Sensor-sorting Automated Technology for advanced Recovery of Non-Ferrous metals from waste

cip competitiveness and innovation framework programme 2007–2013

ECO-INNOVATION
WHEN BUSINESS MEETS THE ENVIRONMENT

1st SATURN Workshop

11th March 2010

Prof. Dr.-Ing. Thomas Pretz

RWTH AACHEN UNIVERSITY

SATURN – Project information

OVERVIEW SATURN

- Project start: August 3rd, 2009
- Project duration: 33 month
- Estimated costs: 1.530.583 €
- EU-funding: (47,3%) 723.648 €
- Partners: TiTech, MeKon, I.A.R., Envirolink, pbo

OVERVIEW SATURN

Changed waste legislation

Waste directive

1. Prevention
2. Preparing for re-use
3. Recycling
4. Other recovery, e.g. energy recovery
5. Disposal

Landfill directive

- Only waste that has been subject to treatment is landfilled (except for inert waste)
- Reduction of biodegradable waste going to landfills must be reduced

OVERVIEW SATURN

Frame of the project

- Due to European waste legislation, more and more mixed municipal solid waste (mixed MSW) is being processed instead of final disposal on landfills
  - Incineration
  - Mechanical-biological treatment (MBT)

Source for mechanical processing and enrichment of metals, in particular NF-metals

- NF metals represent a waste fraction that exhibits good reusability
  - Chemically stable during treatment (thermal and physical)
  - Increasing market values
  - High energy efficiency when recycled

OVERVIEW SATURN

Goal of the project – Energy saving

- **Non-ferrous-metal (NF-metals)** fractions of high purity can be used as **secondary raw materials**
- Extraction of primary raw metals from ores consumes vast amounts of energy

→ Energy savings due to the use of recycling metals in melting plants

Material	Energy savings
Aluminium	95 %
Copper	63 %
Lead	99 %
Nickel	91 %
Zinc	25 %
Ferrous	16 %

Source: Report on the Environmental Benefits of Recycling, Bureau of International Recycling, 2008

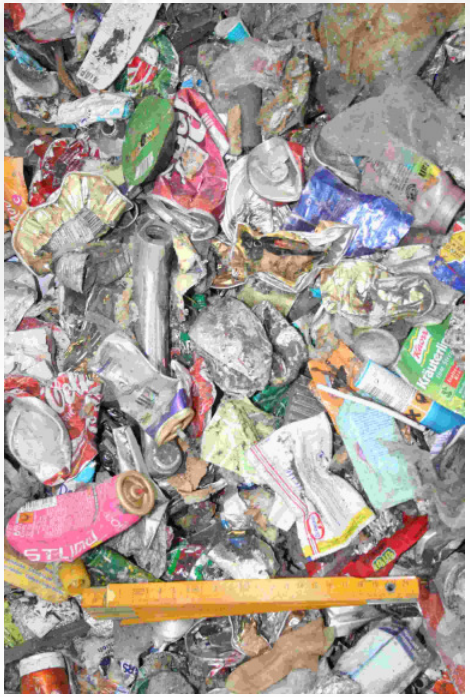
NF-metals in waste

- Household waste contains non-ferrous metals

NF POTENTIAL

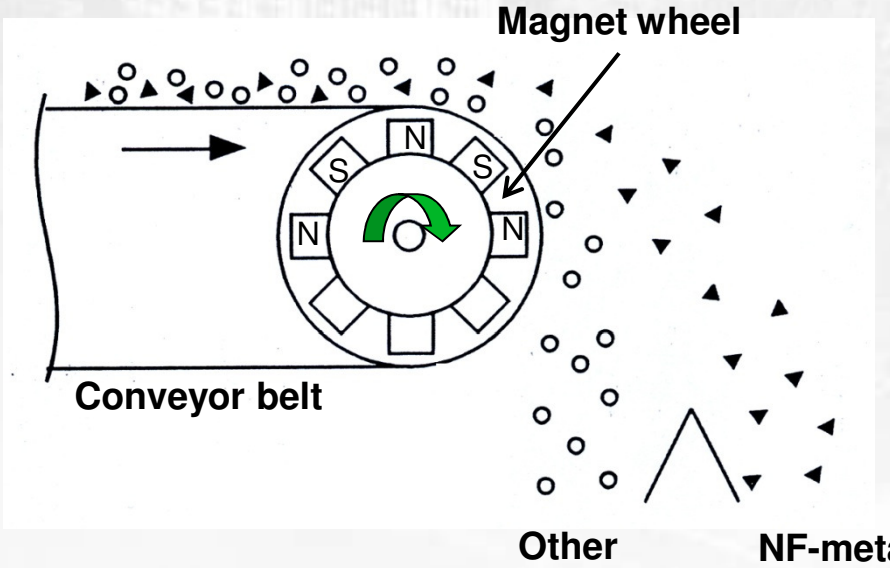
Everyday products:

