The Energy-Efficient Quarry: Towards improved understanding and optimisation of energy use and minimisation of CO_2 generation in the aggregates industry.

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Extraction and processing of rock materials to produce aggregates is carried out at some 20,000 quarries across the EU. All stages of the processing and transport of hard and dense materials inevitably consume high levels of energy and have consequent significant carbon footprints. The FP7 project "the Energy Efficient Quarry" (EE-Quarry) has been addressing this problem and has devised strategies, supported by modelling software, to assist the quarrying industry to assess and optimise its energy use, and to minimise its carbon footprint.

Aggregate quarries across Europe vary enormously in the scale of the quarrying operations, the nature of the worked mineral, and the processing to produce a final market product. Nevertheless most quarries involve most or all of a series of essential stages; deposit assessment, drilling and blasting, loading and hauling, and crushing and screening. The process of determining the energy-efficiency of each stage is complex, but is broadly understood in principle and there are numerous sources of information and guidance available in the literature and on-line. More complex still is the interaction between each of these stages. For example, using a little more energy in blasting to increase fragmentation may save much greater energy in later crushing and screening, but also generate more fines material which is discarded as waste and the embedded energy in this material is lost. Thus the calculation of the embedded energy in the waste material becomes an input to the determination of the blasting strategy. Such feedback loops abound in the overall quarry optimisation. The project has involved research and demonstration operations at a number of quarries distributed across Europe carried out by all partners in the EE-Quarry project, working in collaboration with many of the major quarrying companies operating in the EU.

The EE-Quarry project is developing a sophisticated modelling tool, the "EE-Quarry Model" available to the quarrying industry on a web-based platform. This tool guides quarry managers and operators through the complex, multi-layered, iterative, process of assessing the energy efficiency of their own quarry operation. They are able to evaluate the optimisation of the energy-efficiency of the overall quarry through examining both the individual stages of processing, and the interactions between them. The project is also developing on-line distance learning modules designed for Continuous Professional Development (CPD) activities for staff across the quarrying industry in the EU and beyond. The presentation will describe development of the model, and the format and scope of the resulting software tool and its user-support available to the quarrying industry.