The MEAB Group involved in Nickel Recovery from Stainless Steel Industrial Waste

RECONI (Grant agreement: RFSR-CT-2011-00039): **Recovery of nickel from Waste in Stainless Steel Industry.**

Project carried out with a financial grant of the Research Fund for Coal and Steel

Concept and Objectives

Pickling processes in stainless steel industry produce large amounts of waste acid and neutralization sludge which contains a lot of nickel. In Europe more than 2500 tons of nickel per annum is deposited. Thus, the aims of the project are to recover and re-use this nickel and minimize the raw material consumption in stainless steelmaking.

Two processing routes, one for pickling waste acid and one for neutralization sludge, with several well-coordinated unit operations will be investigated. The recovered nickel will be re-used in the steelmaking process. The recovery processes can be used for both the main pickling systems - HF/HNO_3-pickling and HNO_3-free pickling.

The first processing route - referred to as waste acid route - contains the following unit operations:

- Retardation to lower the sludge amount,
- First precipitation to precipitate most of the non-nickel substance,
- Resin/chemical treatment to purify the residual nickel solution,
- Second precipitation to precipitate the nickel as nickel enriched sludge
- Briquetting to feed the nickel enriched sludge in the steelmaking process.

The second processing route – referred to as neutralization sludge - contains the following unit operations:

- Selective leaching to dissolve ideally only the nickel from sludge,
- Filtration and pH-adjustment to separate leaching solution from residual sludge and to prepare solution for next unit,
- Solvent Extraction to purify and concentrate the nickel solution
- Electro-deposition to transfer the nickel in solid form to the steel making process.

Both processing routes will be investigated in laboratory tests and afterwards in field tests at locations of the participating stainless steel companies since each processing route has its own advantages concerning the economic efficiency and applicability.
To guarantee the applicability at almost every location in Europe both main pickling systems, HF/HNO_3 and HNO_3-free pickling, will be investigated in the project since the waste acid and the neutralization sludge of the two pickling systems differ elementary in concentration and composition, respectively.

The engagement of MEAB

In the RECONI project, MEAB will be involved in the development of separation techniques of nickel, based on state-of-the-art solvent extraction technology. More precise, MEAB will be responsible for design, adaption and operation of a solvent extraction pilot plant in order to demonstrate the nickel separation and purification. The pilot line will be set up at MEAB in Aachen, Germany and will include a nickel solvent extraction separation unit with mixer-settlers having a total processing flow capacity of 50 l/h.

The pilot plant will be designed and constructed as to fit in a single container in order to produce a mobile unit, suitable for field testing. The total engagement of MEAB will be 3300 man hours during three and a half year.