Future Technologies in Recycling

Tulevaisuuden Teknologiat Kierrätyksessä

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Jätehuoltopäivät, 7.10.2015 Tampere

AGENDA

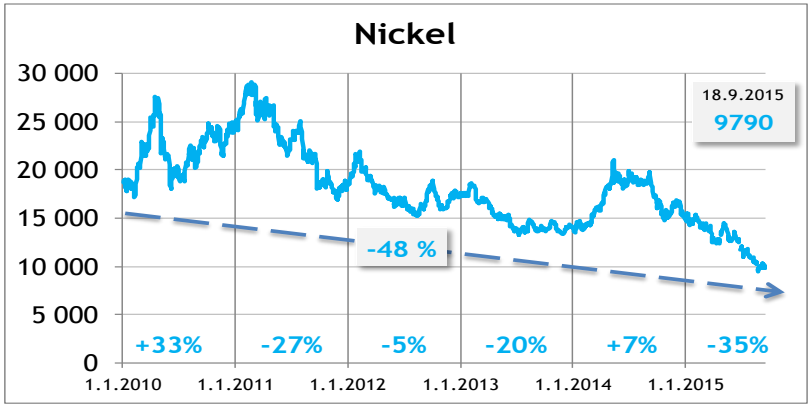
1 Recycling as a Business Today

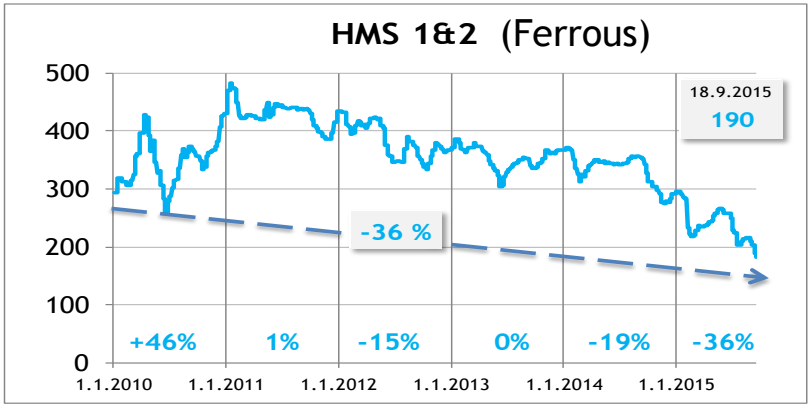
2 Common Recycling Technologies Today

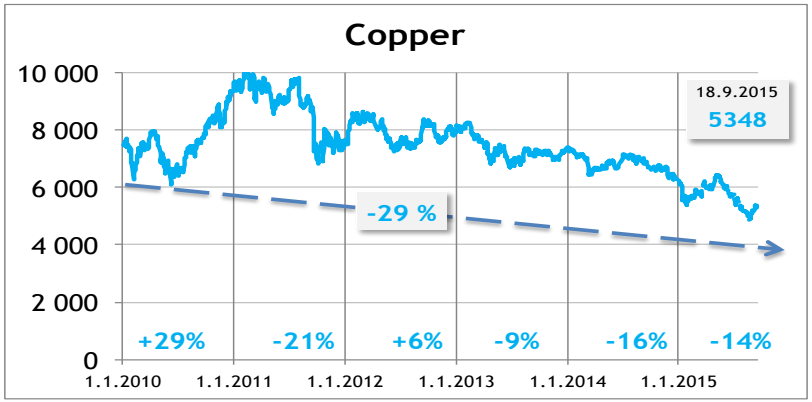
3 Future Perspective

