IPMI European Chapter Seminar 2016

SiC – Diesel Particulate Filters
A Challenge For Autocatalyst Smelters and Recyclers

Oliver Krestin / Pär Rosendahl

08.11.2016

Introduction

1 The Autocatalyst Recycling Market in Western Europe

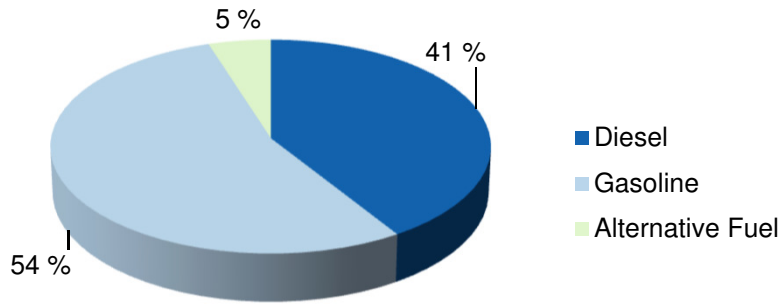
- Estimated Volumens for spent autocatalyst
  - Diesel share vs. Gasoline
  - Influence on recycling volumes

2 The SiC Problem

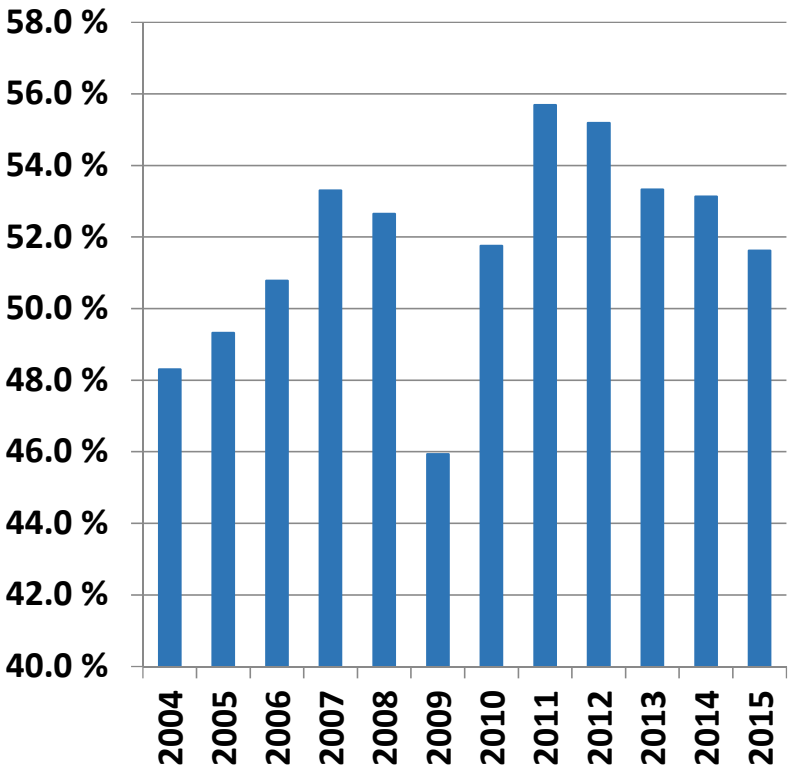
- Carbon level in smelter feed
  - smelter technologies and issues
  - Possible scenarios

Estimated Volumens for spent autocatalyst in Western Europe

Passanger car fleet by fuel type 2014 (approx 230 mio. cars)



Diesel Market Share (New registration WE)



Source: ACEA

Diesel Market

Emision Standards for Diesel

Legislation	Date	Diesel catalyst system
Euro 3	2000	DOC in vast majority of vehicles
Euro 4	2005	DOC and early adopters of coated DPF
Euro 5a/b	2009/11	DOC and widespread introduction of coated DPF

DOC = Diesel Oxidation Catalyst
DPF = Diesel Particulate Filter
CSF = Catalysed Soot Filter

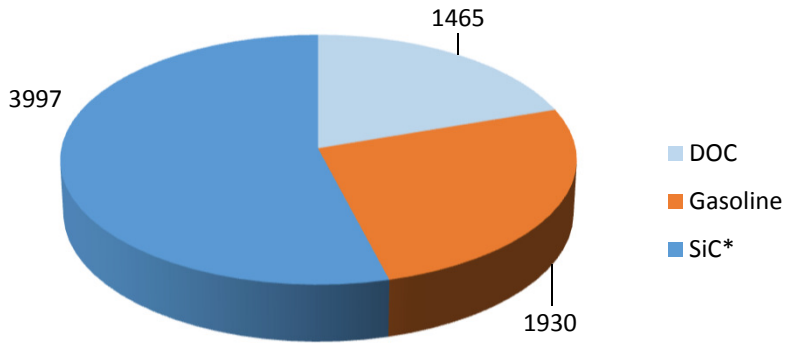
Estimated Volumens for spent autocatalyst in Western Europe

Recycling Volumes

- New car registration 13.000.000 /year
- Recycling rate (ELV) 25 %
- Cars 3.250.000
- Diesel (41%) 1.332.500
- Gasoline (54%) 1.755.000

