

## **Natural stone muds as secondary raw materials: towards a new sustainable recovery process**

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The production of residual sludge is a topical issue, and has become essential to recover and reuse the materials, both for the economics and the environmental aspect. According to environmental EU Directives, in fact, the stone cutting and processing should be characterized by following objectives, targets and actions: the reduction of waste generated, the decreasing of use of critical raw material, the zero landfilling of sludge and decreasing in potential soil contamination, the prevention of transport of dangerous waste, the reduction of energy consumption, the zero impact on air pollution and the cost reduction. There are many industrial sectors in which residual sludge has high concentrations of metals and/or elements deemed harmful and therefore hazardous waste.

An important goal, for all industrial sectors, is an increase in productivity and a parallel reduction in costs. The research leads to the development of solutions with an always reduced environmental impact. The possibility to decrease the amount of required raw materials and at the same time the reduction in the amount of waste has become the aim for any industrial reality.

From literature there are different approaches for the recovery of raw and secondary materials, and are often used for the purpose of chemical products that separate the elements constituting the mud but at the same time make additional pollutants. The aim of the study is to find solutions that are environmentally sustainable for both industries and citizens.

The present study is focused on three different Piedmont rocks: Luserna, Diorite from Traversella and Diorite from Vico, processed with three different stone machining technologies: cutting with diamond wire in quarry (blocks), in sawmill (slabs) and surface polishing.

The steps are: chemical analysis, particle size analysis and mineralogical composition and characterization of the sludge obtained from the various machining operations for the recovery of the metal material by cutting and waste rock through an economical and simple method, without the use of chemical products.

The technical feasibility of the use of stone mud for construction materials, and industrial mud for alloy reuse, is well known on a scientific and lab scale, but it is not industrially developed because of the wide variety of waste generated and logistic or organization difficulties of interaction among companies of different sectors. This can be realized implementing an existing plant with industrial technologies in order to valorize the product "mud", to reuse the heavy metals in the process and therefore to minimize the volume of sludge produced.

A further progress to the previous researches, that is beyond the results obtained in this field, will be the identification of the best technique to eliminate the small amount of heavy metals in the mud fines. This is important because, removing all the toxic substances, the mud properties can be improved in order to be reused in the other process as secondary raw material.