MATERIALS WEEK EUROPE

The next speaker is...

Tayyab Ahmad
Application Specialist Rare Earth Magnets
NETZSCH Grinding and Dispersing
Germany

NETZSCH
Proven Excellence.

Novel Processes for the Manufacturing of Fine-Grained Nd-Fe-B Powders with Steep Particle Size Distribution

Scan below for Conference Agenda


NETZSCH
Proven Excellence.

NETZSCH
Proven Excellence.

THE NETZSCH GROUP

And its three globally active business units

Materials Week 2026 Amsterdam, Tayyab Ahmad, 25th Feb 2026

Erich NETZSCH B.V. & Co. Holding KG

Analyzing & Testing

Thermal analysis instruments, instruments for the determination of thermophysical properties and fire testers

Grinding & Dispersing

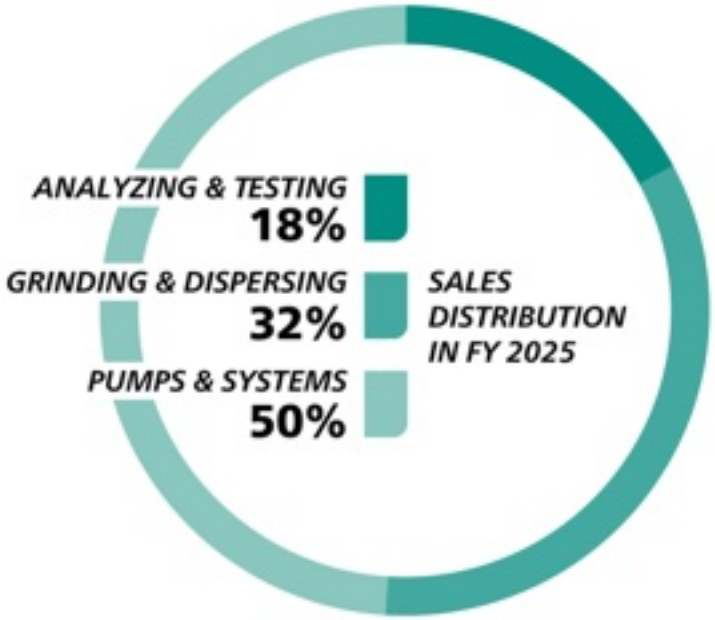
Comprehensive machine program for wet and dry grinding, mixing, dispersing, homogenization and classification

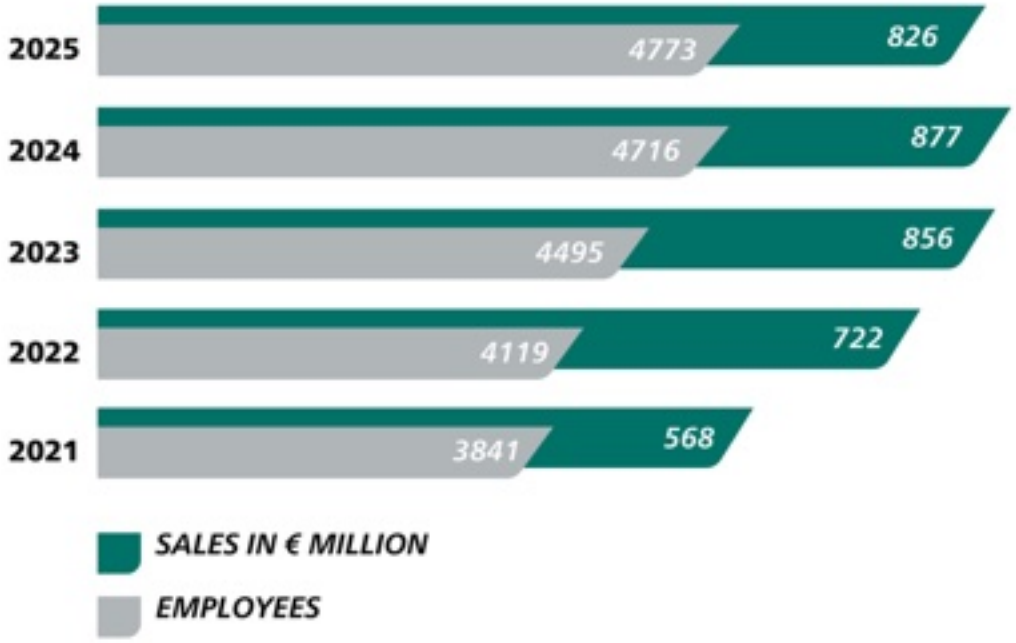
Pumps & Systems

Global partner for complex fluid handling with a wide range of positive displacement pump technologies and complementary components

The NETZSCH Group

Continuous growth





Founded in 1873 by the Netzsch brothers in Selb
More than 4700 employees worldwide
€ 826 million in sales in fiscal year 2024/25

The NETZSCH Group

Continuous growth

1873 Founded in 1873 by the Netzsch brothers in Selb

1890 Development and manufacture of special machines for the ceramics industry

1962 Foundation of NETZSCH-Gerätebau GmbH, foundation of NETZSCH Mohnopumpen GmbH

1969 Foundation of NETZSCH Inc., Exton, PA, USA

1970 World's largest manufacturer of ceramic process technology with 350 patents

1973 Foundation of NETZSCH do Brasil Ltda, Pomerode, Brazil

1974 Foundation of NETZSCH-Feinmahltechnik GmbH and acquisition of the production facility in Tirschenreuth

1979 Foundation of HEISHIN-NETZSCH Co, Ltd, Kobe, Japan, joint venture

The NETZSCH Group

Continuous growth

1987 Foundation of NETZSCH ASIA Pacific Pte. Ltd, Singapore

1988 Foundation of Erich NETZSCH GmbH & Co. Holding KG

1993 Foundation of LANZHOU-NETZSCH Pumps Co. Ltd, Lanzhou, China
Foundation of NETZSCH India Pte. Ltd, Chennai, India

2000 Foundation of NETZSCH (Shanghai) Machinery and Instruments Co. Ltd, Shanghai, China

2010 Inauguration of the new production plant in Goa, India

2020 NEDGEX Empower. Innovate. Create.
Foundation of our own digital unit NEDGEX GmbH

2023 150 Years NETZSCH
NETZSCH Proven Excellence. 150 EST 1873

The Business Unit Grinding & Dispersing

The Business Unit Grinding & Dispersing

290 Mio. €
Sales volume

1150
Employees worldwide

6
Production facilities worldwide

60
Sales and service locations worldwide

10
Laboratories worldwide

4
Business Fields

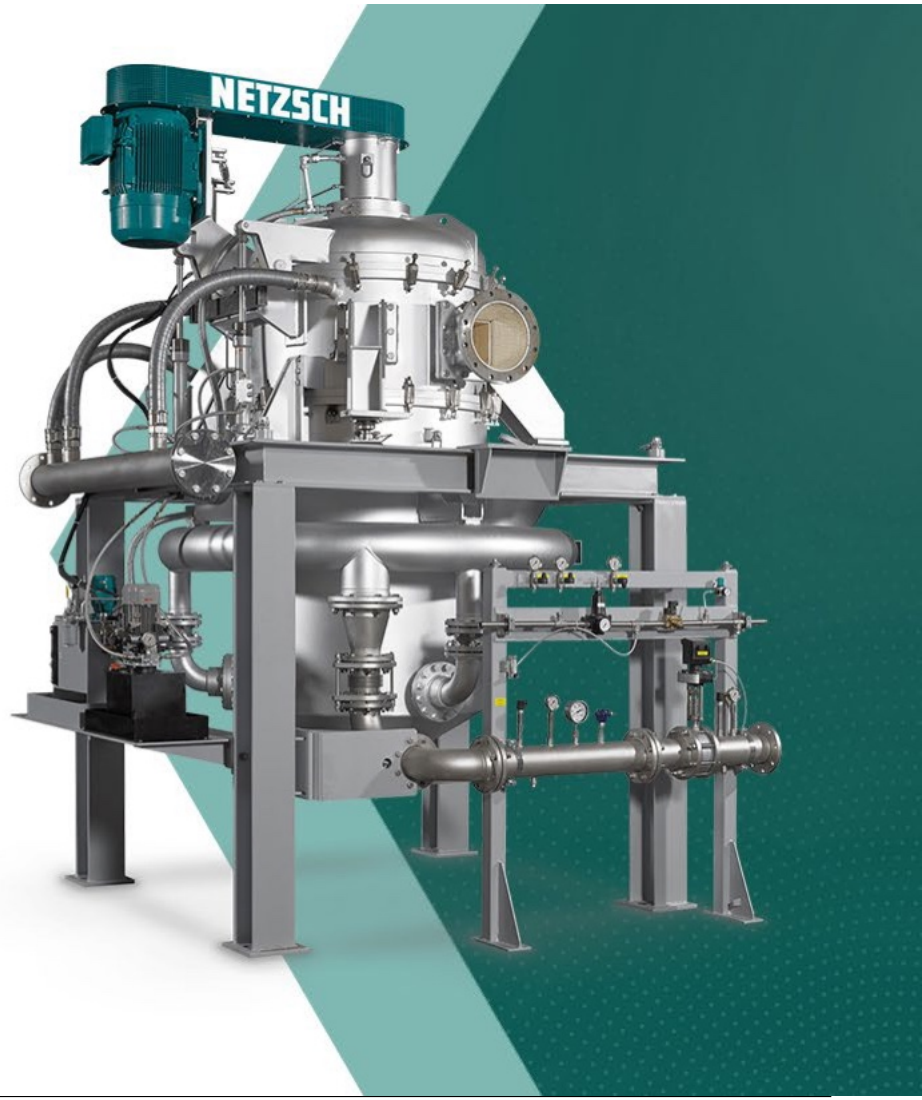
2. Technologies of the Business Unit

Dry Grinding

Extensive mill program for all fineness levels down to the submicron range

- Rotor impact mills
- Classifier mills
- Jet mills
- Fine-cutting mills

High-performance classifier for classifying the finest products
Innovative dry-grinding technology from the single mill to complete turnkey systems



“Your processes will be more economical with our innovative dry grinding technology.”