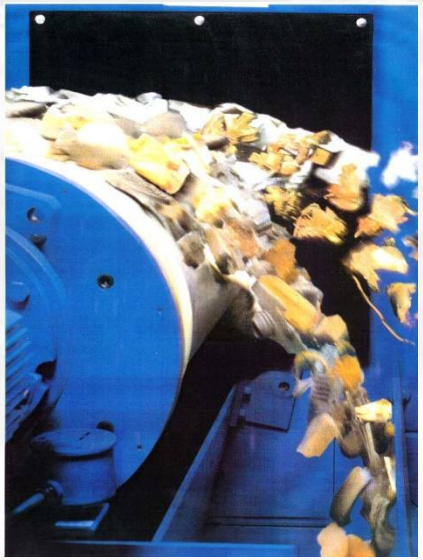
- Frying pans; sauce pans
- Aerosol cans
- Fittings
- Aluminium foils
- Decoration articles
- Lids
- Beverage cans
- Mountings



NF CONCENTRATION

Eddy-current separator





- Alternating magnetic field induces eddy-current
- Magnetic repulsion lifts NF-metals out of normal trajectory parabola

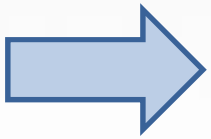
→ Multi-component NF-concentrate

PROCESSING NF-CONC.

Problems in re-use

- **Multi-component NF concentrates from eddy-current separators!**
- Example: Aluminum Recycling Product

Recycling Product	Problems
Aluminum (compact)	-
Aluminum (cans)	Fe-composite
Aluminum (foil)	(Organic) Impurities
Copper	Resource / Impurity
Brass	Resource / Impurity



Further sorting:

Generation of different products

Higher purities score better prices

PROCESSING NF-CONC.

Manual Sorting

Sorting rate depends on

- Belt Speed
- Particle size
- Throughput

} Belt loading

- Visual conditions

→ Throughput of 1 ton/h would require 14 workers to extract the total NF metals contained in the pre-concentrate

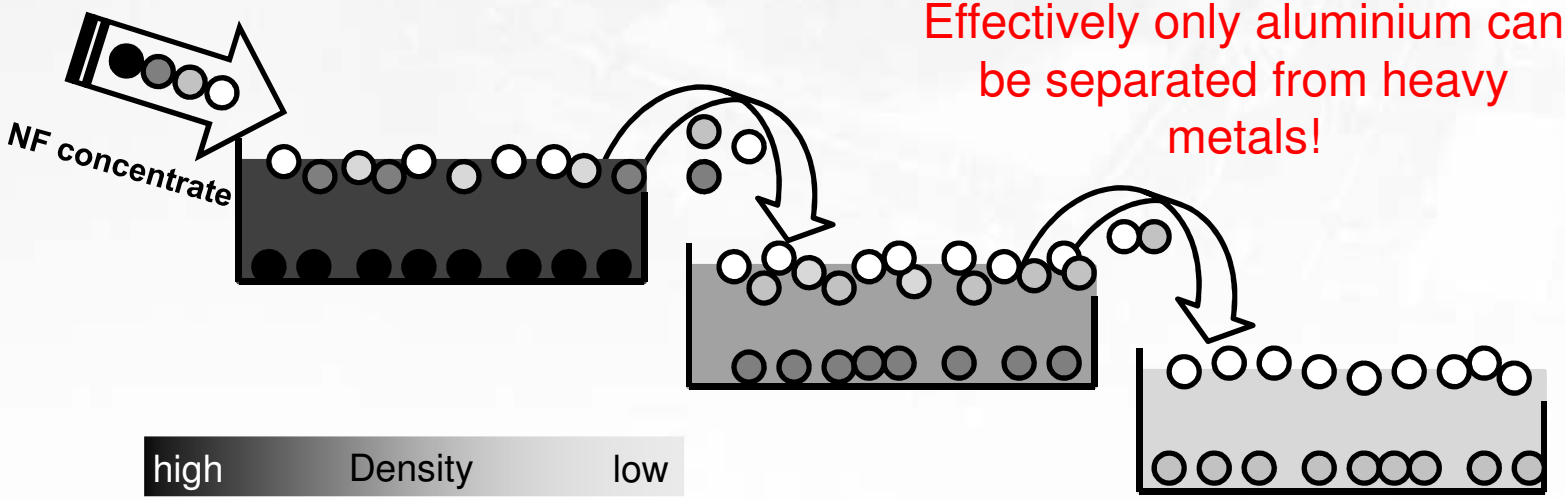
→ NOT PRACTICABLE IN HIGH-INCOME COUNTRIES

→ NO CONSTANT EFFICIENCIES

PROCESSING NF-CONC.