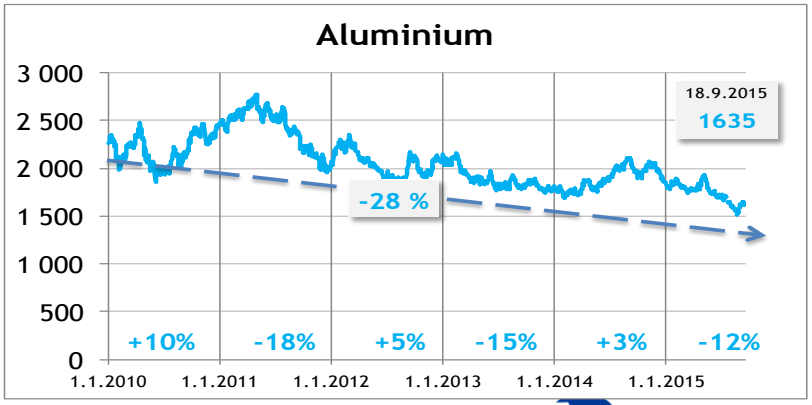
1 Recycling as a Business Today

Metal Prices 2010-2015 - Declining trend during last 5 years







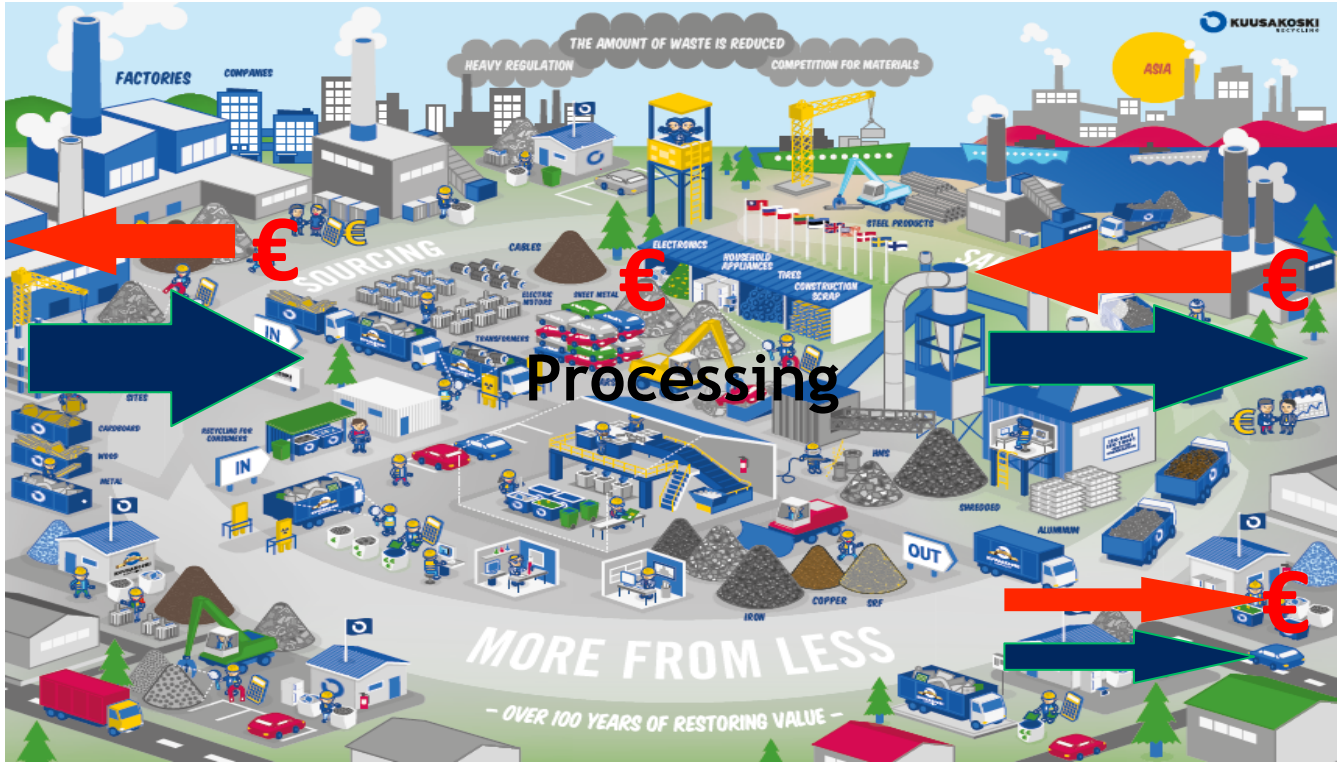


(1) Data source: Metal Bulleting on 21.9.2015; 1.1.2010 - 18.9.2015

1 Recycling as a Business Today

Recycling Business Models – Conventional Material / Money Flow

Raw Material



Processing