Single Machines

Extensive product program – from machines for the laboratory to production-scale machines

Qualitative and quantitative scale-up to production machines is possible

Machines in high demand worldwide for the following technologies:

- wet and dry grinding
- mixing and dispersing
- homogenizing
- deaeration and classification

“We offer cutting-edge technology for the entire value chain.”

Systems & Plants

Complete systems from a single source

Team of highly-qualified specialists

Outstanding machine technology

Knowledge from decades of experience

Plants with conventional and modular construction

From planning through commissioning, supported by NETZSCH

“Our systems are the key to maximum efficiency.”

Laboratory and Process Technology / Toll Grinding

Process laboratories in

- Germany
- USA
- Brazil
- China
- India
- Korea

Tests for machine design Tests for process optimization

Tests for quality assurance

Toll services

“Our process technology know-how is available to you in our applications labs around the world.”

Business Field - *AFTERSALES* Support

In NETZSCH, we are totally convinced that *AFTERSALES* service really matters to our customers. When you acquire NETZSCH equipment, it is our commitment to keep it in operation under optimal performance through the rest of its lifetime.

Specialists provide quick and reliable support

Included in the service offer:

- Installation Support
- Spare Parts
- Fieldservice & Support
- Optimization Services
- NETZSCH-*BEADS*®

Bennedikt Wenisch

Grinding & Dispersing

NETZSCH
Proven Excellence.

Novel processes for the manufacturing of fine-grained Nd-Fe-B powders with steep particle size distribution

Tayyab Ahmad, Application Specialist RE Magnets

New processes for the production of fine-grained Nd-Fe-B powders with narrow particle size distribution

NETZSCH

APPLICATION BACKGROUND

PROVEN TECHNOLOGY

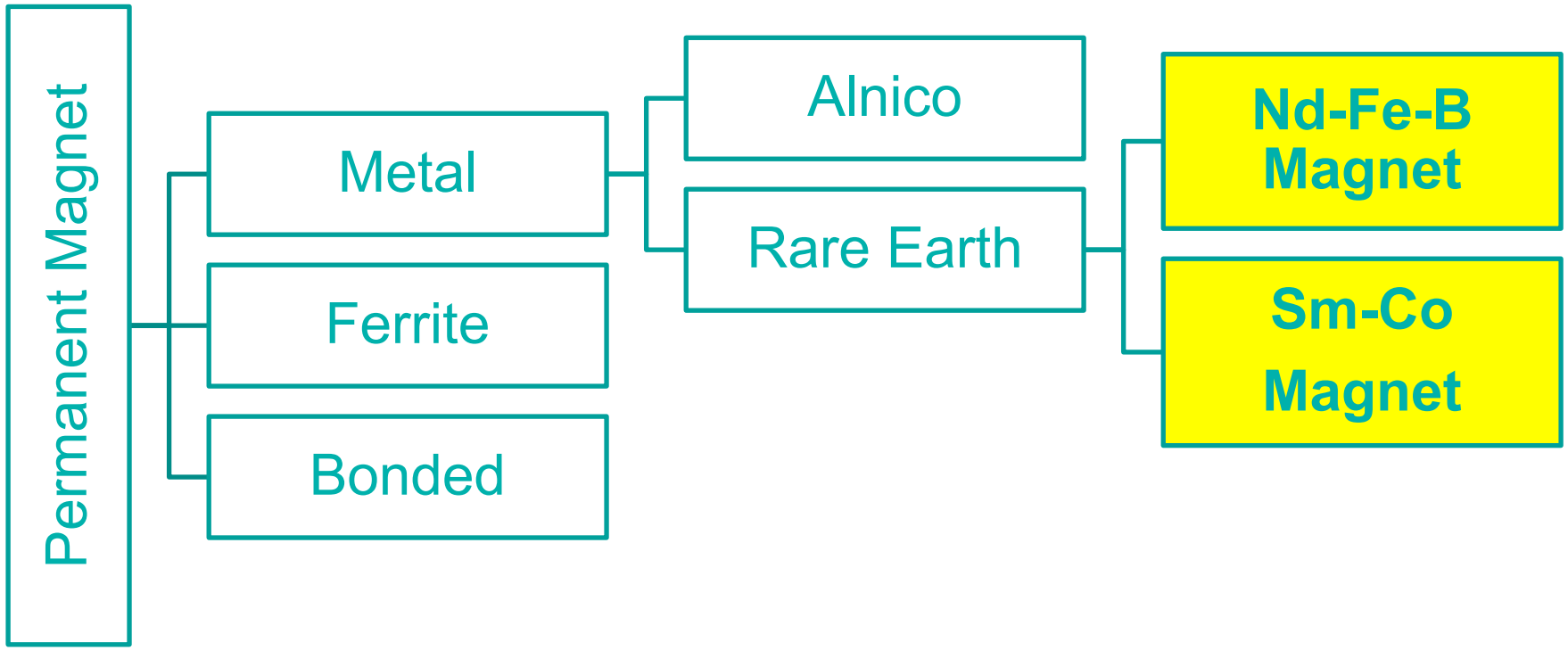
IT IS AVAILABLE NOW

IT IS IMPROVING QUALITY & PRODUCTIVITY

Permanent Magnets

NETZSCH

APPLICATION BACKGROUND

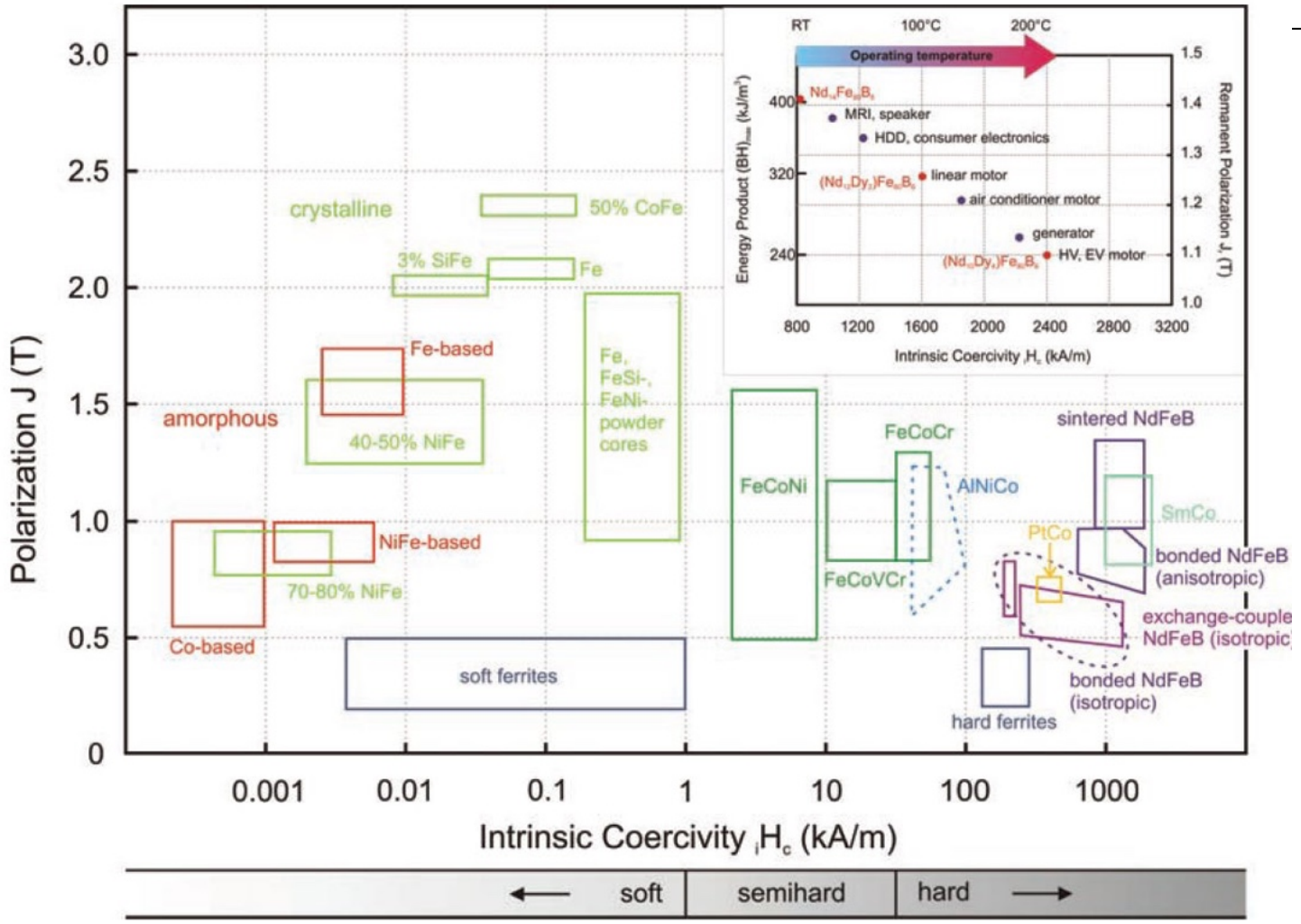


VACuHttps://vacuumschmelze.com/Expertise/Material-Competence

Permanent Magnets

NETZSCH

Application Background



3. Polarization versus coercivity of soft and hard magnetic materials. The inset shows a closer look at high energy density NdFeB-t
arious Dy-contents for applications from room temperature to 200 °C.

