Landfill mining in practice: Dismantling of the old dump Kössen / Austria

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Landfill mining in der Praxis: Rückbau der Altablagerung Kössen / Österreich.

This case study presents in its first part a hands-on assessment of the content of a former landfill which was operated between 1920 and 1985 and accepted all municipal waste streams generated in a predominantly rural environment with tourism as a main economic factor. The assessment was performed – according to the principle "let´s replace assumptions by knowledge" – prior to the complete removal of the landfill content (volume about 50.000 m^3).

The second part gives an overview on the excavation and separation works itself which have been triggered by flood events in summer 2013 (Kössen, a small town located on a river emptying into Chiemsee in Bavaria was the municipality mostly affected by this flood in Western Austria).

Inhaltsangabe

Als Tribut an den Hochwasserschutz wird eine 1920 bis 1985 betriebene Müllkippe „zerlegt und verräumt". Es handelt sich um eine typische ehemalige Universal-Abfallsenke einer Tiroler Gemeinde, gelegen an der Grenze zu Bayern (nächstgelegene Ortschaft: Reit im Winkl) direkt gegenüber der Einmündung eines Bachs in einen Fluss, welcher als Tiroler Ache 25 km weiter in den Chiemsee mündet. Der Beitrag beschreibt in seinem ersten Teil bereits 2008 durchgeführte Erkundungsarbeiten und in der Folge die eigentlichen Rückbauarbeiten (bestehend aus Aushub, Siebung und tlw. händischer Sortierung) eines Volumens von etwa 50.000 m^3, welche durch ein Hochwasserereignis im Sommer 2013 ausgelöst wurden (Kössen war mit 300 evakuierten Einwohnern und hunderten bis ins Erdgeschoss überfluteten Häusern die am stärksten betroffene Gemeinde Westösterreichs). Zum Zeitpunkt der Tagung „Waste-to-Resources 2015" wird das Projekt abgeschlossen sein; es können somit endgültige Ergebnisse präsentiert werden.

Keywords

Landfill mining, Deponierückbau, mechanische Abfallbehandlung, Hochwasserschutz. Landfill mining, landfill reconstruction, mechanical waste treatment, flood protection.

1 Project background and overview

The former landfill "Auwirtslacke" is located in Kössen, a Tyrolean municipality directly on the river Kitzbüheler Ache (in Germany: Tiroler Ache) which flows into Chiemsee, a large lake in Bavaria. It was operated for all kinds of municipal solid waste between end of World War I and the mid 1980ies without whichever emission control.

As a part of mayor flood protection measures in the area it was decided to remove the entire landfill (volume about 50.000 m^3) in order to give the river more space. The excavation works which are followed by screening and sorting the entire landfill content started in July 2014 and are scheduled to be finished in May/June 2015.

2 Exploration phase

In order to have a sound estimate on disposal cost before starting the excavation works a complex assessment on the physical landfill content and its composition to be expected was performed, consisting of

- *the evaluation of historical data* (which turned out as relatively fruitful compared to similar cases)
- *interviews* with former operating staff and finally
- *the digging of trenches* – total length about 800 m, distance between trenches 10 and 15 m – on the entire surface down to the landfill body´s bottom.