Products

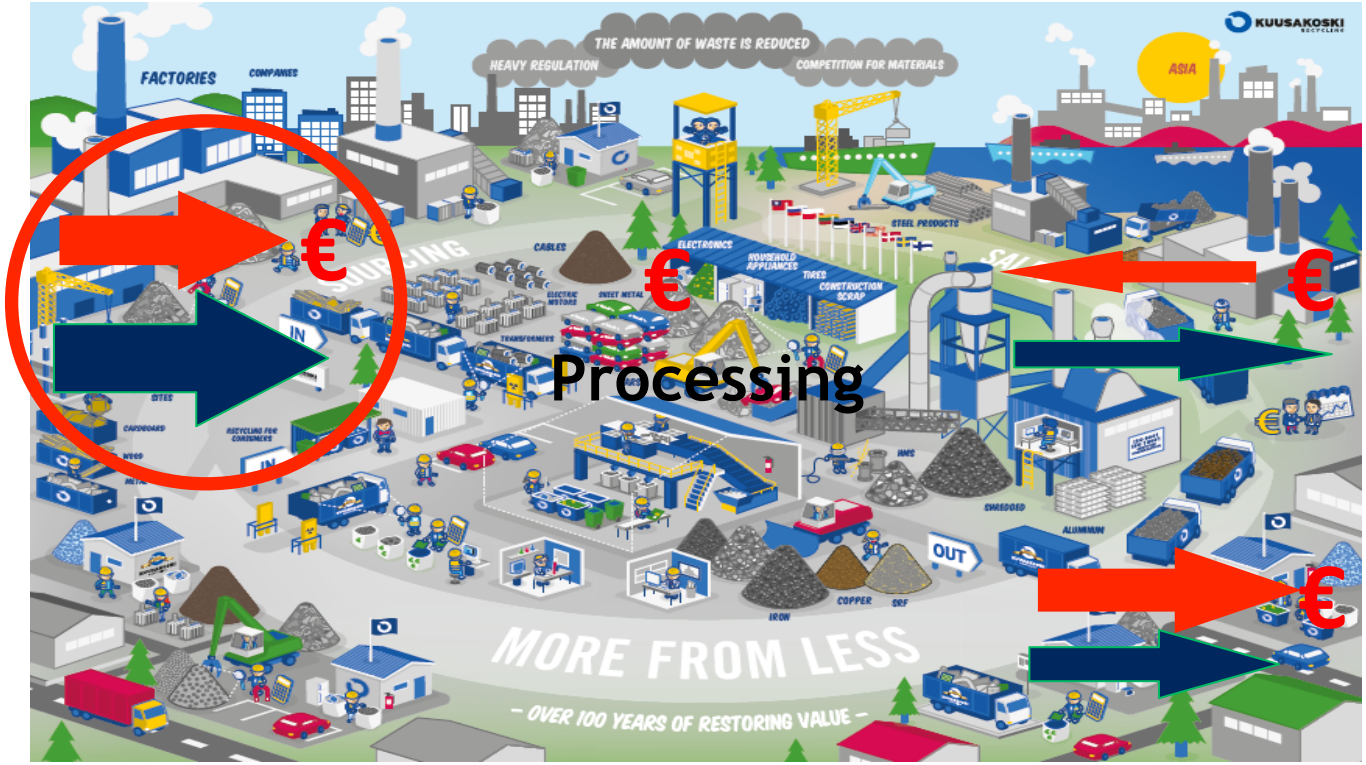
Waste

KUUSAKOSKI RECYCLING

1 Recycling as a Business Today

Recycling Business Models – Service Based Material / Money Flow

Waste Material



Processing

Products

Treated Waste

KUUSAKOSKI RECYCLING

1 Recycling as a Business Today

Customer Oriented Approach

Primary Smelter

Steel

Stainless steel

Copper

PGM (w Copper)