Gutfleisch, Oliver & Willard, Matthew & Brück, E. & Chen, Christina & Sankar, Sury & Liu, J.P.. (2011). Magnetic materials and devices for the 21st century: Stronger, lighter, and more energy efficient. Adv. Mater.. 20. 1-22.

Applications of NdFeB magnets

APPLICATION BACKGROUND

Electro mobility :

Cars, bicycles (300 g), motor scooters …

Wind Energy Plants: 500 - 600 kg NdFeB / MW

Electromotor :

Linear drives, machine tool manufacturing, step by step motors ….

Communication / Consumer Electronics:

Speakers, headsets, motors for hard drives (polymer magnets)

Others

Medical technology, home appliances, air conditioning …

Typical Composition of NdFeB magnets – Alloying elements

NETZSCH

APPLICATION BACKGROUND

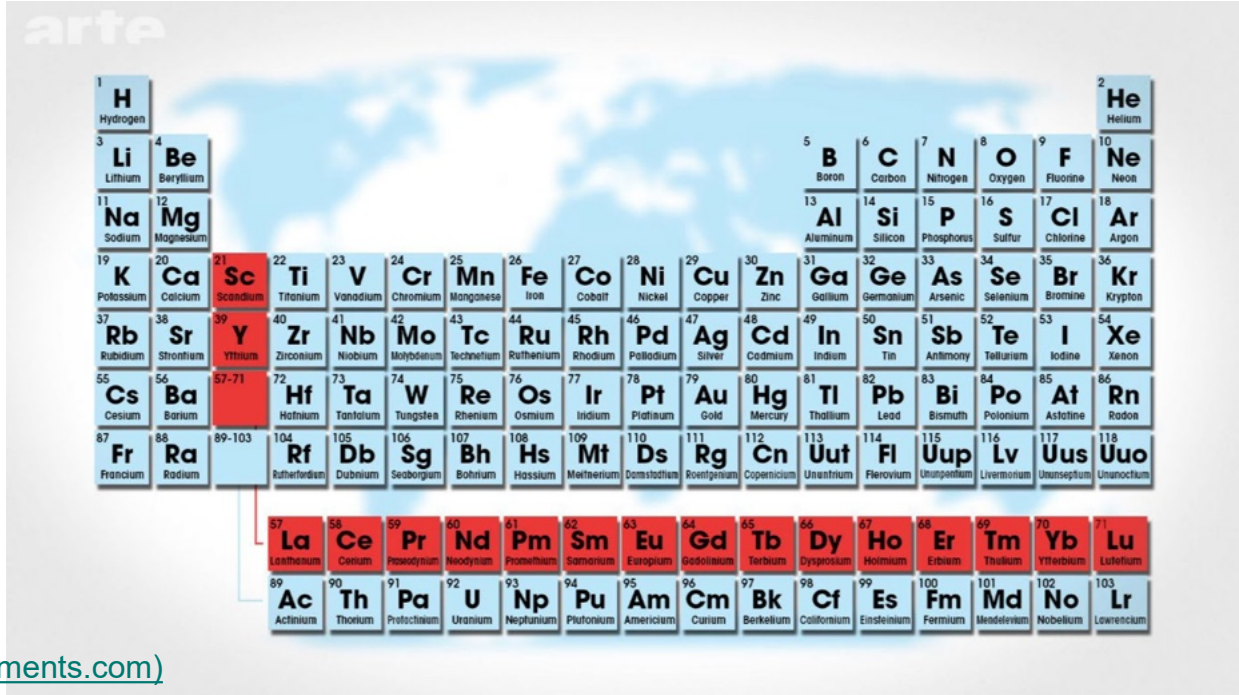
Neodymium (29 - 32%)

Iron (60 - 65%, development of the magnetic phases ...)

Boron (1%, magnetic phase)

Dysprosium (up to 9%, temperature consistency)

Other rare earths



Seltene Erden - Informationen, Verwendung, Kauf - Strategic Elements (strategic-elements.com)

Typical Production Process for Sintered NdFeB

NETZSCH

APPLICATION BACKGROUND

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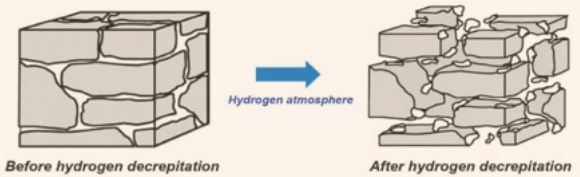
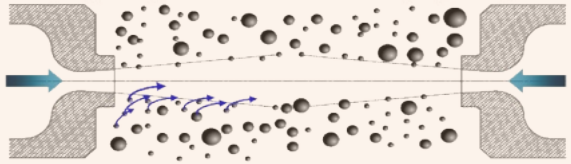
Strip Casting

Hydrogen Decrepitation

Jet Milling





Raw Material Preparation → Melting → Powder Production → Pressing

Sintering → Testing → Machining → Surface Treatment

Magnetizing → Packing

Fineness Target after Jet Milling for Sintered NdFeB

NETZSCH

APPLICATION BACKGROUND

Feed fineness: up to 2 mm after hydrogen decrepitation

Bulk density: 2 – 3.5 kg/l

Final fineness:

standard d50= 4 - 5 µm **(pyrophoric !)**

new tendency d50 = 2 - 3 µm **(pyrophoric !!!)**

Typical system design

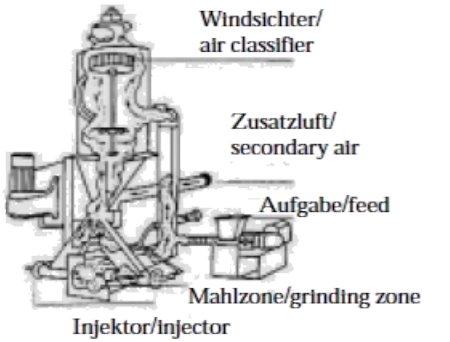
Closed loop, with inert gas like nitrogen, material contacted parts can be executed in carbon steel/ ceramic/ hard metal, with PU lining option

Pyrophoric - chemical materials that react heavily with oxygen at room temperature, when finely distributed.

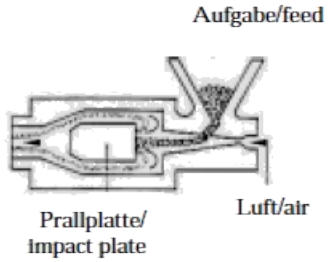
NETZSCH

Application Background

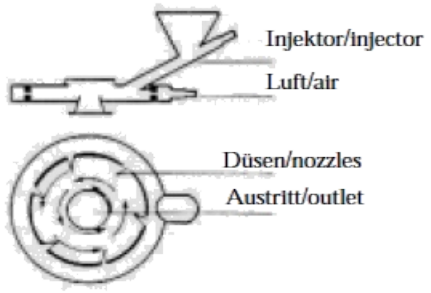
Bild 1: Einige Beispiele bekannter Strahlmühlen-Bauarten
Fig. 1: Examples of common types of jet mill



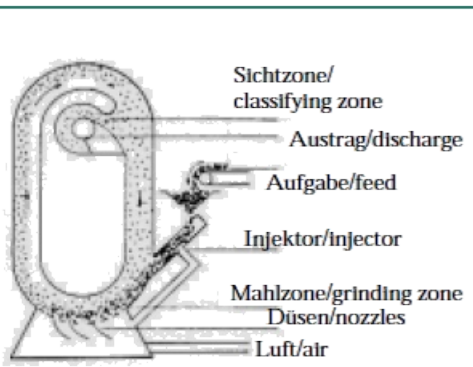
Majac Gegenstrahlmühle



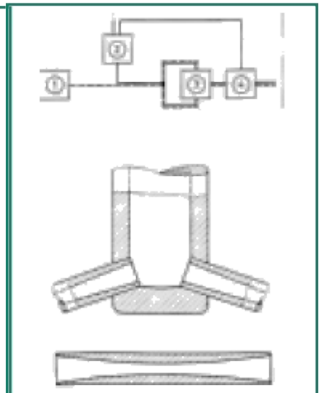
Strahlmühle mit Prallplatte



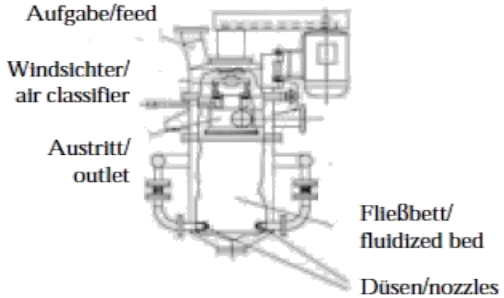
Spiralstrahlmühle



Ovalrohr-Strahlmühle



Finnpulva Gegenstrahlmühle
(1: Luft, 2: Produktaufgabe, 3: Mahlkammer, 4: Sichter)



