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Horlivka Chemical Plant remediation

A project for the Ministry of Ecology and Natural Resources of the Government of Ukraine funded equally by the Delegation of the European Union to Ukraine and the Swedish International Development Cooperation Agency, and implemented by the United Nations Industrial Development Organization

Annual Project Report 2014

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Prepared by: J. Stucki

Reviewed by: I. Volodin

0. Executive summary

In 2014, all equipment potentially containing hazardous material at the site was cleaned and removed, while the hazardous material was stored in a temporary storage facility. Political instability in Ukraine complicated the final disposal of the recovered TNT. Due to the deteriorating situation that culminated in an armed conflict in Eastern Ukraine from summer 2014, all project activities had to be suspended. The final project activities will have to be specified after assessing the situation on the ground once the situation in Eastern Ukraine allows it.

1. Project activities in 2014

The activities reported here after are extracted from the fourth and fifth Progress Reports submitted by the Blacksmith Institute as part of the reporting requirements of its subcontract.

Due to technical considerations, including the impact of severe weather, Blacksmith Institute was forced to switch the order of implementation of Phase 2 (underground storage tanks) and Phase 3 (production equipment) of the amended project plan. Phase 2 could be accomplished in colder weather, and was thus implemented after phase 3.

PHASE 3

Activities at Building 37b

After the toluene was nitrated in building 4b and washed and purified in building 7a, it used to be dried and flaked in building 37b. Two large drying tanks and six large round drums (Figure 1a) used to chip or flake the TNT were dismantled, removed from building 37b and washed. TNT remnants from the equipment were collected and stored in plastic drums in the temporary secure storage facility (Figure 1b). Wastewater from the washing was treated in the wastewater treatment system.



Figure 1: (a) TNT chipping equipment cleaned by hand, steam and flame (to remove trace elements of TNT), and (b) TNT securely stored in temporary storage

The detailed activities at building 37b included:

- Dismantling of, and extraction of TNT from all equipment and piping;
- Sending all equipment and piping for physical cleaning, steam cleaning and flame cleaning at the designated cleaning site near building 4b; and,
- Collection, packaging and warehousing of TNT production products in the temporary storage facilities.

Activities at Building 7a

Building 7a contained a number of tanks used to wash TNT and collect acid water (Figure 2a). These tanks were removed, washed and repurposed to create the wastewater collection and neutralization system that the Blacksmith Institute used to treat all wastewater from the site.



Figure 2: (a) Interior of building 7a before dismantling and removal the TNT production equipment, and (b) after removal of the TNT production equipment

In particular, the following activities were undertaken at building 7a:

- Dismantling and removal of all equipment and piping (Figure 2b);
- Removing of nitric products from technological equipment and pipelines;
- Sending all equipment and piping for physical cleaning, steam cleaning and flame cleaning at the designated cleaning site near building 4b;
- Collection, packaging and warehousing of TNT production products in the temporary storage facilities; and,
- Collection and neutralization of all acidic wastewater.



Figure 3: (a) Wastewater treatment and neutralization system, and (b) top of the active carbon absorption column

PHASE 2

Emergency Tanks adjacent to building 4b

The two emergency tanks were excavated, removed from the ground, cut open, emptied and cleaned. During the excavation process the following information about the tanks, their contents and the surrounding soils and water were collected:

1. Tank structures were compromised over the years and materials moved in and out of the tanks. Acids probably leaked out of the tanks and mud filtered in;
2. The volume of material inside the tanks was roughly twice what had been estimated; and
3. The area around the tanks was contaminated with acids and, potentially, organics components (TNT or precursors) due to holes in the tanks.