Secondary Smelter

Steel

Copper / brass

Aluminum

1 Recycling as a Business Today

Business Principle for Collection & Operations

Local Collection

Regional Processing

Products to Global Markets

KUUSAKOSKI RECYCLING

1 Recycling as a Business Today

Car Shredder Plants in Finland

Kuusakoski
- Vantaa
- Heinola
- Airaksela
- Lapua

Stena Recycling
- Pori / Tahkoluoto

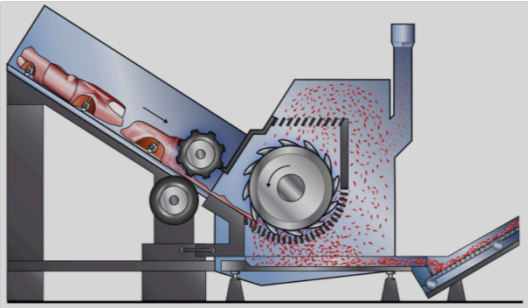
Eurajoen Romu
- Eurajoki

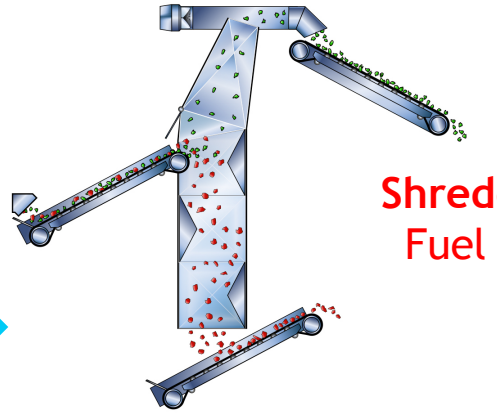
Kajaanin Romu
- Kajaani

KUUSAKOSKI RECYCLING

1 Recycling as a Business Today

Shredder Plant – Case regulation





Shredder Light Fraction
Fuel for Energy (FIN ?)

Magnet

Non-Ferrous Metals
For subsequent
metal sorting

Shredded Ferrous
Final Product =>
Raw material for steel plants

Pictures M.A. Reuter | EMEC Recycling

AGENDA

1 Recycling as a Business Today

2 Common Recycling Technologies Today

3 Future Perspective

2 Common Recycling Technologies Today

Local Collection

Material In

Receiving

Visual Inspecion
Detection

Weighing

Data to ERP

Processing

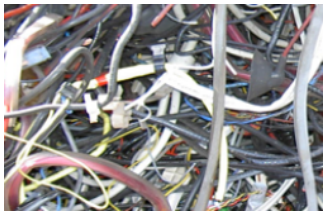
Simple Sorting
by metals

Material Out

Sales to customers (ext)

Sales to processing units (int)

Data to ERP



2 Common Recycling Technologies Today

Key Unit-Processes in Recycling

Pre-sorting	to prepare material-specific batches for crushing
↓	
Crushing	to decrease the size for better handling
↓	
Screening	to fraction materials for better recovery
↓	
Sorting	to produce element- or alloy-based products
↓	
Up-grading	to increase commercial value of the product

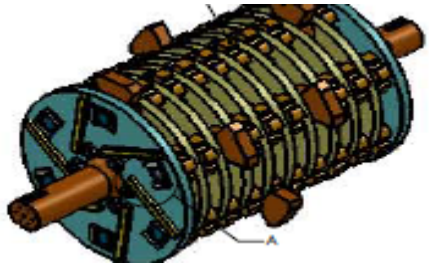
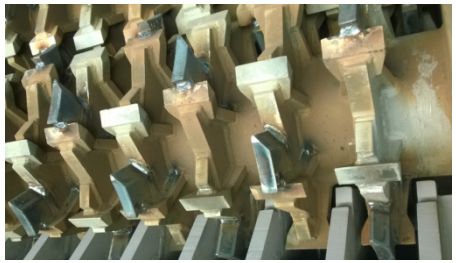
2 Common Recycling Technologies Today

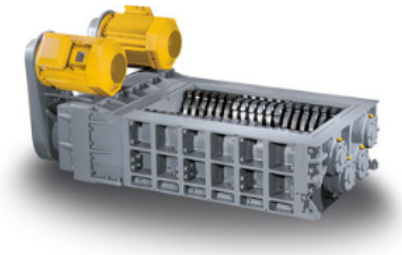
Crushing

Objective to break down the material into optimum size and quality for subsequent separation / sorting processes







