WET PROCESSING AND RECYCLING OF DEMOLITION WASTE < 8 mm

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Abstract

Conventional recycling process of demolition waste creates about 25 - 30 % fines (mostly < 8 mm) which has low quality - grain size distribution, organic content and high ammount of brittle particles - and can therefore only be used in low price applications. The new wet process creates products, which are in quality range of natural products or even higher. High quality applications are possible. Heart of the plant is an attrition combined with classification and sorting by density. Agglomerated grains in the feed are soluted, brittle grains are destroyed, the following classification separates the mud as well as organic parts. The process was realized and tested in pilot scale. Application tests gave outstanding results in the field of concrete and building material. During the development of the process a new method (new for recycling industry) was used for analysis of products and by products - the sink and float analysis.

General problems of fines and brittles - investigation targets

The use of recycling material (under 8 mm) in high quality applications is not possible mainly for four reasons:

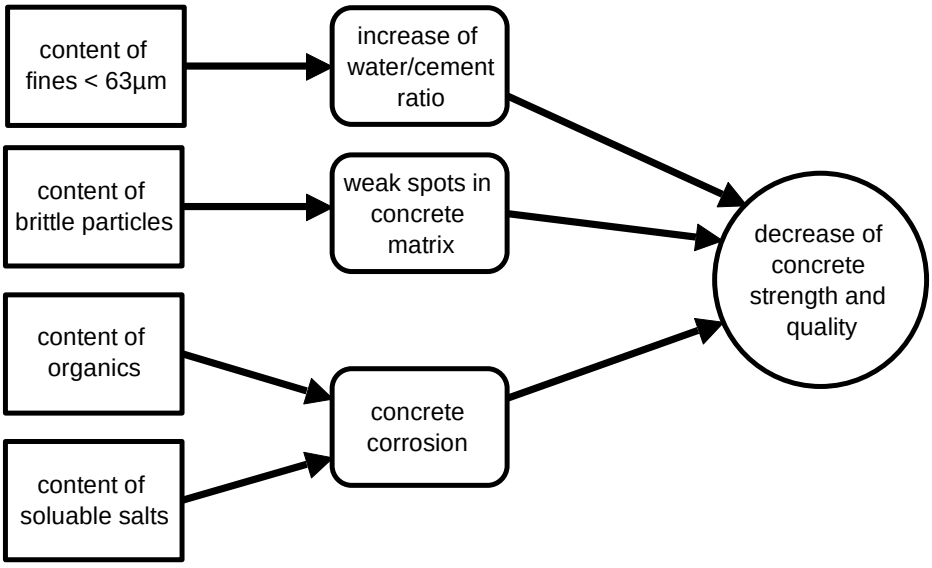

Figure 1 : Reasons for low quality of demolition waste < 8 mm for use as concrete aggregates

The main target of the investigation program was to develop a process method to transform this material into a high quality product for use as concrete aggregates.

Application and development of a new analysis method

Mineral processing characterises raw materials by particle size distribution and (for density) by sink and float analysis. In recycling industry untill now this characterization is usually done by description only.

e.g.

30 %	bricks	5 %	glass
40 %	concrete	1 %	metal
15 %	bituminous	4 %	wood
5 %	plastics	100 %	total

In this investigation program sink and float analysis of each particle size fraction was excecuted, to achieve reproduceable evaluation of preparation results.

Flow sheet development

After excecution of lab- and pilot scale test series, the basic engineering for an industrial plant was designed. The complete process is realised by combination of well known technologies used in mineral processing industries. Heart of the plant is an attrition combined with desliming and classification and (if necessary) gravity separation by tabling and jigging (for sand and for gravel)