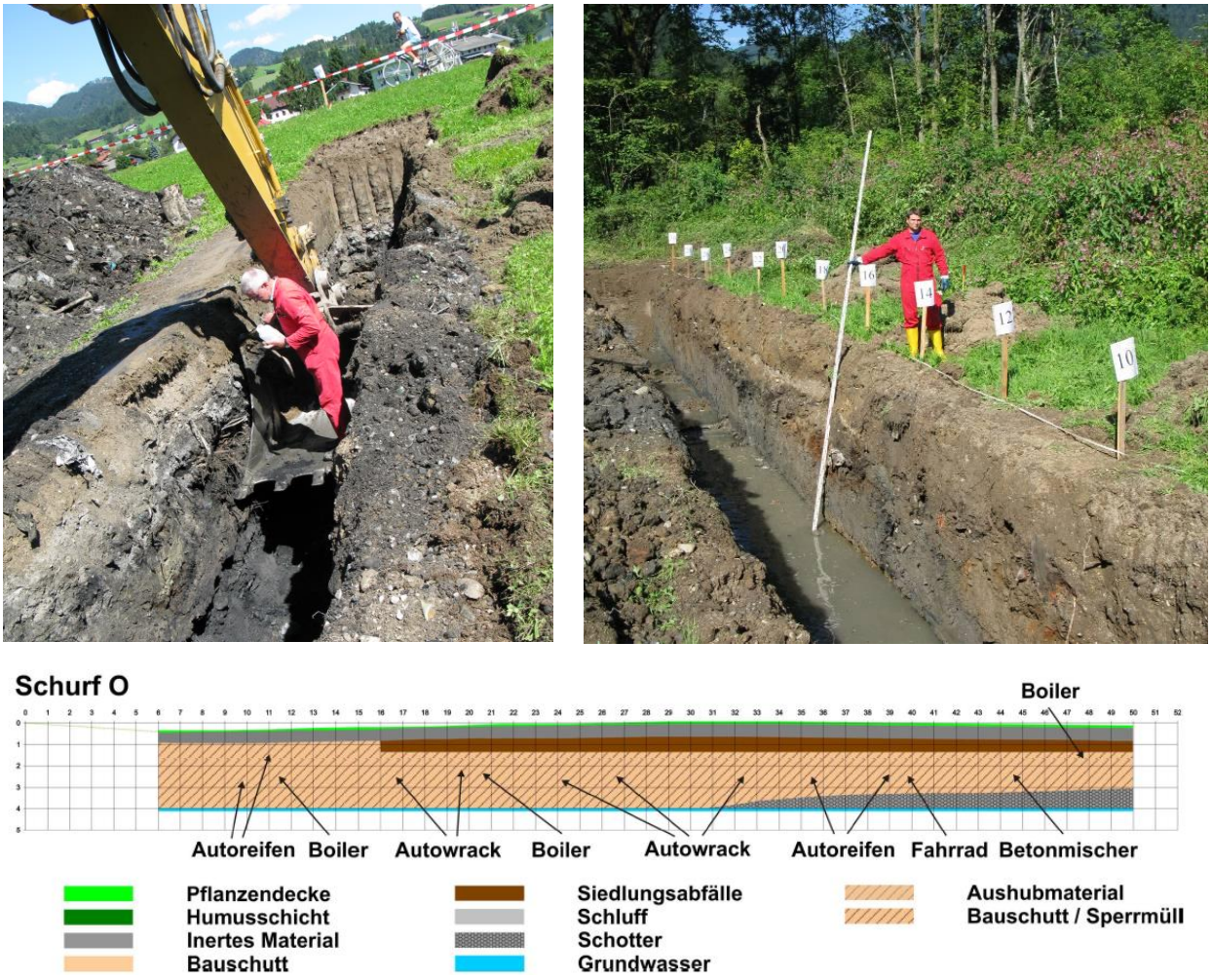

Figure 1 Digging of trenches with sampling (left photo) in order to receive an overview on contaminants as well as volume proportions by documenting measures of single layers

The achieved data gave a good picture on the landfill´s composition which provides not only an indication about expectable disposal cost, but also on the way subsequent excavation works have to be organized. As a particular question the one on the date of final landfill closure (which in such cases often matters in legal terms – who will bear which cost ?) could be answered by finding certain items which allow a clear judgement on its earliest disposal = latest closure date (eg. food and beverage packaging with readable shelf dates, refer to Figure 2).

By way of summarizing the dump´s content can be described as mainly inert materials (excavation, construction and demolition debris) "contaminated" with relatively small amounts of municipal solid waste the putrescible components of which have been largely eluted into the nearby river due to the impact of high groundwater levels over a long period. A significant portion of scrap metal was to be expected since the site served in its last operational decade (1975 – 1985) for disposing of bulky waste only, and car wrecks (for which recovery in Austria was commenced in the late 1970ies).

