CRM Day: Rare Earths, Cobalt & Electric Vehicles

Bert Witkamp, AVERE

September 27th, 2016, Brussels
3O founded in 1978, 14 National Associations, 700 indirect members

Platform for the Electrification of Transport

AVERE LEV Task Force

SUBAT

ELEDRIVE

HarmonHy

THE 30TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM & TRADE FAIR
OCTOBER 9-11, 2017 MESSE STUTTGART, GERMANY
Rare earth applications in cars is widespread, specific for (some) plug-in electric cars: permanent magnet motors

REE Approaches:
- Avoid use REE (PM)
- Recycling of REE
REE4EU

Integrated high temperature electrolysis and Ion Liquid Extraction for a strong and independent European Rare Earth Elements Supply Chain
The project objectives

- The project will develop, validate and demonstrate in 2 industrially relevant pilots an innovative rare earth alloys production route from **permanent magnets and nickel metal hydride battery waste**.

- The targeted integrated solution is based on recently developed lab-proven technologies for direct high temperature electrolysis of rare earth alloys production. It will be combined in the pilots with an innovative and proven ionic liquid extraction or tailored hydrometallurgical pre-treatment.
The consortium cover the **core value chain** from RE recovery from PM and secondary battery waste, **RE metal production, manufacturing** of permanent magnets, **end-users** from automotive, electric and hybrid vehicles, as well as **recycling** companies.
Relevant stakeholders are asked about the following aspects:

1) Application of REE in electric bikes
2) Rare earth magnet content
3) Availability of scrap and scrap potential in Europe
4) Availability of collection measures & collection rates
5) Barriers to recycling
Cobalt & EV’s: (potential) issues

Can Cobalt Supplies Scale With Massive EV Market Growth?

What happens when China and India push for Western levels of personal car ownership?

by Tam Hunt
June 09, 2016

Cobalt Shortage Put Brakes on Electric Car

Published Tue, Jan 13, 2015 | Tim Maverick, Senior Correspondent

Electric vehicles to power cobalt revival

MARKET NEWS | Wed Jun 8, 2016 | 9:39am EDT

* Electric car sales could top 17 mln in 2030
All electric cars Cobalt based?

Cobalt production: 125,000 ton/year; developed reserves: 7 million ton

Only Cobalt based batteries?

500,000 Model 3 in 2018: around 7 kg Co/EV
Total Tesla (Model S, X, PowerWall): 7,000 ton Cobalt

2018: 5% global, total Canadian Cobalt production?

Total car sales (80 million) EV Cobalt based:
- 500,000 ton Cobalt/year

Total car fleet (1 billion cars): 6 million ton

2015 production Reserves
Congo 63,000 3,400,000
Others 7,700 610,000
China 7,200 82,000
Canada 6,300 240,000
Russia 6,300 250,000
Australia 6,000 1,100,000
Zambia 5,500 270,000
Phillippines 4,600 250,000
Cuba 4,200 500,000
Madagascar 3,600 130,000
New Caledonia 3,300 200,000
South Africa 2,800 31,000
Brazil 2,600 78,000
USA 700 23,000
Use of Cobalt in EV batteries?: sometimes

- Heavy duty vehicles and Light Electric vehicles: non-Cobalt chemistries
- Cars: Cobalt based or Nickel Manganese based (power density, power)
- Battery chemistries and solutions rapidly evolving

- There are choices BUT Cobalt may very well become an issue, short term and or long term!
- Need for recycling is a given not an option
Electric vehicles lower cost than internal combustion engine vehicles

*Bloomberg: 2022, Deutsche Bank: 2020*
Societal needs and technology will shape mobility

*electric vehicles are only one aspect of a transforming mobility*

**Society & cities needs:**

- Better air quality
- Lower noise levels
- Carbon neutral
- Walking / cycling
- Public transport
- Car sharing
- Multimodal transport
- Zero-emission zones

**Vehicles will be:**

- Digital / Connected
- “Software on wheels”
- (Semi) Autonomous
- Electric drive
- Lighter weight
- Right-sized
- Shared (use/ownership)
- Part of a mobility system
- Less in number!

**Right sized, shared, autonomous, connected & electric vehicles in cities:**

-90% vehicles, -50 to 80% cost

*ICE at high utilisation is too expensive and lifetime too short*
Technology disruptions are rarely foreseen by industry insiders and experts

• Around or before 2025: EV’s likely to be the lowest cost vehicles
• Decarbonisation of transport is not a choice, it has to happen and fast
• EV dominant passenger car technology within a decade?
• In 2030 or before all cars sold are electric?, last ICE in 2035?!

At a certain moment, people will not buy old technology anymore, especially young people! People love EV’s 😊
EAFO Web Portal: www.eafo.eu
European Alternative Fuels Observatory
Thank You

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