Fließbettgegenstrahlmühle

Commonly Used Fluidized Bed Jet Mill for Sintered NdFeB

NETZSCH

APPLICATION BACKGROUND

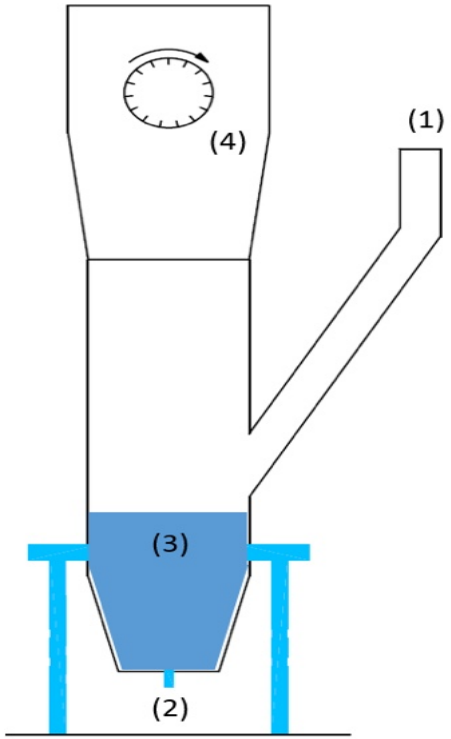
Basic Design

(1) Product Inlet

(2) Nozzles (including one nozzle at bottom)

(3) Grinding Zone

(4) Classifier Wheel



conventional design

Common Problems with Fluidized Bed Jet Mill for Sintered NdFeB

NETZSCH

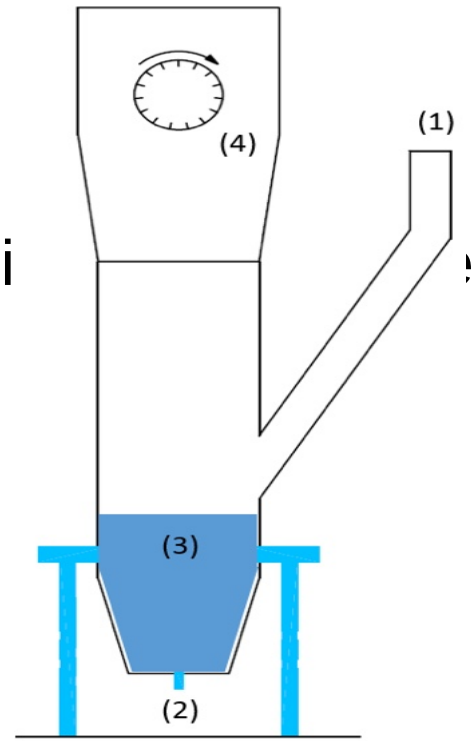
APPLICATION BACKGROUND

variations of PSD during start / stop phase of the mill

product residue (including undesirable hard to grind-iron containing particles) in the grinding chamber, difficult for cleaning and changing product

possibility of contamination of the complete grinding plant by hard to grind particles and coarse particles in the grinding chamber

variations of alloy composition during start / stop phase of the mill



conventional design

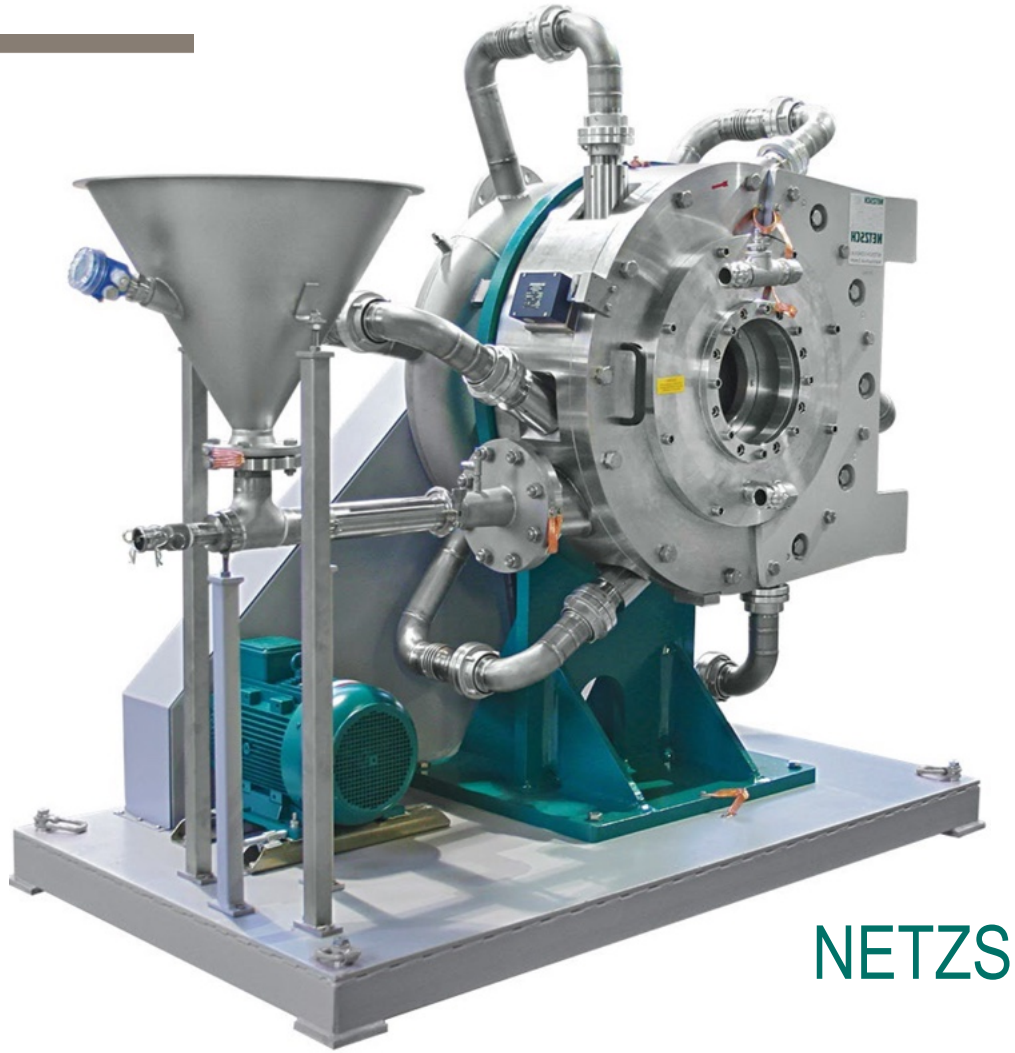
(1) Product Inlet; (2) Nozzles (including nozzle at the bottom); (3) Grinding Zone, (4) Classifier Wheel