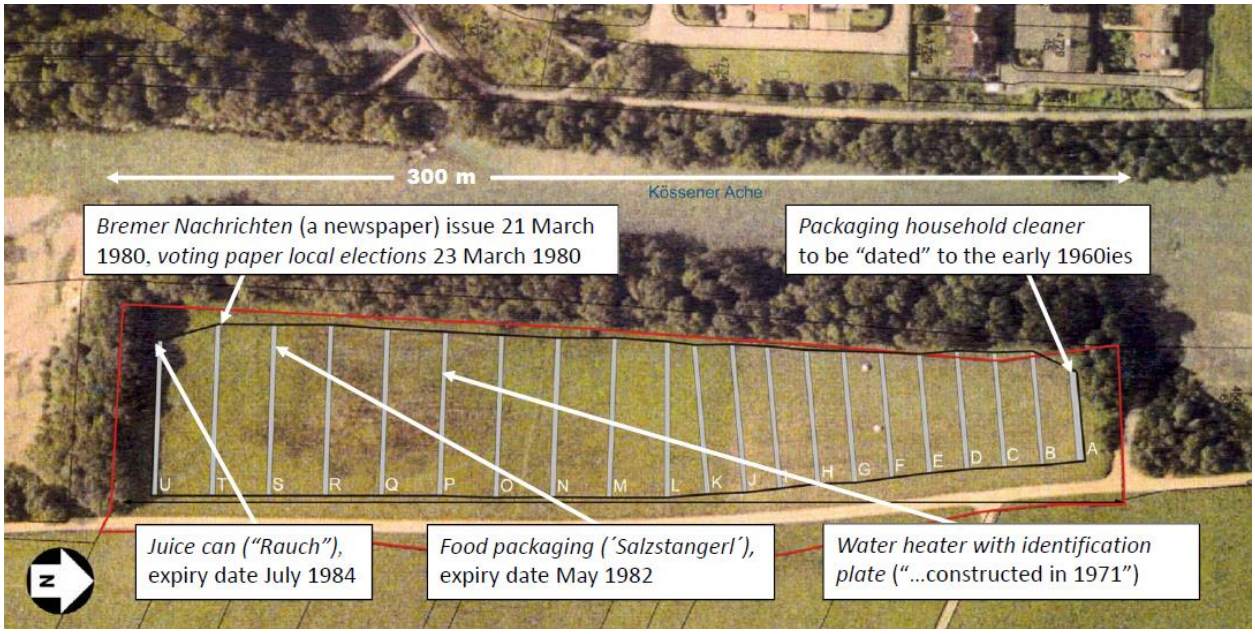

Figure 2 Former Kössen landfill: Survey on the entire location and typical „age tracers" found during the assessment (the numbered bars indicate the before-mentioned trenches)

3 The entire excavation and ´dismantling´ phase

Trigger for a decision to remove the entire dump inventory (with the aim to create space for the two watercourses to join inside their banks even at high water levels) was a major flood event in June 2013. Since landfill regulations in place in Austria and related cost considerations forbid a plain "transfer" to another landfill (or whichever other disposal) an entire "dismantling" was necessary, i.e. to separate inert materials from not decomposed domestic waste components such as wood, glass, plastics and scrap metal.

