

Summary

Construction and demolition waste is one of the major waste flows in the Netherlands. The waste generated in construction, renovation, restoration and demolition is usually transported to waste processing facilities. These facilities handle the waste separation, processing and disposal. For these activities they charge a processing fee. As natural resources are getting more scarce, prices for raw materials are increasing. This market mechanism and environmental government policy together stimulate the recycling of waste materials. The added revenues of selling the processed waste materials are currently for the owner of the waste processing facility. If the waste is separated on-site, as well as processed, this saves the processing fee and the additional revenues are for the contractor. Another benefit are the reductions in transport movements and distance, since the processed materials can be directly transported towards the customer.

Waste is according to the dictionary the useless remainder after processing. Juridical speaking, it is a collection name for materials or objects the owner disposes himself of, is willing to, or has disposed of.

The different sources for construction and demolition waste are construction, renovation, restoration and demolition. The main component category of construction and demolition waste are debris, metal, timber, plastics, glass and other. There are different options to deal with waste products:

1. products can be directly reused
2. the material can be reused
3. energy can be generated from the waste
4. it can be incinerated
5. or disposed as landfill

The governmental policy is to prevent dumping, by imposing high dumping taxes. The targets are described in the LAP, the Dutch National Waste management plan. There are many parties involved in the waste processing industry, from contractors, interest groups to the local and central government.

The annual amount of CDW exceeded 24 Mton in 2004. The composition varies for different user groups:

- Housing
- Utility
- Road and waterworks

Main component is the stone fraction, which accounts for 89, 96 and 99% respectively. The high recyclability grade of 98% for the total construction and demolition waste market is achieved due to the good recycling possibilities of stone rubble.

Processed stone rubble can be used in new concrete, road foundations, waterworks and ground works. The trends and expectations for the future show a growth of 80% in construction and demolition waste for the year 2005-2025.

During the demolition process the aim is to separate different materials on-site, since recycling of gypsum, wood, plastic is only possible when separated properly and is hard to separate afterwards. The extra work on-site saves in processing costs afterwards. Besides separation, processing on-site is also possible with mobile equipment. Transportation to a processing plant is no longer necessary, material can be directly used on-site, transported to a temporary storage location or to the end-user. Internet offers a marketplace to deal in processed products without a middleman.

A demolition license is required when the waste generated in the process exceeds 10 m³. In the application for a license the use of mobile processing equipment must be stated. Beside the license, national governmental rules on handling and processing CDW, like the Bouwstoffenbesluit are active. Boundary conditions apply for the use of mobile processing equipment, not complying means both the loss of the license and a fine, up to 10 euro per ton. The conditions are for instance on nuisance, like sound levels and vibration amplitudes. Countermeasures must be taken to meet the requirements.

Excavators, shovels, skid steers and dozers are used for on-site transportation of bulk materials. Except for the dozers, these machines can be equipped with a quick coupler and act as a tool carrier. Tool carriers are able to use different attachment types for demolition, separation and processing activities. Special case are the extended reach equipment, tool carriers exceptional long booms to get to hard to reach places. Processing wood is done with shredders, grinders or chippers, while stone is being processed by crushers. Separation based on size difference, screening, can be done with drum sieves. Separation based on density difference, sifting, with a wind shifter. Transport over the roads is done with trucks.

The theory behind crushing is based on fracture mechanisms and propagation models. These different mechanisms are applied in different variants. In practice, the most common variants are the impact, jaw and cone crusher. For processing of recycling materials, only the impact and jaw crusher type are used in mobile equipment. This equipment can be a complete plant, or only an attachment for a tool carrier, which is called a bucket crusher.

Automation of the crushing process in complete plants allows high throughput capacities and therefore low cost per unit material. There are bottlenecks that could occur which limit production. Reinforced concrete is hard to crush and could clog the device. One of the solutions is to use a tough primary crusher, which enables extraction of iron by a magnetic overbelt. The secondary, more vulnerable crusher then delivers the desired end-product.

There has been a rapid rise in the market share of mobile crushing devices, from 10% in 1997 to 52% in 2005. Expected market share for the year 2012 is even 62%. The quick adaption of the industry to use mobile crushing devices is not only due to market circumstances and government incentives. The availability of already well-developed equipment also plays a role. The mobile crushing devices originate from the mining industry and are, although adapted for, not newly designed for recycling applications. Investment in proven technology is safer, contractors are likely to await developments.

Although the annual volumes of construction and demolition waste seem to have stabilized for the last five years, a scenario study predicts a growth of 80% for 2025. The economical viability of mobile crushing depends greatly on the market prices of recycled aggregate. These prices depend on demand and supply, a growth of 80% in supply would require at least the same growth in demand, for prices not to collapse. Therefore, focus should be on quality and on new applications. High quality granulates are an advantage in a high competition market, while new applications ensure sufficient sales possibilities. Also the development of applications for low quality products is important, to prevent them being disposed as landfill.

The use of on-site processing equipment requires a license and is bound to certain environmental demands and restrictions. These restrictions can get more firm in the future, like for instance dust emissions. With more stringent European directives for (dust) emissions and concentrations in the air in the future, developments like a moisturizing cannon, which traps particles could ensure future usage of outside mobile processing.

The use of an online marketplace for trading processed waste materials, such as granulate, offers advantages. A map shows the location, the quantity and the quality of the material. The client is able to find the nearest location with his required materials and can get directly in touch with the supplier. The total amount of transport kilometers can be limited, when using this trading method.

For large projects, combination equipment can be used, whether integrated in one installation or the combination and interaction of different single-piece equipment. What would be more cost-effective? A separate jaw crusher, impact crusher(s), wind shifter and drum sieve versus a complete processing plant. Also important factors to look at are the flexibility, scalability, robustness etc.