The new NETZSCH Jet Milling Solution

NEW Jet Milling Solution: NETZSCH *M-JET*

NETZSCH

PROVEN TECHNOLOGY



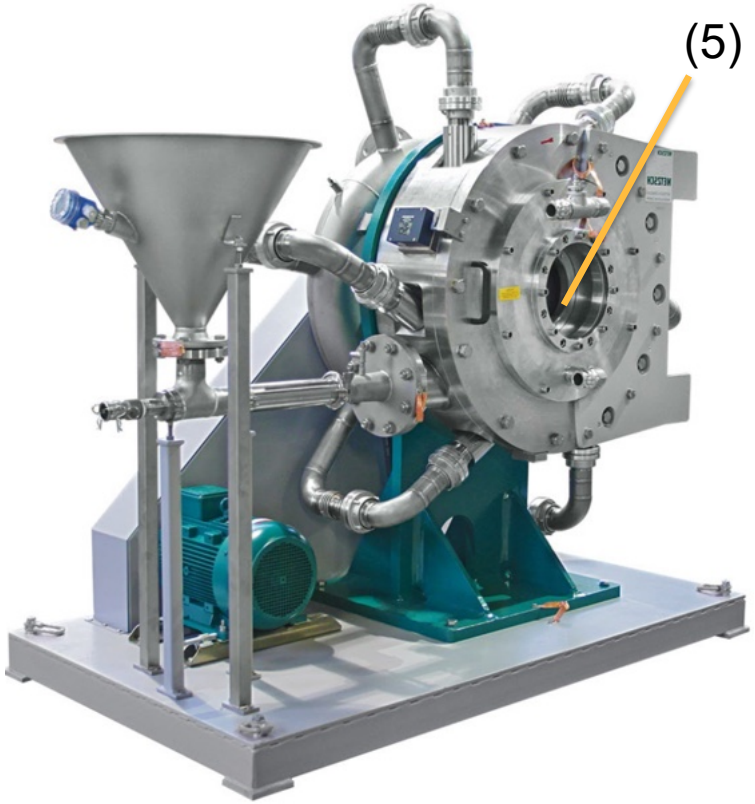
NETZSCH *M-JET*

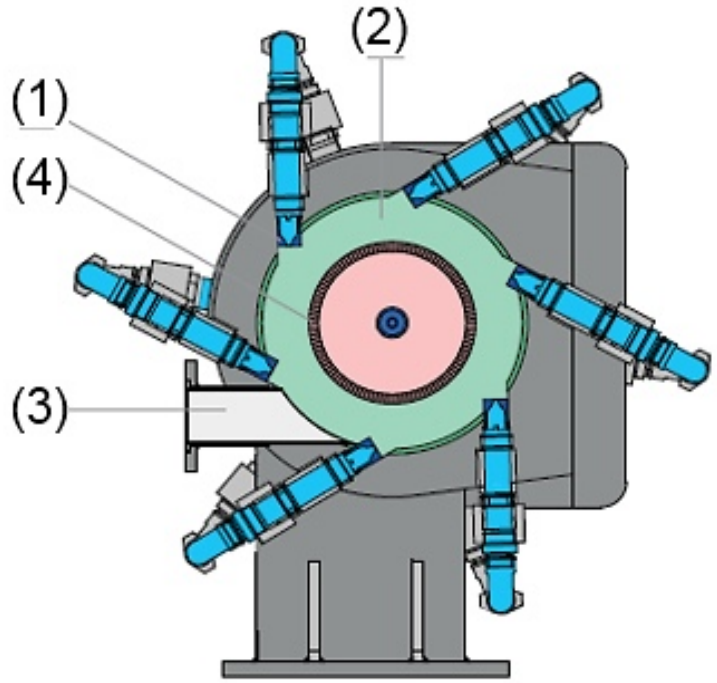
NEW Jet Milling Solution: NETZSCH *M-JET*

NETZSCH

PROVEN TECHNOLOGY

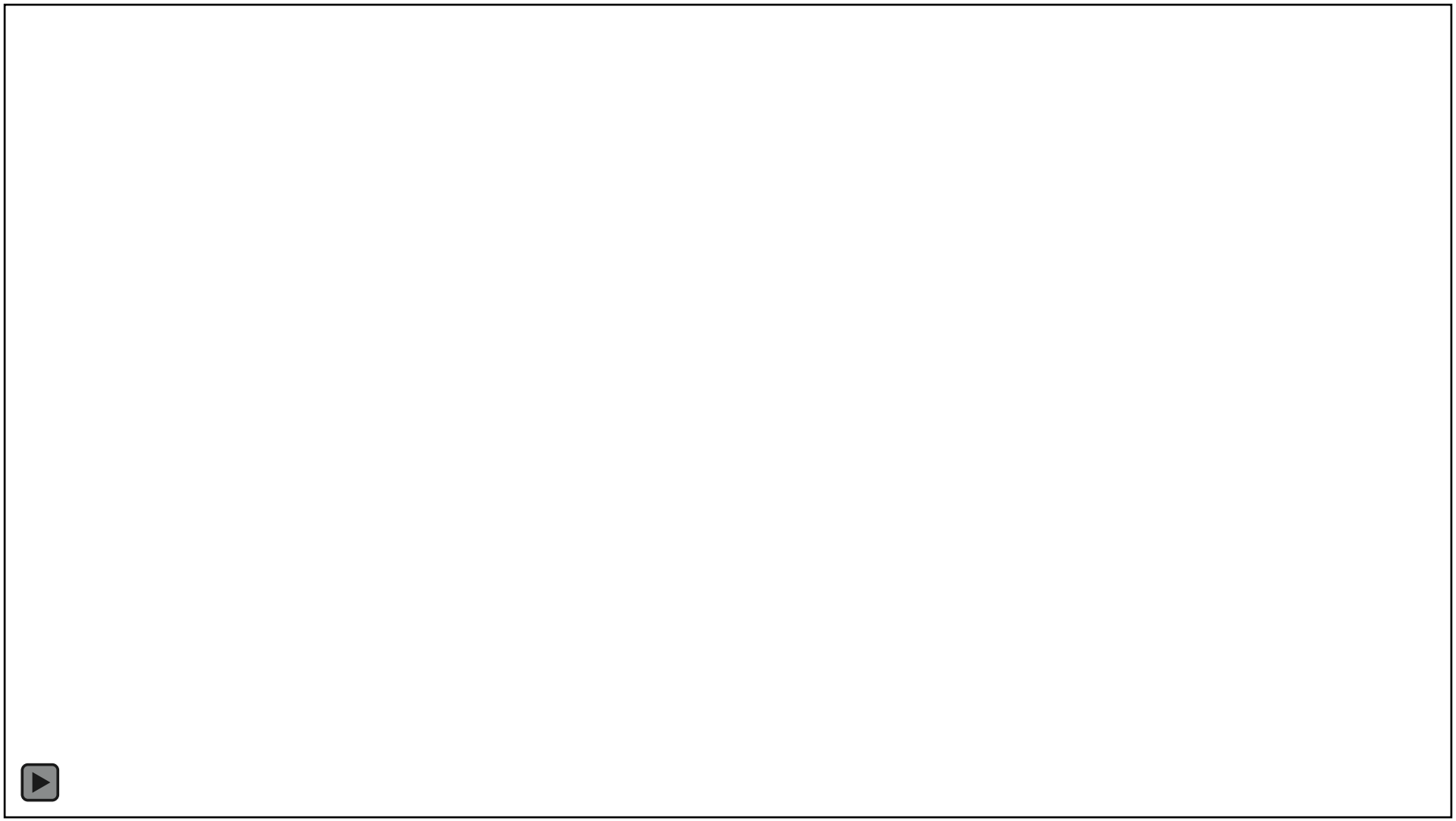
Spiral Jet Mill with integrated Classifier wheel, specially designed for rare earth alloy powders





(1) Nozzles; (2) Grinding Chamber; (3) Product Feed; (4) Classifier Wheel; (5) Fines Outlet

NEW Jet Milling Solution: NETZSCH *M-JET*



NEW Jet Milling Solution: NETZSCH *M-JET*

Spiral Jet Mill with integrated Classifier wheel

NETZSCH

PROVEN TECHNOLOGY

grinding effect is independent from the material amount in grinding chamber

no variations of PSD during start / stop phase of the mill

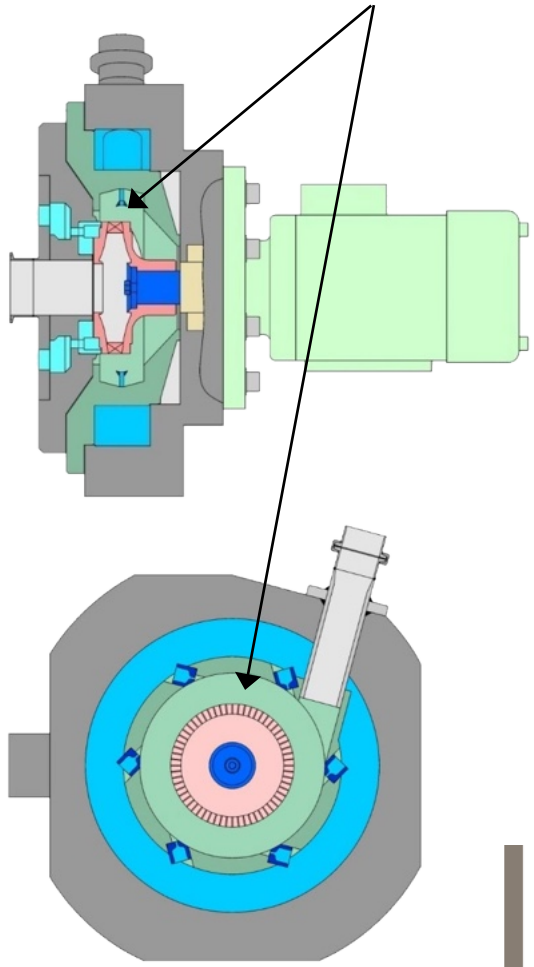
lower d90/d10 values - narrower particle size distribution

significant less content of fine particles < 1 µm in ground powder

no product residue in grinding chamber after milling stage

fully automatic discharging of hard to grind particles without contamination of the complete grinding plant