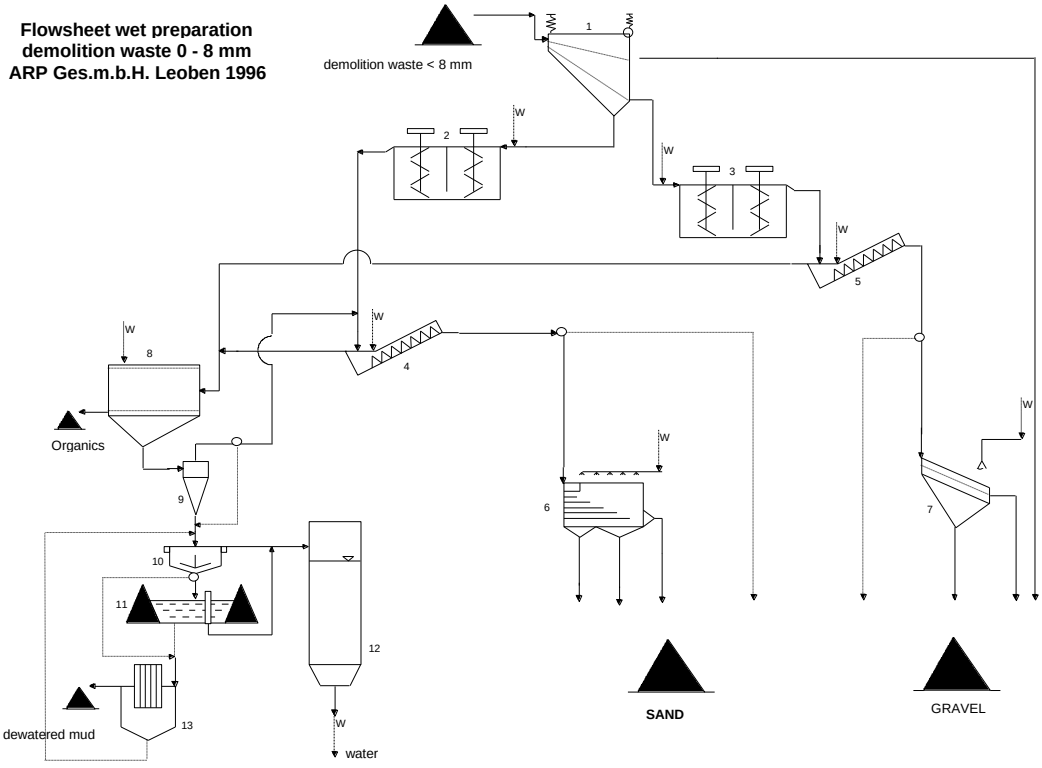

Figure 2 : Flow sheet of wet preparation process for demolition waste recycling < 8 mm

1	Mogesen Sizer	8	Drum screen
2	Attrition 0-2mm	9	Hydrocyclone
3	Attrition +2mm	10	Thickener
4	Screw classifier	11	Settling lagoon
5	Screw classifier	12	Tank for water reclaiming
6	Shaking table	13	Filtering
7	Wet screen	W	water

Product properties for use in concrete

In contrast to the feed material (untreated) the sand and gravel product contains weather organics and soluable salts, nor fines and brittle particles. Figure 3 shows a comparison of particle size distribution before and after the preparation process.