The activities completed around building 4b included:

- Clearing all equipment, debris, contaminated dirt and sludge out of the building and storing any contaminated material in the temporary TNT storage facility, including trays and channels used during emergency “flushes” of the TNT production system;
- Construction of a cleaning area outside building 4b where physical cleaning of equipment by shovel and brush, by steam and by flame took place;
- Completion of acid wastewater neutralization system using a soda solution and an active carbon absorption column;
- Soil excavation around the emergency tanks to inspect the tanks and evaluate options for accessing the interior of the tanks and raising the tanks to ground-level (Figures 4a and 4b);

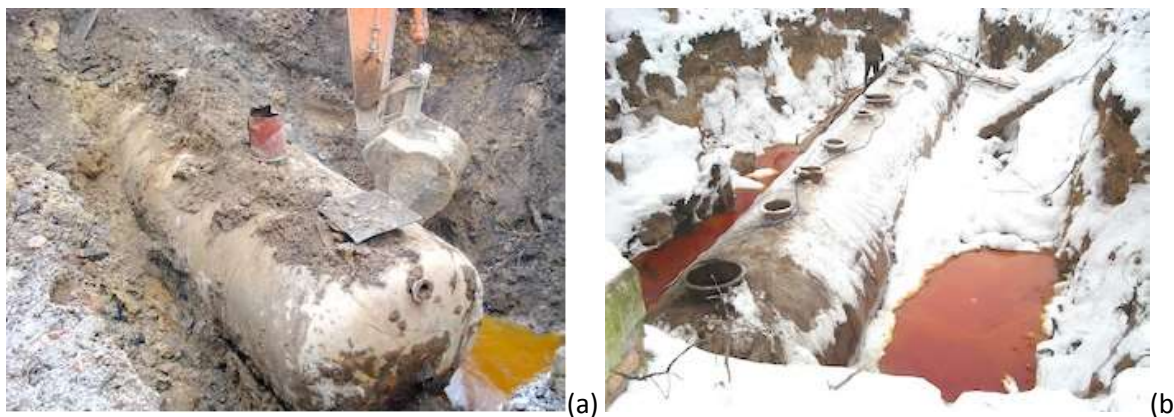


Figure 4: (a and b) Excavation of emergency tank

- Sampling of materials inside the emergency tanks to understand the approximate volume of materials inside tanks and the composition of that material (Figures 5a and 5b). This assessment included an analysis of the material’s susceptibility to explosion by shock;



Figure 5: (a and b) Sampling of material in emergency tanks

- Opening the tanks and removing them from the excavated pits (Figures 6a and 6b);



Figure 6: (a) Opening of emergency tanks, and (b) removal from excavated pit.

- Removal of acidic mud and TNT materials from inside the tanks (Figures 7a and 7b);
- Isolation and storage of TNT and TNT precursor materials from bottom layers of material inside the tanks in the temporary storage facility; and,
- Analysis of neutralized wastewater to ensure no traces of TNT remains – conducted by third party Research and Production Enterprise “Zarya,” in Rubezhnoe city.