very compact Grinding Chamber

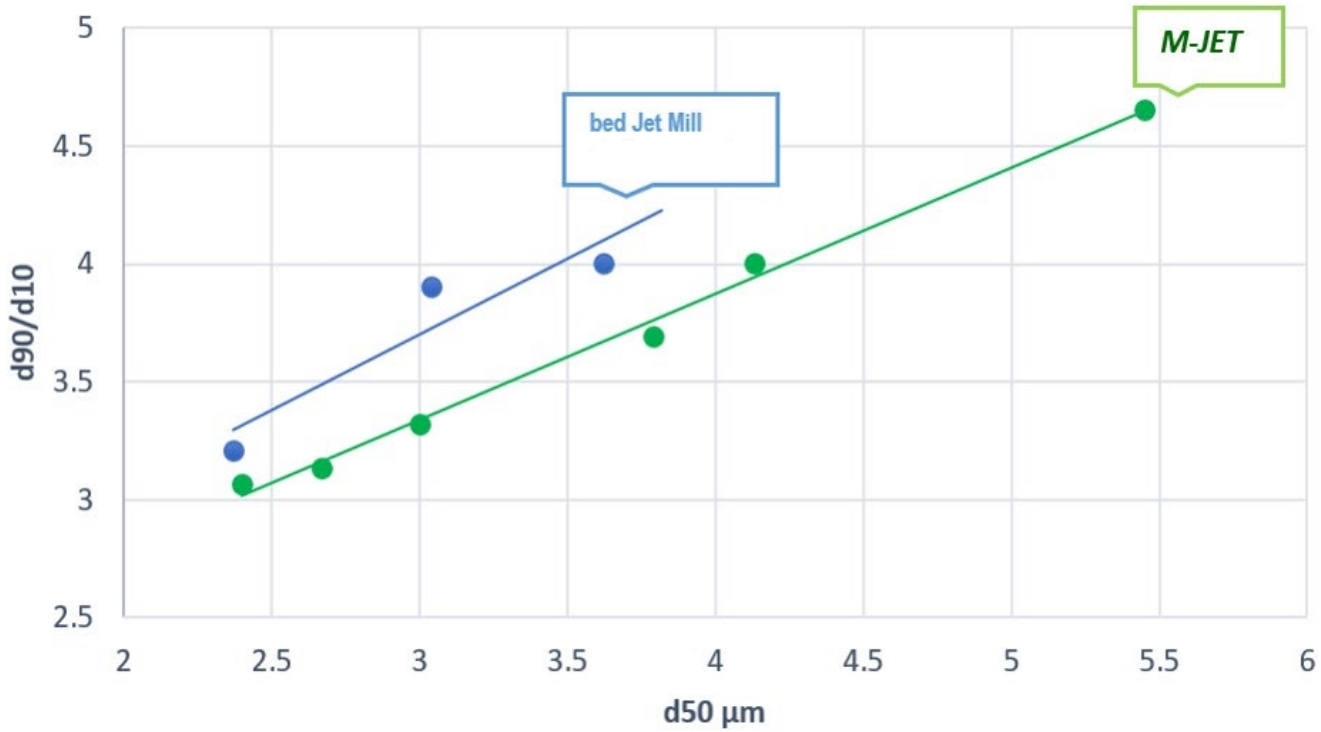


NEW Jet Milling Solution: NETZSCH *M-JET*

Spiral Jet Mill with integrated Classifier wheel

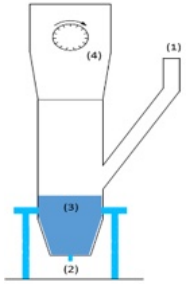
IT IS IMPROVING QUALITY

Experimental Results: lower d90/d10 values - narrower particle size distribution



M-JET

Fluidized Bed Jet Mill



conventional design

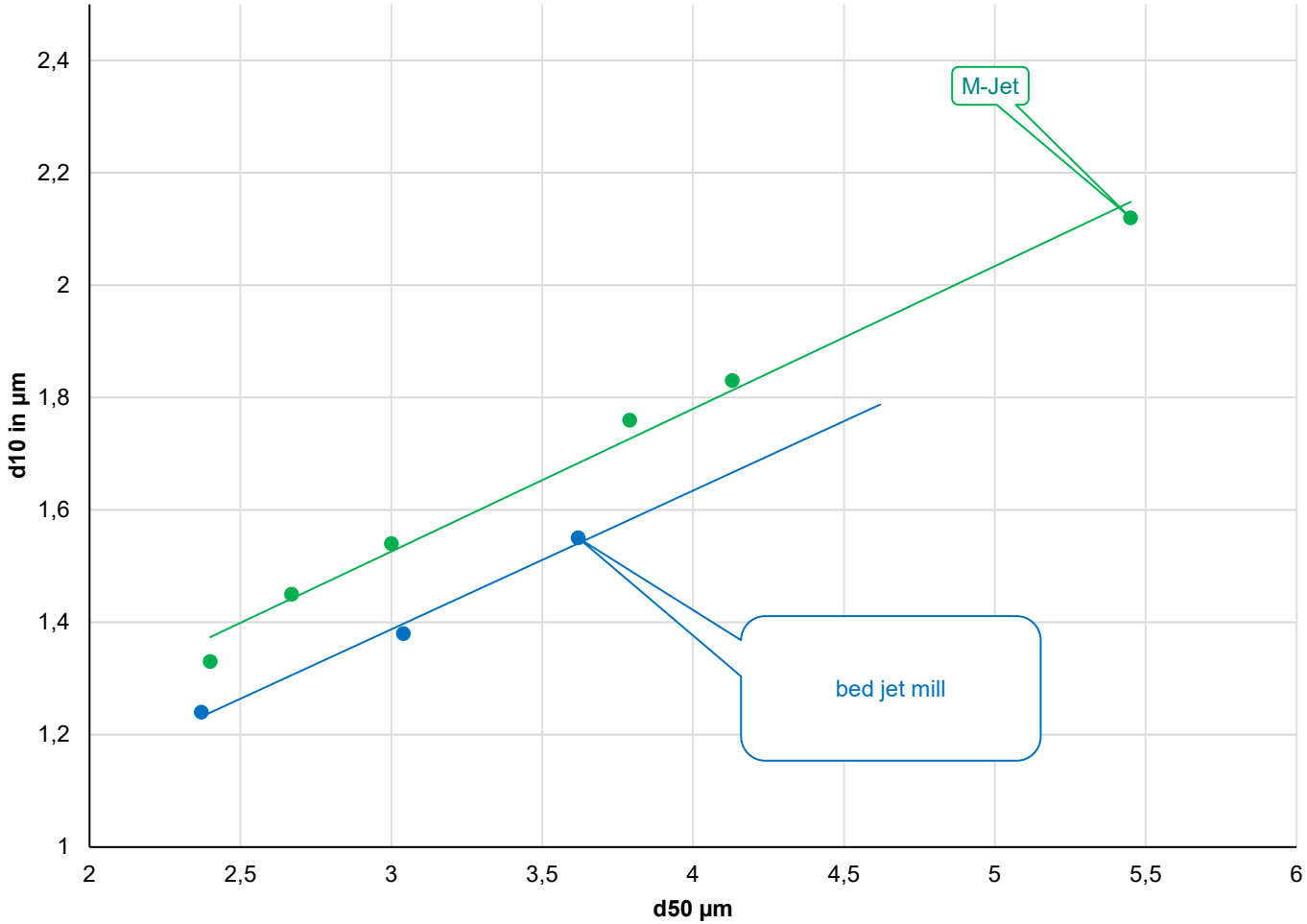
NEW Jet Milling Solution: NETZSCH *M-JET*

Spiral Jet Mill with integrated Classifier wheel

NETZSCH

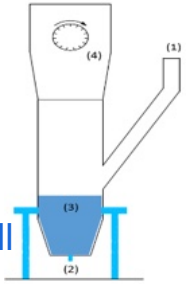
Experimental Results: **less undesired super-fine particles**

IT IS IMPROVING QUALITY



NETZSCH M-JET

Fluidized Bed Jet Mill



conventional design

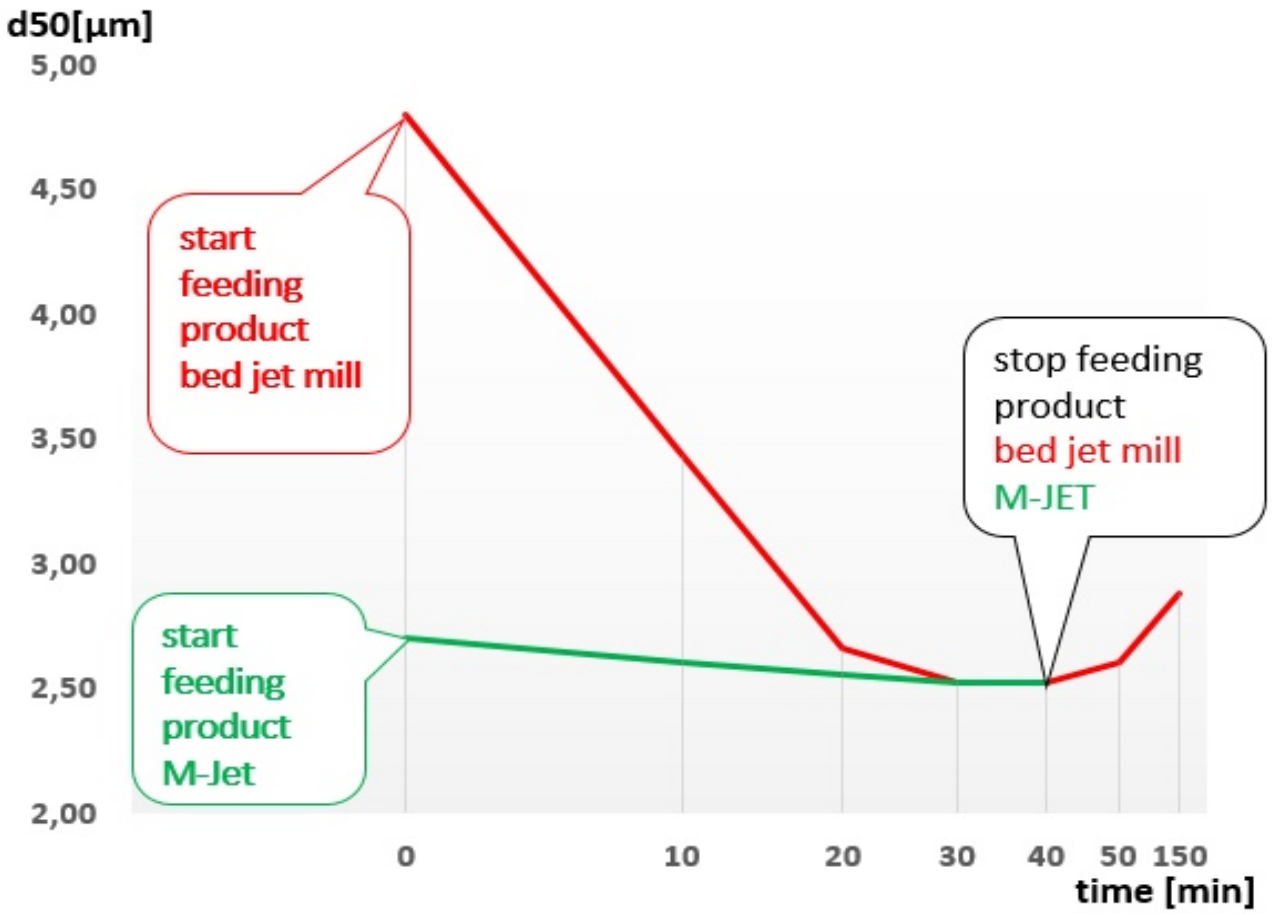
NEW Jet Milling Solution: NETZSCH *M-JET*