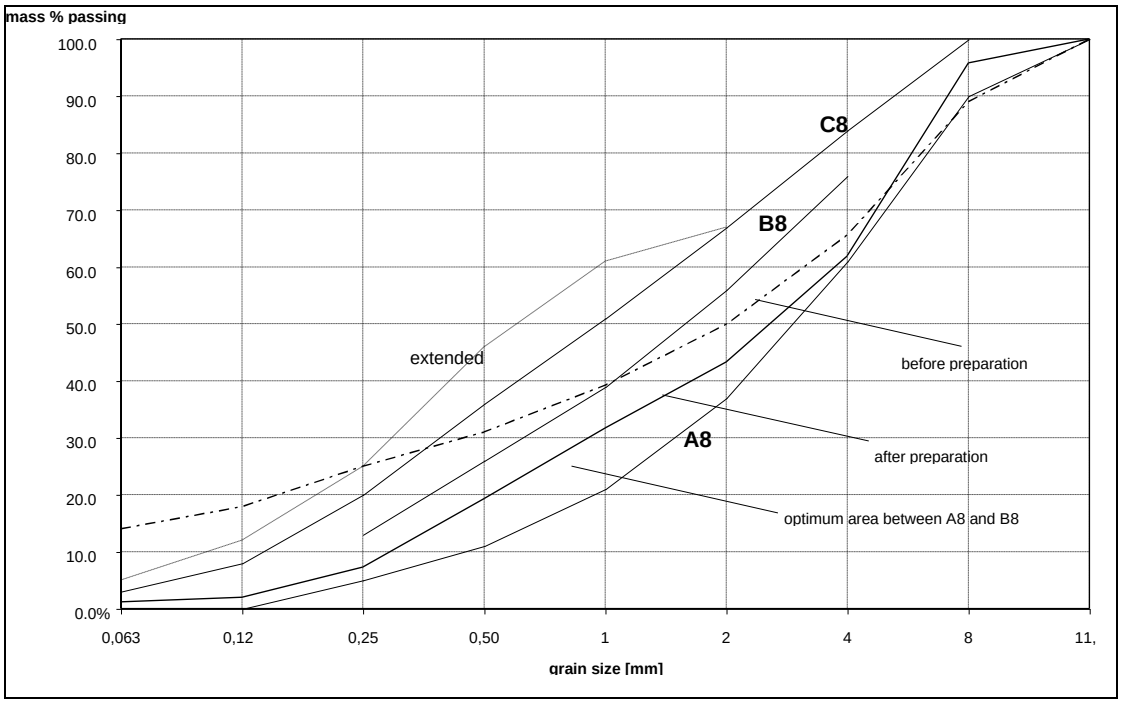

Figure 3 : Particle size distribution following ÖNORM B 3304

Application tests for use as concrete aggregates were excecuted by measuring compressive and flexural strength after 7 and after 28 days.

N/mm^2	before prep.	after prep.	B300 min	B400 min
flexural strength after 7days	3.9	5.6		
flexural strength after 28days	4.5	6.4		
compressive strength after 7days	17.5	31.3	23.0	32.0
compressive strength after 28days	23.2	42.8	30.0	40.0

Figure 4 : Concrete strength with addition of gravel before and after preparation process

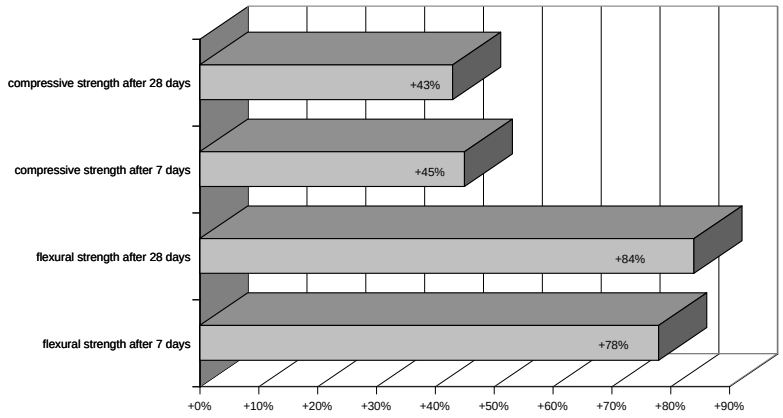

Figure 5 : Percentual increase of concrete strength by preparation of aggregates

Mass balance and economics

The mass balance in Figure 6 refers to pilot production with a representative sample (< 8mm) taken from an austrian recycling plant, in which this fraction is approximately 20 - 25 % of feed material.

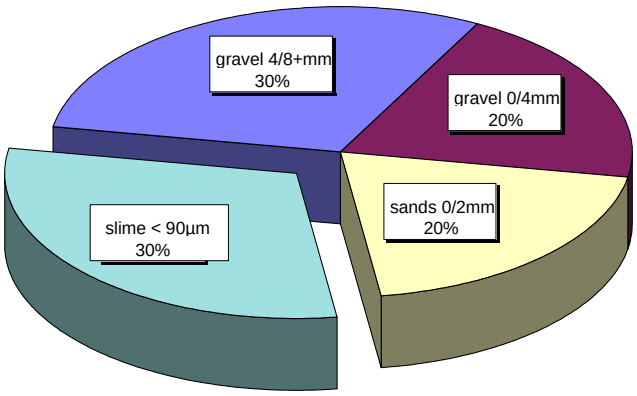

Figure 6 : Mass balance (rough) of wet preparation process

The cost and income calculation is based on a plant capacity of 20 to/hour (120.000 to per a)

depreciation	50,--		total cost	-107,--
Personal	35,--		income	80,--
energy	14,--		difference*)	- 27,--
consumptions	8,--		*) payed by deposit cost	

Figure 7 : costs and income calculation per ton of input material (feed) in Austrian Schilling