Ukraine, which owns the 412-acre site, has asked Blacksmith Institute to lead the TNT remediation effort and provide technical assistance and advice for MNCB repackaging and incineration. Building on the previous partnership with Blacksmith Institute to repackage MNCB, the government began

repackaging the remaining MNCB in the summer of 2011. By the spring of 2012, the bulk of the MNCB should be off-site and Blacksmith Institute can begin removing and neutralizing the TNT. Once both compounds are removed, Blacksmith will analyze the extent of groundwater and soil contamination and assess the need for further remediation. While the potentially contaminated groundwater is not presently used for drinking water in the city, it is unclear if contaminated groundwater is getting into local



Figure 2 — Dilapidated chemical production building at the Gorlovka chemical plant

streams and whether the fractured rock aquifers of the region might take the contamination potentially to a drinking water supply for another community.

One of the primary dangers at the site is the risk of a TNT explosion. Such a blast could potentially spread toxic compounds across the surrounding neighborhoods and turn a dangerous site into an intractable disaster zone. TNT will be extracted from equipment, piping and tanks by pumping steam into the various storage vessels. Once the TNT is removed, it will either be neutralized by composting or will be received by an industrial facility that can either incinerate or reprocess the TNT for productive use. The design of the TNT remediation project is being led by a member of Blacksmith Institute's Technical Advisory Board with over 20 years of experience with

the U.S. Army Environmental Center and extensive experience in the cleanup of hazardous wastes at industrial and military facilities.

The Gorlovka chemical plant is one example of the legacy of toxic sites left by the Soviet Union. Throughout Russia, Eastern Europe and Central Asia, former soviet states are uncovering and trying to deal with polluted sites that pose extraordinary risks to human health. The majority of these sites are the result of mining, smelting, chemical manufacturing and military activities. Because many of these sites and facilities were secret under Soviet rule, the governments that emerged after the fall of the U.S.S.R. are still not fully aware of the location and characteristics of sites within their borders. At many of these sites, local residents can be seen grazing animals

on pastures contaminated with heavy metals, pesticides and radionuclides.

Conclusion

The cleanup effort at the Gorlovka chemical plant is part of a broader effort by Blacksmith Institute to draw attention to and reduce the human health impact of the many toxic sites in the former Soviet region. The government of Ukraine has been proactive in this area and has embarked on an ambitious plan to cleanup legacy toxic pollution in the country. A successful remediation project at the Gorlovka chemical plant could serve as a model for future efforts to engage a broad stakeholder group in the cleanup of complex legacy pollution sites in the former Soviet Union and around the world.