Spiral Jet Mill with integrated Classifier wheel

NETZSCH

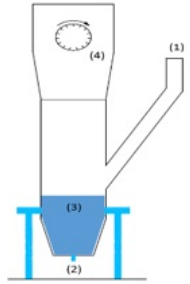
IT IS IMPROVING QUALITY

Experimental Results: **no variations of PSD and alloy composition during start / stop phase of the mill**



NETZSCH M-JET

Fluidized Bed Jet Mill



conventional design

NEW Jet Milling Solution: NETZSCH *M-JET*

Spiral Jet Mill with integrated Classifier wheel

NETZSCH

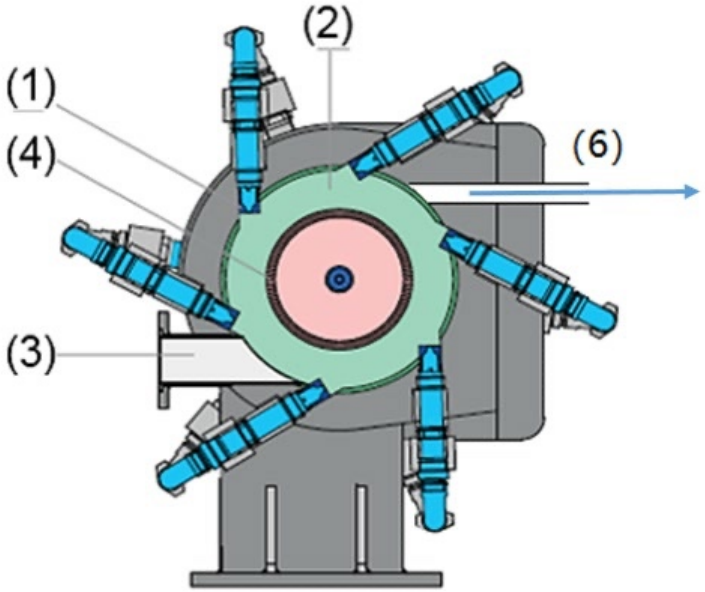
PROVEN TECHNOLOGY

Ratio of active quantity of product in grinding chamber in comparison to Fluidized Bed Jet mill is only 1:20

Special designed channel at grinding chamber can realize:

fully automatic quick discharge of hard to grind particles during normal operation of the mill

Quick discharge of material for changing product type

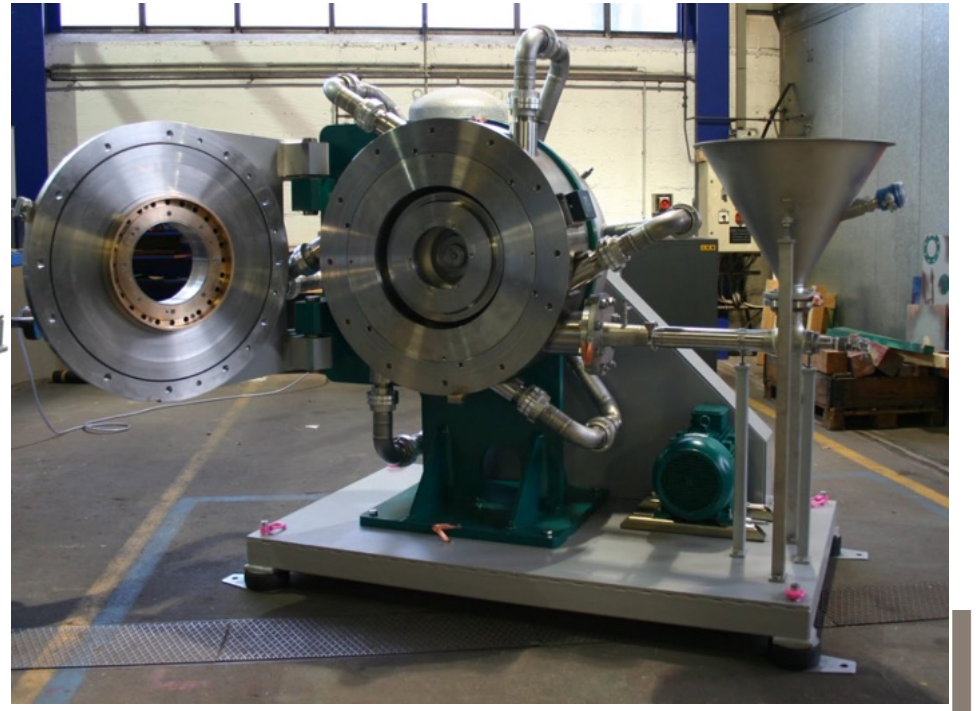


(1) Nozzles
(2) Grinding Chamber
(3) Product Feed
(4) Classifier Wheel
(5) Fines Outlet
(6) discharge pipe for hard to grind product

NEW Jet Milling Solution: NETZSCH *M-JET*

NETZSCH

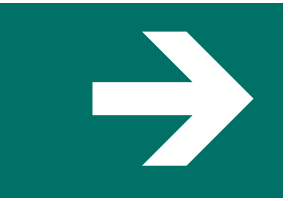
PROVEN TECHNOLOGY



NEW Jet Milling Solution for Rare Earth Magnets

Customer benefits

- Finer d50 value of final powder – 2 to 3.5 µm
- lower d90/d10 values – narrower particle size distribution
- significant less content of fine particles < 1 µm in ground powder
- Grinding effect is independent from the material amount in grinding chamber
- no variations of PSD during start / stop phase of the mill
- no product residue in grinding chamber after milling stage
- fully automatic discharging of hard to grind particles without contamination of the complete grinding plant



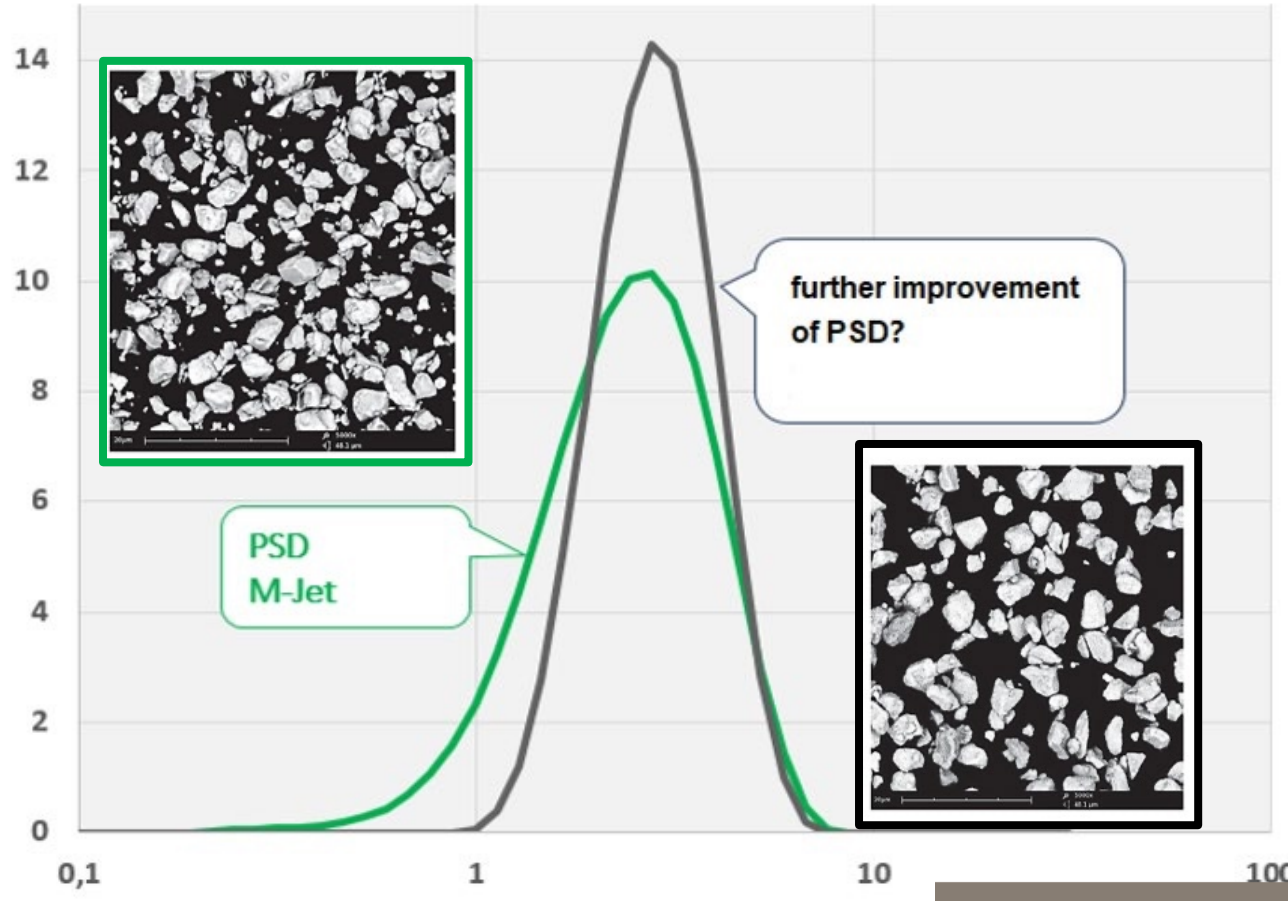
One more step ahead is also possible!