2 Common Recycling Technologies Today

Screening

Objective to fractionate materials for better recovery in sorting

Rotary Screens

Coarse Mid Fine

Vibratory & Flip-Flop Screens

Star Screens &…

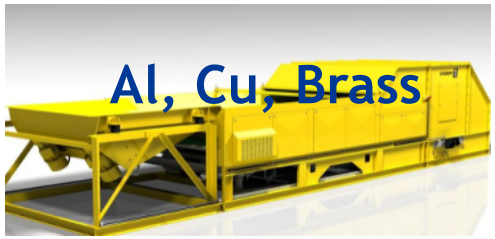
2 Common Recycling Technologies Today

Sorting

Objective - to sort out sellable products at maximum value and minimum waste

SINK & FLOAT

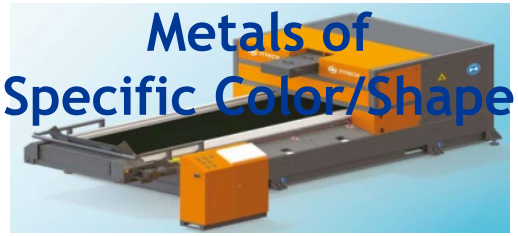
MAGNETS



EDDY CURRENTS

Principle - to detect and displace

FINDERS



COMBI

XRF / XRT

AGENDA

1 Recycling as a Business Today

2 Common Recycling Technologies Today

3 Future Perspective

3 Future Perspective

Operational Environment / Regulation

Regulation

- Global
- EU
- National
- Local

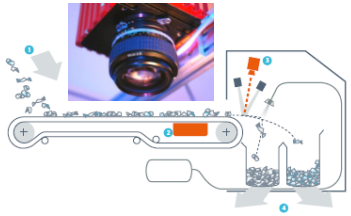
Waste classification more important

More complex materials have to treated

3 Future Perspective

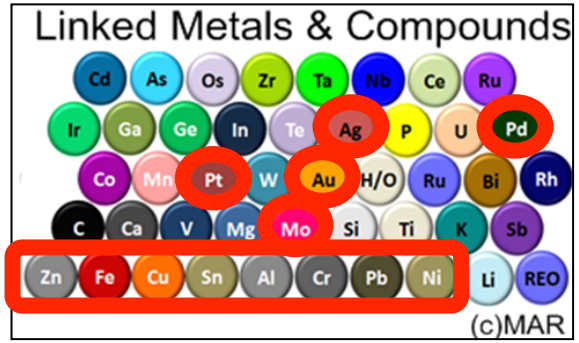
Operational Environment - Metals

- Developed markets
- **Volatile metal prices**
- New materials ?
- Sorting technologies
- Regulation



Available Materials → Collection Pre-sorting → Processing Sorting → Products €

Regulation



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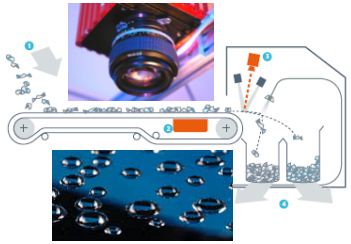
3 Future Perspective

Operational Environment - WEEE

XRF, XRT, Laser, MIR



Available Products → Collection Pre-sorting → Processing Sorting → Products €

Regulation

- Markets ?
- Metal scarcity ?
- New materials ?
- Metal prices ?
- Sorting technologies ?
- Regulation ?
- New technologies ?
- Tracability

Co, As, Sb, Te

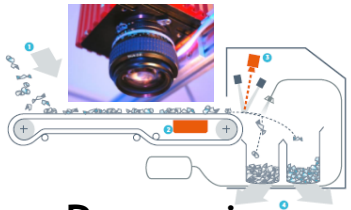
REE

Li, Ga, Ge, In

3 Future Perspective

Operational Environment – WEEE / Plastics

XRF, XRT, Laser, MIR



Available Products → Collection Pre-sorting → Processing Sorting → Products €

Regulation

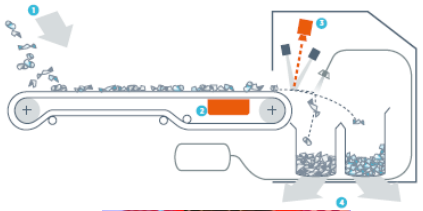
- Markets ?
- Metal scarcity ?
- New materials ?
- Prices ?
- Sorting technologies ?
- Regulation ?
- New technologies ?
- Tracability

