

REE4EU



REE needs/barriers/opportunities from the view of European RE Permanent Magnet Industry

Brussels, April 24, 2019
Rolf Blank, Vacuumschmelze



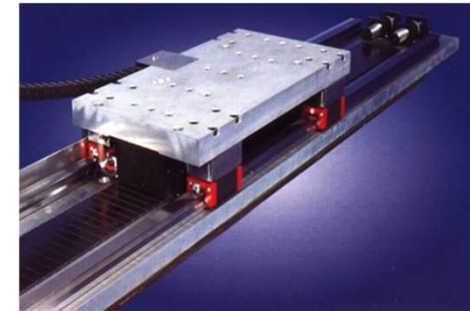
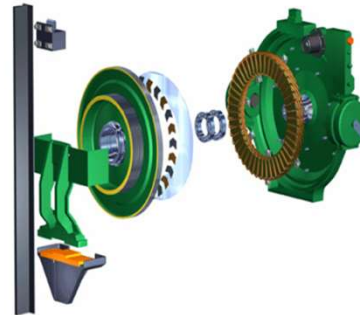
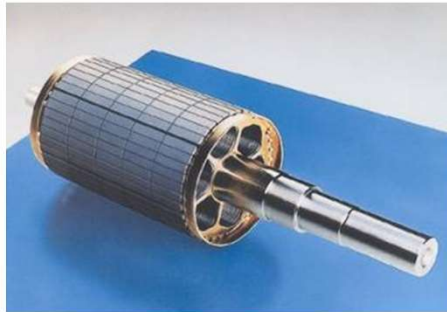


Introduction Vacuumschmelze

VAC-group: 400 Mio. € sales; 100 Mio. € for Permanent Magnets (PM)
 VAC, Germany + NEOREM, Finland: 800 t/a PM

Main applications:

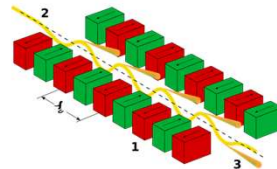
- Motors



- Sensors (automotive)



- Scientific applications





Advantages / Disadvantages for VAC



VAC is the only major producer of NdFeB magnets in Europe

800 t/a (incl. NEOREM) → 50 – 100 t/a sludge for recycling

Disadvantages:

- Raw material is coming from China, only legal and no access to „grey“ market
- Compared to Chinese competitors VAC has to pay 13 % VAT on the metal / alloy prices
- Only few producers of strip cast withn export license → little competition
- Production costs for milling, pressing, sintering and machining is significantly higher than in China

Advantages:

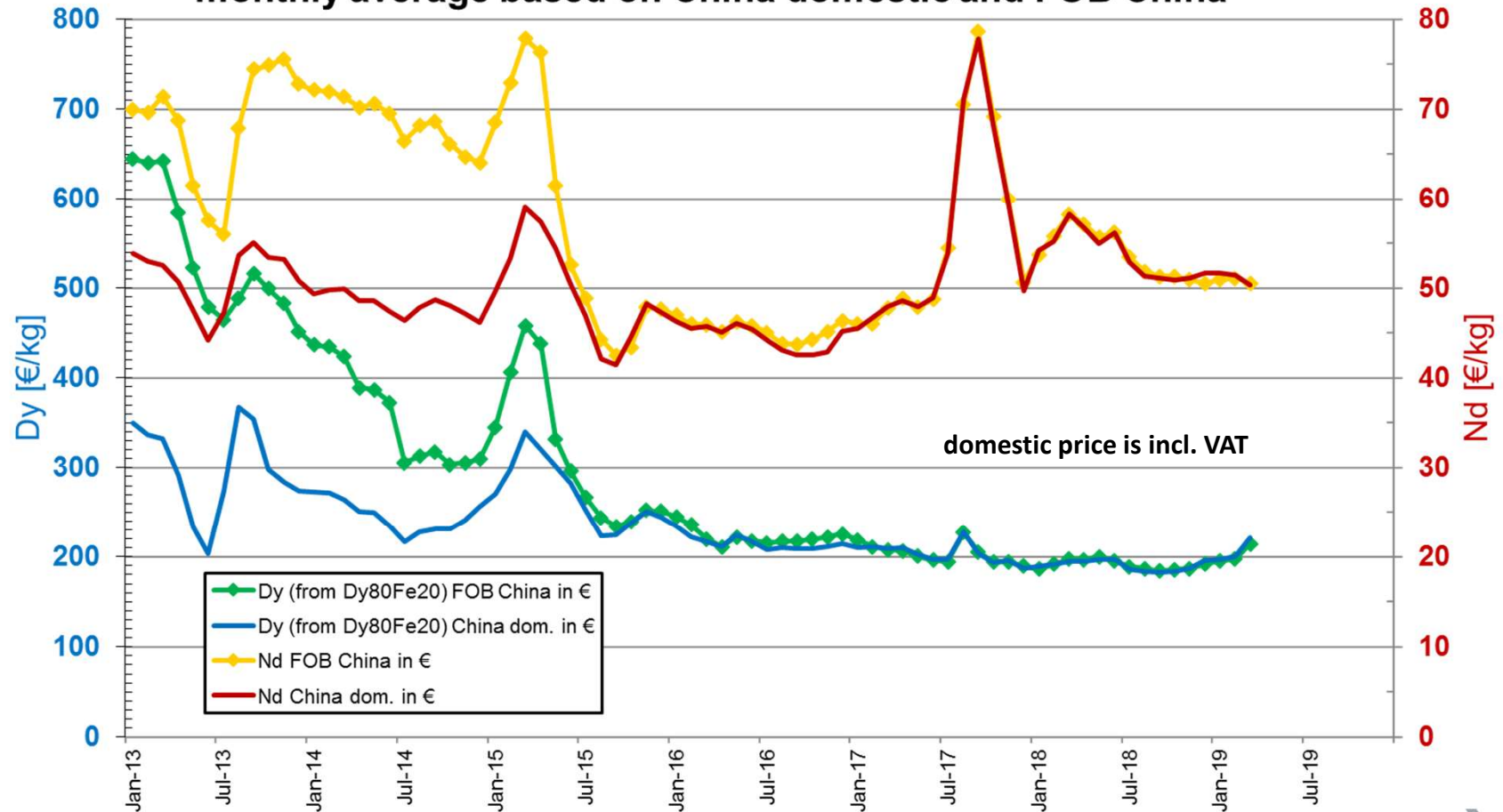
- Close to the customer, customized products
- Environmental friendly production
- VAC as local R&D partner
- Risk management for non Chinese sources (in future) possible
 - non Chinese ores with separation at REEtec and reduction at LCM
 - recycling with REE4EU process





Asian Metal prices for REE

Nd and Dy (from Dy₈₀Fe₂₀) market price 2013 - 2019 in €/kg
 monthly average based on China domestic and FOB China





Possible models for recycling



1. Buy sludge / scrap magnets and re-sell strip cast alloy
2. Commission processing:
VAC owns the material and pays the costs for the recycling



Model 1: Buy and re-sell



Re-selling price is coupled to Asian Metal price

Price for the RE-oxide or RE-metal must be significantly below Asian metal price to compensate for European process steps:

- costs for reduction of oxide to metal
- costs for melting and strip casting
- costs for HD treatment

Price of HD powder must be the same as for HD powder from China w/o VAT

Only then VAC has the same starting conditions as Chinese magnet producers





Model 2: Commission processing



VAC will pay production costs for recycling independant from Asian Metal prices

VAC to own the sludge and to pay for the different production steps (in Europe):

- Calcination
- Concentration to the mixed (Nd,Dy) oxide
- Reduction of the mixed oxide to the mixed Nd-Dy-Fe metal
- Melting and strip casting of the final alloy
- HD treatment to the coarse powder

The **costs for these production steps** must be below the price for HD powder produced in China (w/o VAT) less the value of the sludge:

10 – 20 €/kg (= 15-30 €/kg (HD powder) – 5-10 €/kg (value of sludge))





THANK YOU

