GRECIAN MAGNESITE

DUNITE TO NANO-SILICA

A holistic approach to waste management

Extraction & processing of magnesite

In the southernmost part of the ophiolite complex in western Chalkidiki Peninsula, the Yerakini area, magnesite ($MgCO_3$) deposits are exploited by **GRECIAN MAGNESITE** producing magnesia (MgO) as final product. Several hundreds of millions of tons of snow-white, cryptocrystalline magnesite have been deposited as fracture-filling material in the ultramafic part of this complex.

Ore is extracted in open pits - the mineable depth of the deposits exceeds 70m- and the process to transform the extracted run of mine to final products, consists of four different stages: i) pre-beneficiation, ii) main beneficiation, iii) calcination/sintering and iv) end-processing.

Grecian Magnesite mine

Grecian Magnesite mining waste

Dunites and harzburgites, which are serpentinized to different degrees, are the hosts to the magnesite veins. Thus, during the processing of magnesite large amounts of dunite/harzburgite waste are produced. The mean mineralogical composition of this material in the western Chalkidiki ophiolite complex is **55-60% olivine**, **30-35% serpentine and 9-12% pyroxenes**. In 2008, the annual dunite waste material produced by GM beneficiation process was around one million tonnes.

Magnesite veins and host rock

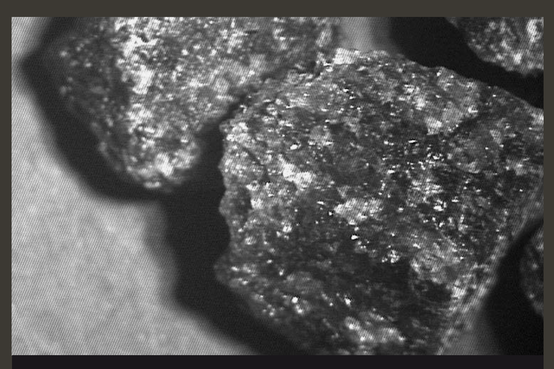
Unprocessed Dunite waste

Valorising dunite waste

In the frame of ProMine project many routes for beneficiating the dunite waste have been tested such as selective mining, dense media separation, size clasification, shaking table and magnetic separation. The target of this research would be to provide a material **rich in olivine (>75%)** with a **low serpentine content (<10%)** and a correspondingly **low LOI value (1.5-2.0%)** that would be suitable for the production of nano-silica for cement and paper applications.

Serpentine, dolomite and magnesite found in dunite waste rock - which are the main undesirable phases for nano-silica production- have considerably lower bulk densities than pure olivine: ~2.65g/cm³, 2.80g/cm³ and ~3.00g/cm³ respectively compared to 3.30-3.40g/cm³ for olivine. This **difference in bulk density** gave strong indications that **gravity concentration methods** could be used effectively in this case.

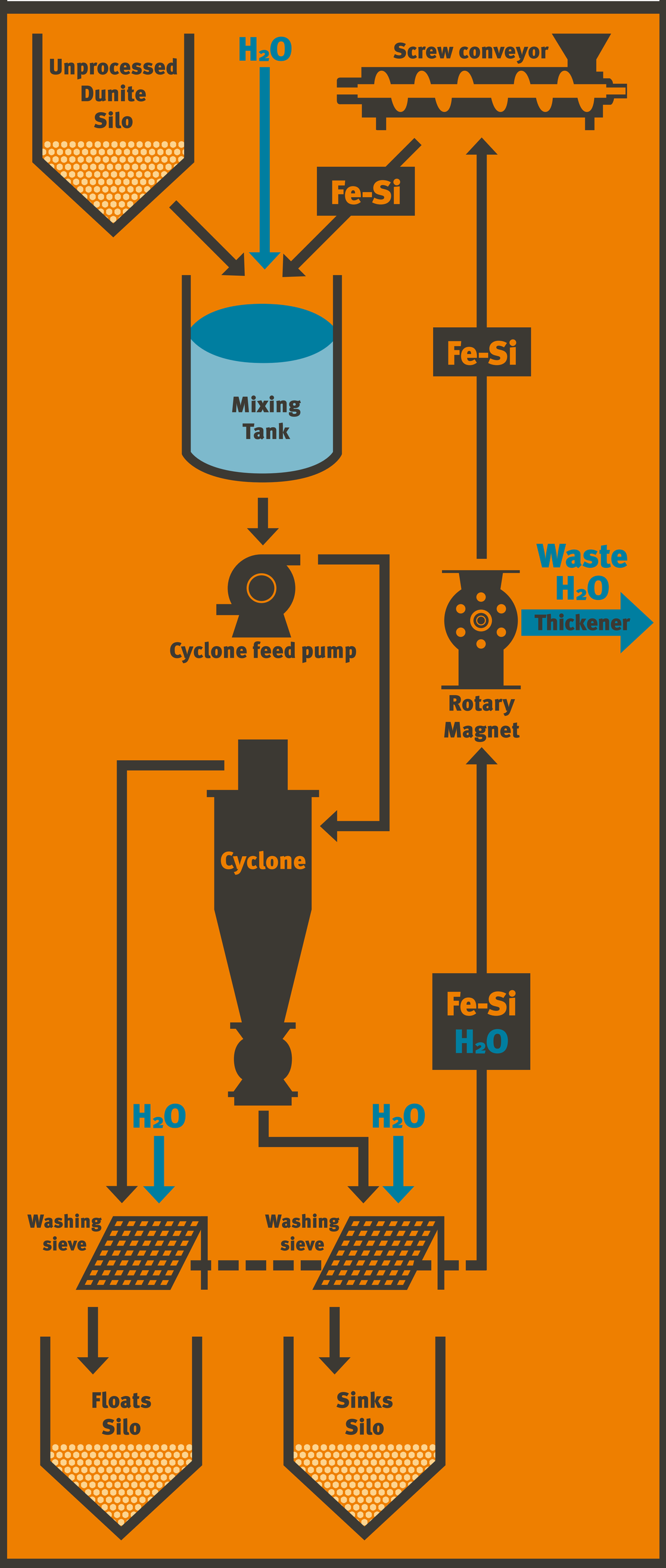
After both laboratory research and industrial trials, it was proven that by processing the dunite waste material with Dense Media Separation method a product fulfiling the desired purity specifications could be sustainably produced.



Olivine in 20X

Dolomite in 20X

Dunite beneficiation process



Funding Scheme

ProMine — SEVENTH FRAMEWORK PROGRAMME

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27) KWH-MIRKA
28) GRECIAN MAGNESITE