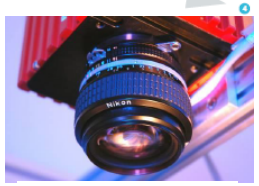
Technical Plastics

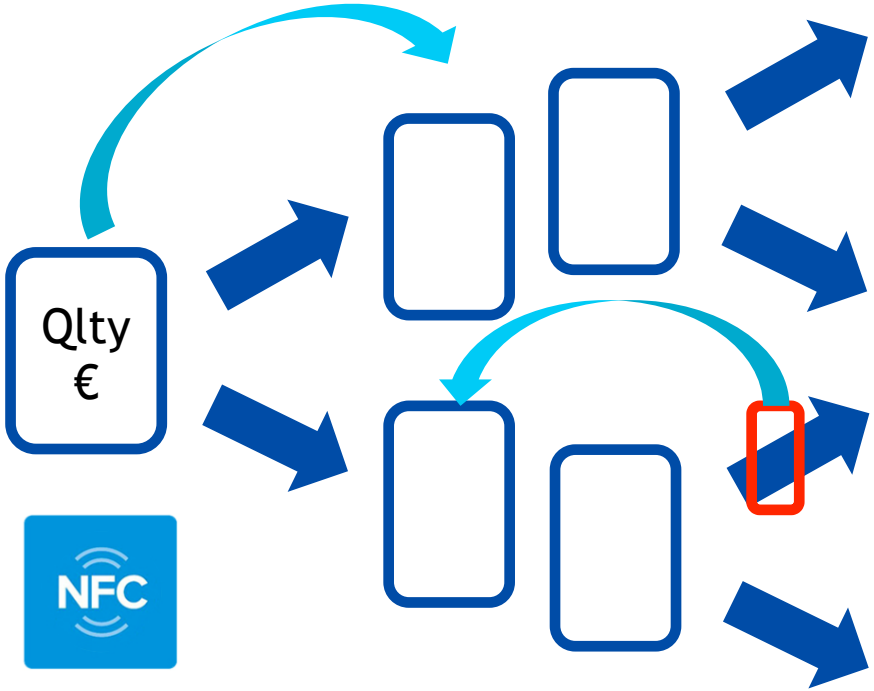
- Properties
- Cleaness vs image
- Thermochemical conversion
- Sorting technologies / MIR
- Also black plastics sorting

3 Future Perspective

Operational Environment / Processing with Data Collection and IOT







Cleen products

Process control & automation

On-line optimization

Recycling to 21st century

3 Future Perspective

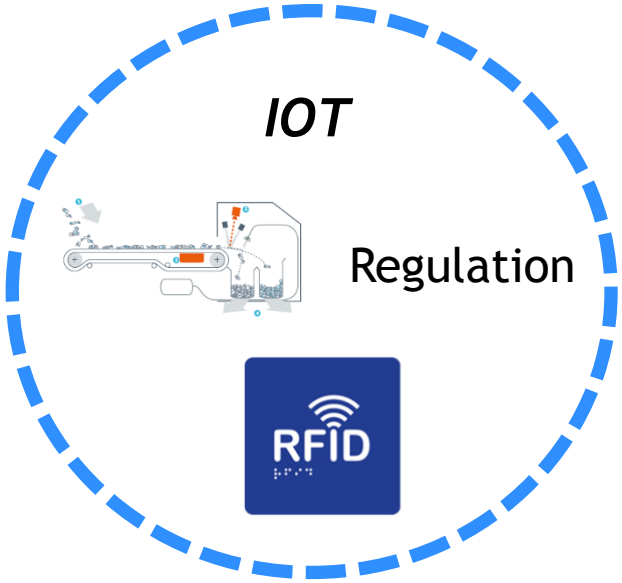
Challenges

RFID => Heterogeneity => Material balance

RFID & IOT & sensors => data => Process automation

ARVI project => HSC => Recycling process modelling

E U R €



RESTORING VALUE

KUUSAKOSKI
RECYCLING