



COIN Project: Towards a zero-waste technology for concrete aggregate production in Norway

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Aggregate production is a mining operation where no purification of the “ore” is necessary. Still it is extremely rare that an aggregate production plant is operating on the basis of zero-waste concept. This is since historically the fine crushed aggregate (particles with a size of less than 2, 4 or sometimes 8 mm) has been regarded as a by-product or waste of the more valuable coarse aggregate production. The reason is that the crushed coarse aggregates can easily replace coarse rounded natural stones in almost any concrete composition; while, the situation with the sand is different. The production of coarse aggregate normally yields fine fractions with rough surface texture, flaky or elongated particles an inadequate gradation. When such a material replaces smooth and rounded natural sand grains in a concrete mix, the result is usually poor and much more water and cement has to be used to achieve adequate concrete flow.

The consequences are huge stockpiles of the crushed fine fractions that can't be sold (mass balance problems) for the aggregate producers, sustainability problems for the whole industry and environmental issues for society due to dumping and storing of the fine co-generated material. There have been attempts of utilising the material in concrete before; however, they have mostly ended up in failure. There have been attempts to adjust the crushed sand to the properties of the natural sand, which would still give a lot of waste, especially if the grading would have to be adjusted and the high amounts of fines abundantly present in the crushed sand would have to be removed. Another fundamental reason for failure has been that historically such attempts have mainly ended up in a research carried out by people (both industrial and academic) with aggregate background (= parties willing to find market for their crusher fines) providing only conclusions already well known by the engineers involved in concrete production.

Due to the pressing situation with the left resources of the natural sand and gravel in Scandinavia, a new and different development approach has been recently attempted with the Concrete Innovation Center (COIN) in Norway. The centre is a research based innovation project that has brought together and served as a source of funding to facilitate the crucial interaction between the professionals from the different involved industries (quarrying machinery supplier, aggregate producers, concrete producers and concrete contractors) and the academic people from universities and research institutions, in order come up with a better crushed sand solution for the future. The concept under development has been a zero-waste technology for aggregate production, where instead of reducing the amount of the crushed fines their properties are rather engineered to crucially increase the overall performance of the sand in concrete. The project also involves collaboration with a state-of-the-art aggregate production plant where the new technology has already been implemented. The production process there is based on the new engineered sand concepts successfully supplying 100% all of the produced fractions to concrete and asphalt producers.