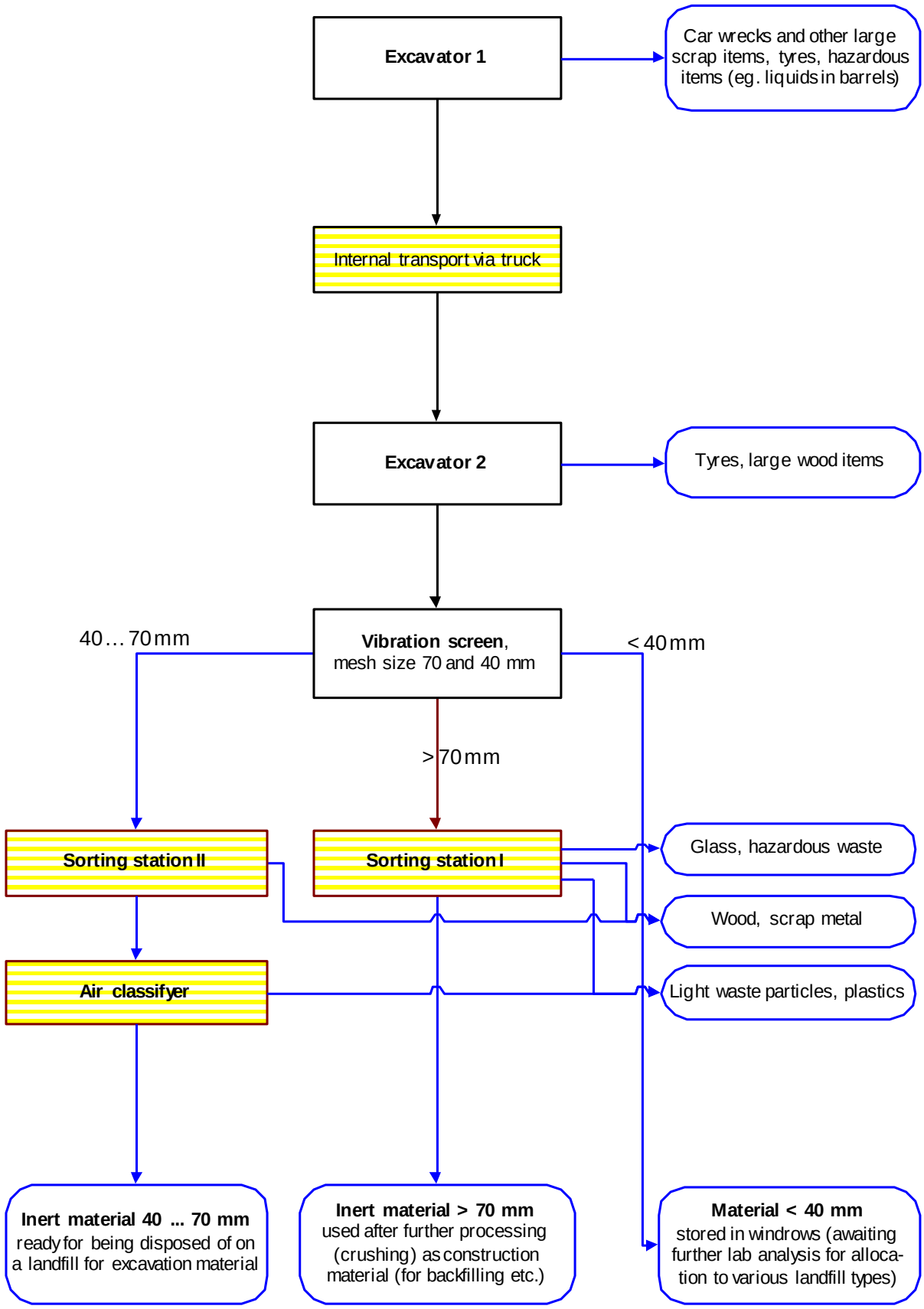

Figure 3 Landfill mining Kössen: Process flow sheet

For a flow sheet of the applied separation process it is referred to Figure 3; the core unit – a vibration screen with two mesh sizes, 40 and 70 mm and manual sorting of its overflow – is shown below.

Figure 4 Core unit applied for dismantling the dump´s inventory: a vibration screen producing a fine fraction (leaving the screen right hand side, windrows visible in background), a fraction 40 … 70 mm (left) for further processing via air classifier, and > 70 mm out of which the fractions wood, glass, scrap metal and plastics/MSW are sorted manually.

4 A few data on cost

At the time of writing this report – the works commenced in July 2014 and will be concluded in May 2015 – total project cost including disposal and related transport efforts is estimated with 1,25 – 1,5 m €.

Manual operations (mainly handpicking of the screen fractions > 70 and 40 … 70 mm) were performed by asylum seekers, mainly from Syria and African countries (note that in Austria the employment of asylum seekers by public entities – the project is carried out by the Municipality – in activities for the public welfare is legally settled at a state-wide payment). Without this contribution (i.e. when applying local wage levels for about 5,500 working hours) total cost would have increased by 10 %.

About 5 % of the total cost could be compensated by revenues (marketing two qualities of ferrous scrap and various non-ferrous metals, for prices refer to Table 1).

Table 1 Revenues / cost (negative values) for relevant fractions, transport ex works included

Fraction	Revenue / cost per ton	Comment
Non-ferrous metals	€ 600	Average revenue for a mixture of stainless steel, aluminium, copper (massive parts, motors, cables), lead (waste pipes, car batteries), and brass
Ferrous metals, quality 1	€ 148 [1]	Items with a strength larger than 6 mm
Ferrous metals, quality 2	€ 133 [1]	Mainly vehicle wrecks and parts thereof (eg. wheels)
Glass	€ 0	Bottles, manually separated into white / coloured
Wood	- € 25	Plywood production
Tyres	- € 80	Thermal utilization (cement industry)
Domestic waste	- € 101	Delivered to a WtoE facility (distance about 400 km)
Oil/water emulsions	- € 108	Oil spillage (mixed with excavation): About - € 300
Inert material > 70 mm	€ 0	Secondary construction material (after crushing)
Inert materials < 70 mm	- € 3 … 30	Depending on landfill category, and distance

5 Literature

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[1] Price level 7/2014 which dropped until 3/2015 by € 40 (application of a contractually defined price index).