- Gasoline monolith 1,1 kg/converter
- DOC 1,0 kg/converter
- DPF 3,0 kg/converter

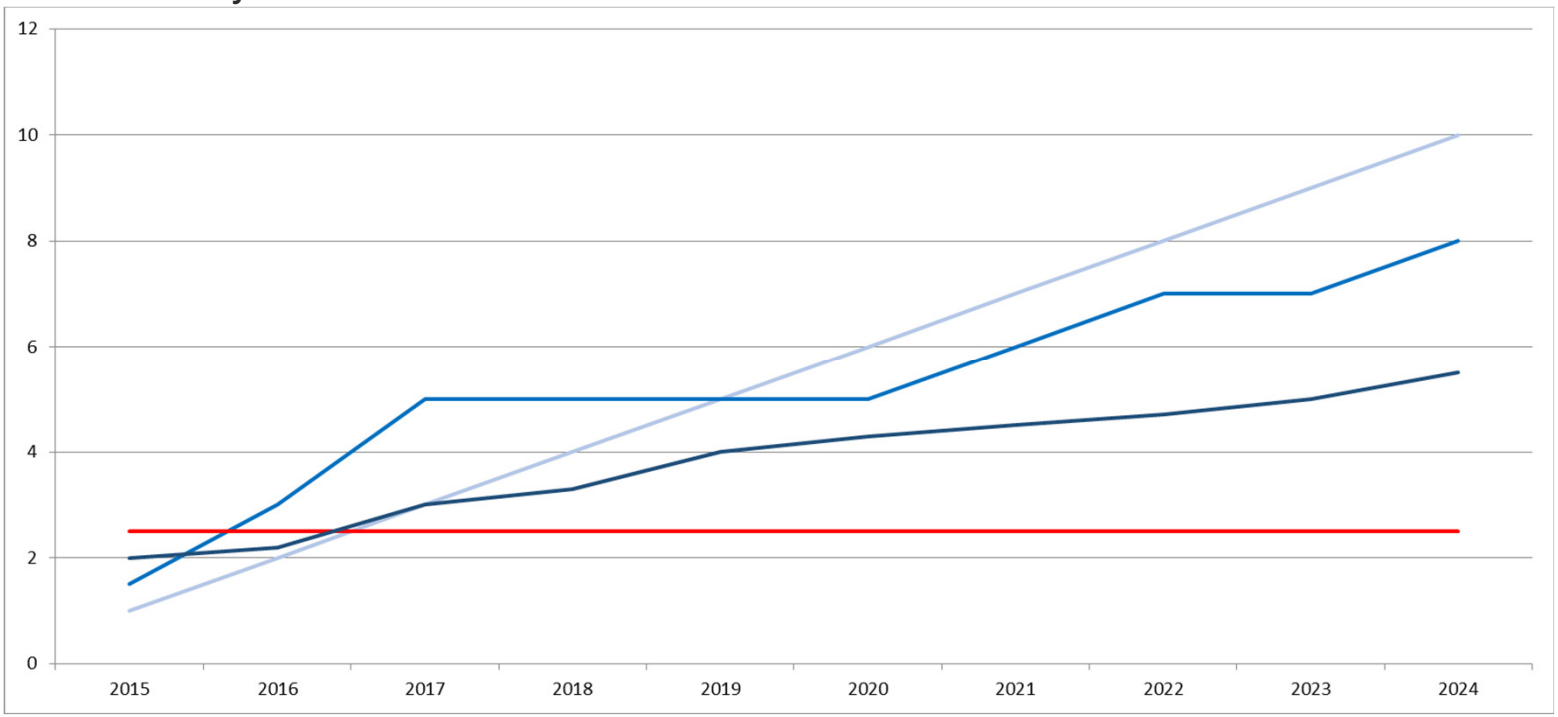
Catalyst material for recycling



Total catalyst material for smelting/refining 7.392 t/year

Carbon level in smelter feed

- SiC has approx 30 % Carbon
- SiC blended with DOC & Monolith will increase C level in smelter feed to 16 %
- 3.997 t SiC at 30 % C = 1.191 t C
- Total catalyst 7.392 t



Smelter technologies and issues

- Electric arc furnaces or plasma arc furnaces can only process limited amount of carbon (varies between 0,1 % to 2,5 %)
- SiC needs to be oxidized to SiO_2 and CO_2. Smelters typically operate under reducing conditions instead of oxidizing
- Reverbatory furnaces can operate in both modes but have limited installed capacity.
- Existing arc or plasma arc furnaces can not easily be modified.
- Even small amounts of SiC will have a negative impact on metal yield

Possible scenarios

- Separating DPF´s from regular monolith
  - 100 % separation most likely not possible
  - Even 3 DPF in 100 Catalyst will increase C to 3 %
- Penalties on Carbon content similar to other deleterious elements
- New smelting technologies need to be developed

Thank you.

Address

Hensel Recycling Group
Mühlweg 10
63743 Aschaffenburg
Germany

Communication

Telefon +(0)49 6028.12 09-xx
Fax +(0)49 6028.12 09-xx
E-Mail info@hensel-recycling.com
Internet www.hensel-recycling.com