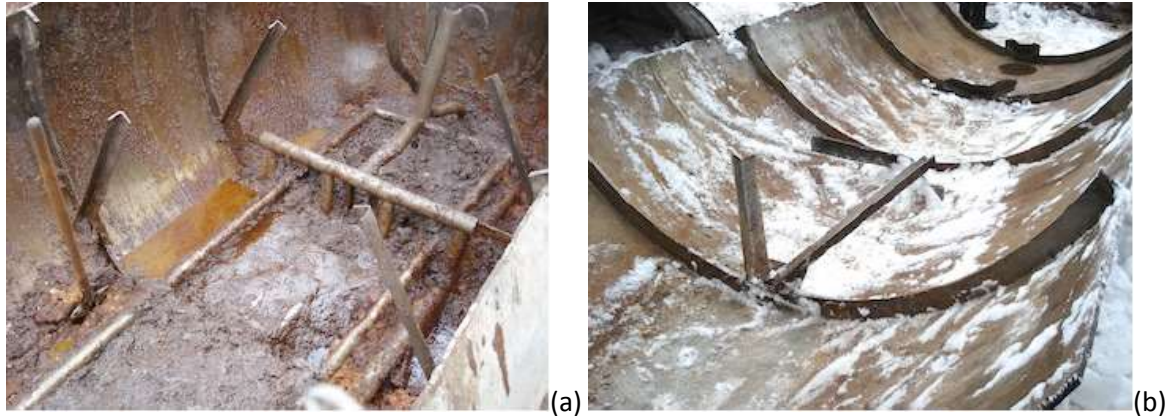


Figure 7: (a and b) Cleaning of emergency tanks

Following Phase 2 and Phase 3 activities, 48 tons of waste material, including approximately 5 tons of pure TNT and 43 tons of mixed material containing TNT and acids were successfully and safely removed from the buildings and underground emergency tanks at the Horlivka Chemical Plant. This material was stored in uniform drums in a temporary storage facility on site at the plant.

In April 2014, the armed conflict in Eastern Ukraine escalated significantly and the city of Horlivka came under the control of an anti-government militia. City officials were removed from their posts and civilian movement in and around Horlivka became unsafe. Armed guards were employed at the project site to ensure the security of the packed waste material until May 31 of 2014, at which time the conflict in the region prevented security personnel from safely entering the site. Since May 31, no personnel associated with the project entered the site.

Project staff monitored the situation in Eastern Ukraine and pursued all available sources of information about the project site and the waste material stored there. It was confirmed through local sources that anti-government militia entered the project site, but no information was available regarding the current state or location of the packaged waste.

Between June and September 2014, the City of Horlivka was the center of significant fighting between government and anti-government forces, which included a campaign by the Ukrainian Army of extensive shelling with unguided ordinance. Implications from this campaign on the project site are unknown.

In September 2014, a large explosion occurred at the Donetsk State Enterprise Chemical Plant, where project partners intended to incinerate the TNT waste. The extent of the damage and state of the incinerator is unknown.

Project expenditures for the year 2014 are summarized in Annex A.

REMAINING PROJECT ACTIVITIES

The results of the environmental assessment at the project site showed extensive contamination of soil and groundwater around the TNT production buildings. It is believed that the contamination of soil and groundwater extends beyond the TNT production area, and includes other toxic chemicals not associated with TNT production from two waste landfills where toxic chemicals were buried during the Plant's operation. This contamination poses a threat to the city residents.

Furthermore, UNIDO recommends continued engagement at the project site after the resolution of the conflict. Regardless of the state of the packaged waste materials, the Horlivka Chemical Plant could pose significant risks to the surrounding population without further remedial actions. While the priority of possible further actions cannot be determined at this time due to the unknown effects of the conflict, it is preferable to return to Horlivka and destroy or safe-guard the TNT. If some of all of the TNT waste was removed or destroyed, the remaining project funds would allow for important steps to be taken to reduce risks from legacy soil and groundwater contamination at the site. An assessment of the site will be conducted once the conditions allow it. Based on this assessment, the remaining project activities will be defined.

Horlivka Chemical Plant remediation						Released Budget	Expenditures	Funds Available
Grant	Fund	Calendar Year	Sponsored Class		EUR	EUR	EUR	
200000065	EU	1000/EE	2012	2100	Contractual Services	153,215.00	153,215.00	0.00
200000919	SIDA	1000/TE	2012	2100	Contractual Services	166,215.00	166,215.00	0.00
200000065	EU	1000/EE	2013			0.00		0.00
200000919	SIDA	1000/TE	2013	1700	Nat.Consult./Staff	10,032.75	10,032.75	0.00
200000065	EU	1000/EE	2014	1600	Staff Travel	1,531.95		1,531.95
				1700	Nat.Consult./Staff	13,609.30		13,609.30
				2100	Contractual Services		-153.06	153.06
200000919	SIDA	1000/TE	2014	1600	Staff Travel	1,487.08		1,487.08
				1700	Nat.Consult./Staff	9,268.14	6,641.00	2,627.14
				5100	Other Direct Costs		90.29	-90.29
					Subtotal	355,359.22	336,040.98	19,318.24