Heavy media separation

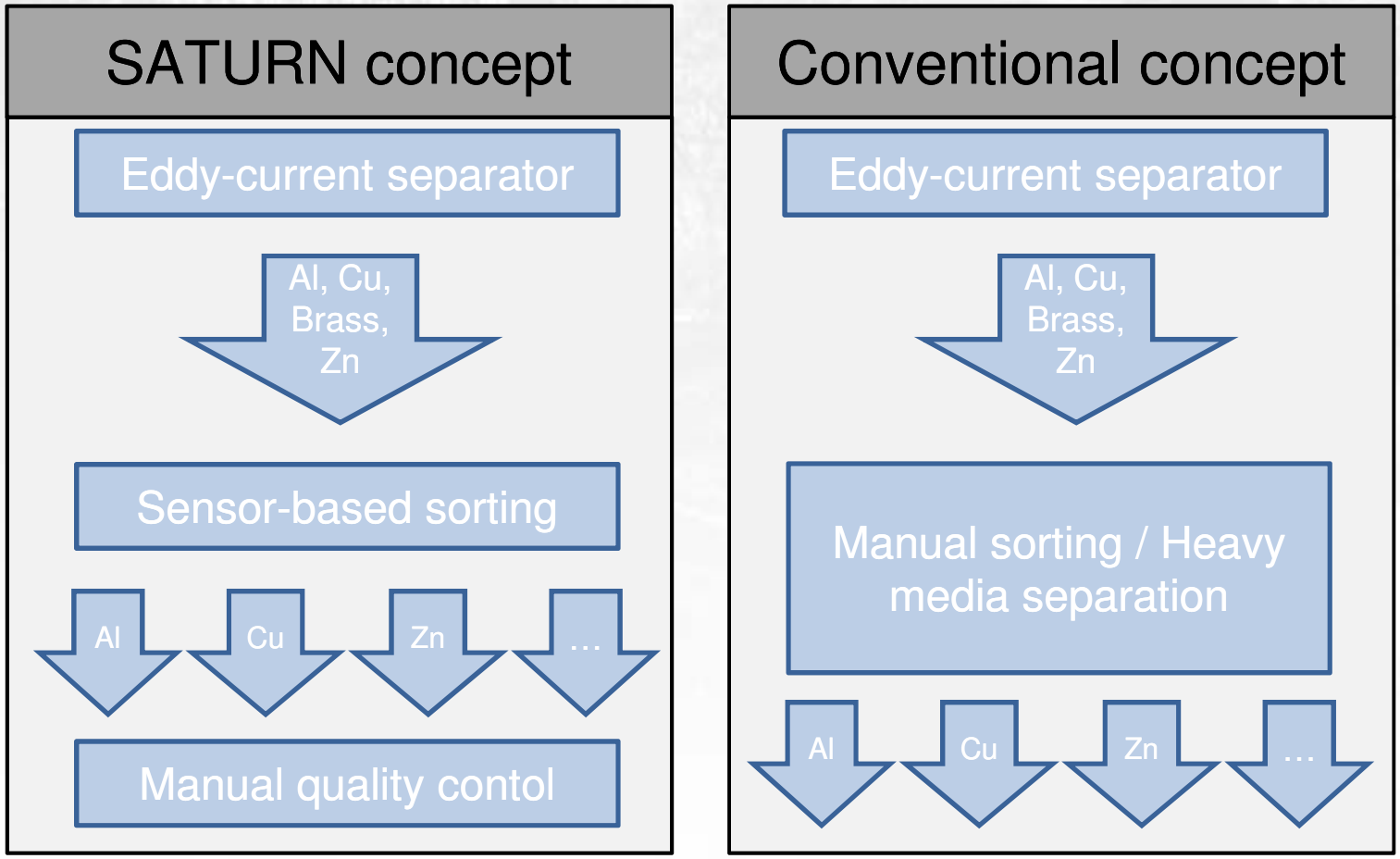
- Sorting according to the density
  - Wastewater arises
  - Impurities accumulate and contaminate pulp and output materials
  - Composite materials are not identified



Effectively only aluminium can be separated from heavy metals!

OVERVIEW SATURN

Competitive solution



OVERVIEW SATURN

Status quo

- Design of the plant and basic engineering schematics have been made
- Machine list has been established
- Machines are installed
- Composition of input materials has been tested
- Testing of sensor-sorting machines with input material provided by MeKon
- EU market: analyses of NF-metal products from England
- Website online