To produce narrower PSD product than jet milling process

NETZSCH

PROVEN TECHNOLOGY

Do you want to have an even narrower PSD than *M-JET*?

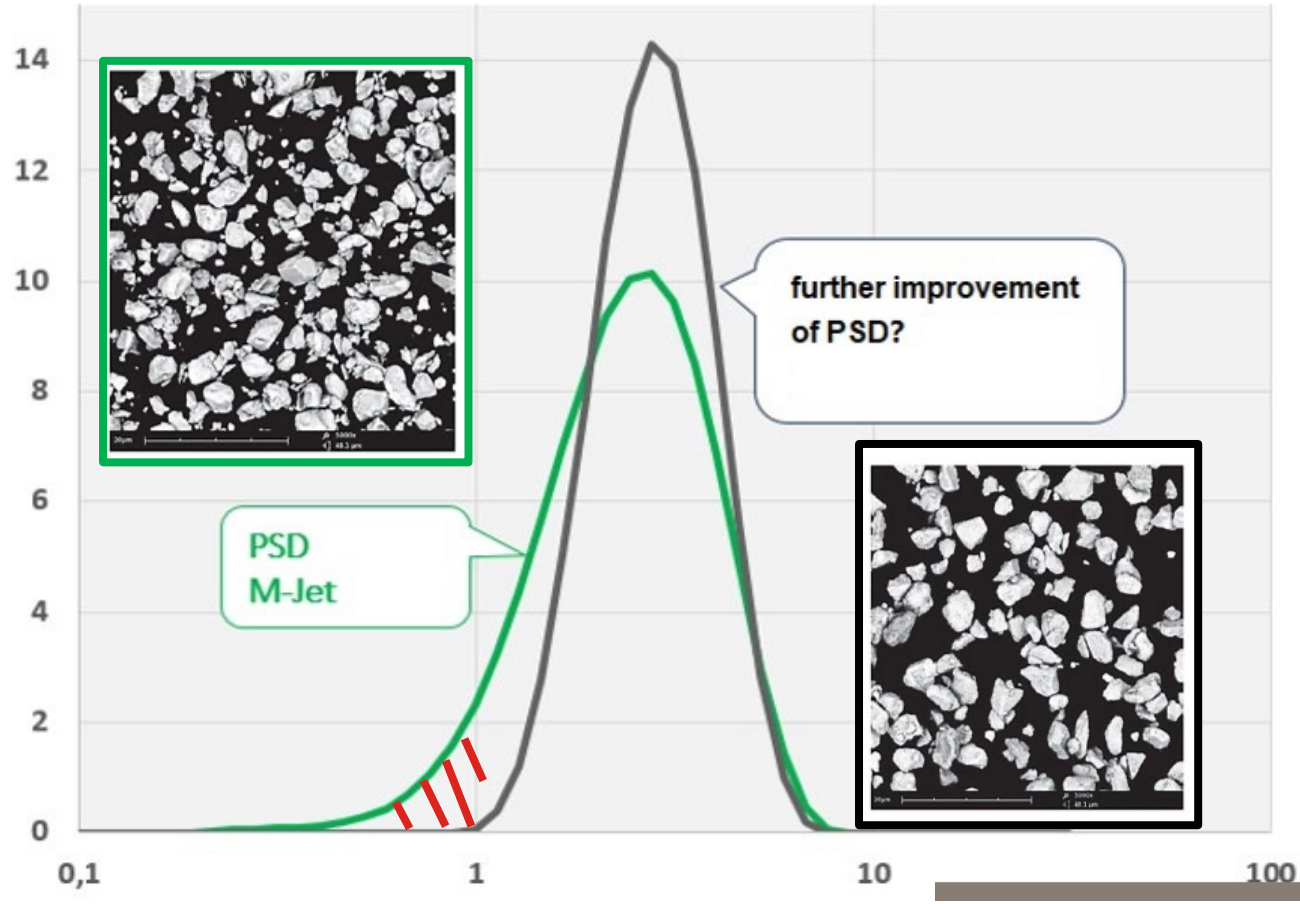


To produce narrower PSD product than jet milling process

NETZSCH

PROVEN TECHNOLOGY

Do you want to have an even narrower PSD than *M-JET*?



Solution to produce a product with a narrower PSD: NETZSCH *M-CLASS*

PROVEN TECHNOLOGY

High Dispersion Classifier specially designed for rare earth alloy powders

removing of finest and or coarsest particles from ground powder to produce any desired particle size distribution

lower d90/d10 values as only ground product, narrower particle size distribution as ground product

improvement of the magnetic properties of sintered magnets

High-efficiency Fine Classifier CFS/HD-S

NETZSCH

ConVor® type classifier wheel with horizontal shaft and belt drive

Product enters from the top

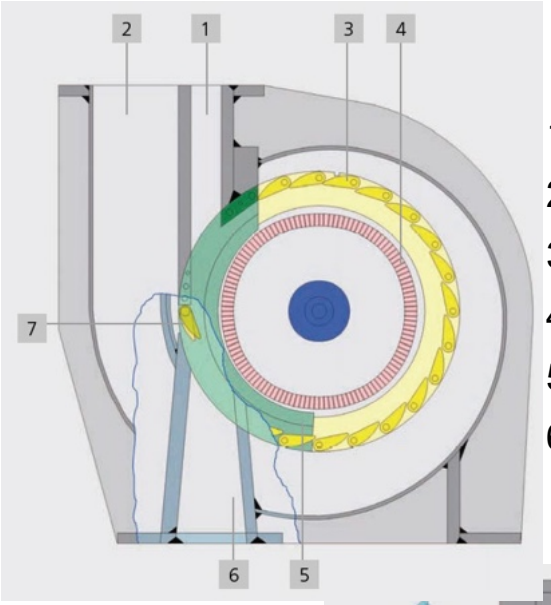
Air enters from the top, moving in spiral flow pattern through the guide vane ring

High Dispersing (**HD**) close to the Classifier

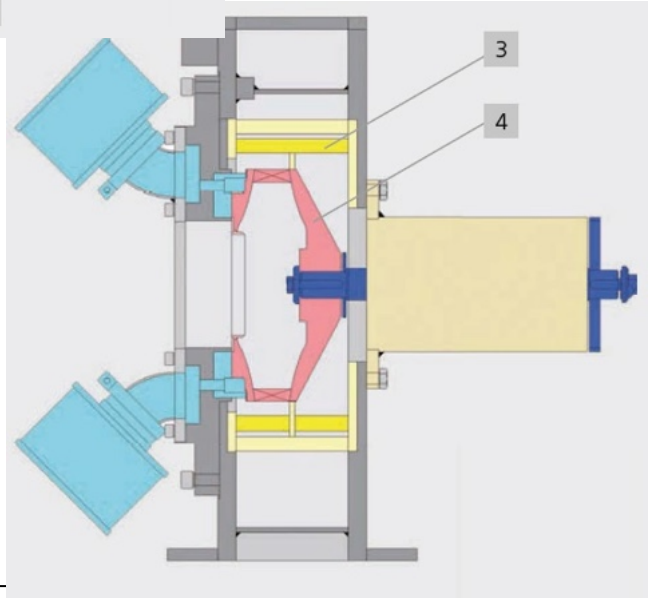
Fines exit through the wheel together with the air flow, Coarse material exits the housing at the bottom

Highest separation point down to 2 µm (d_{97})

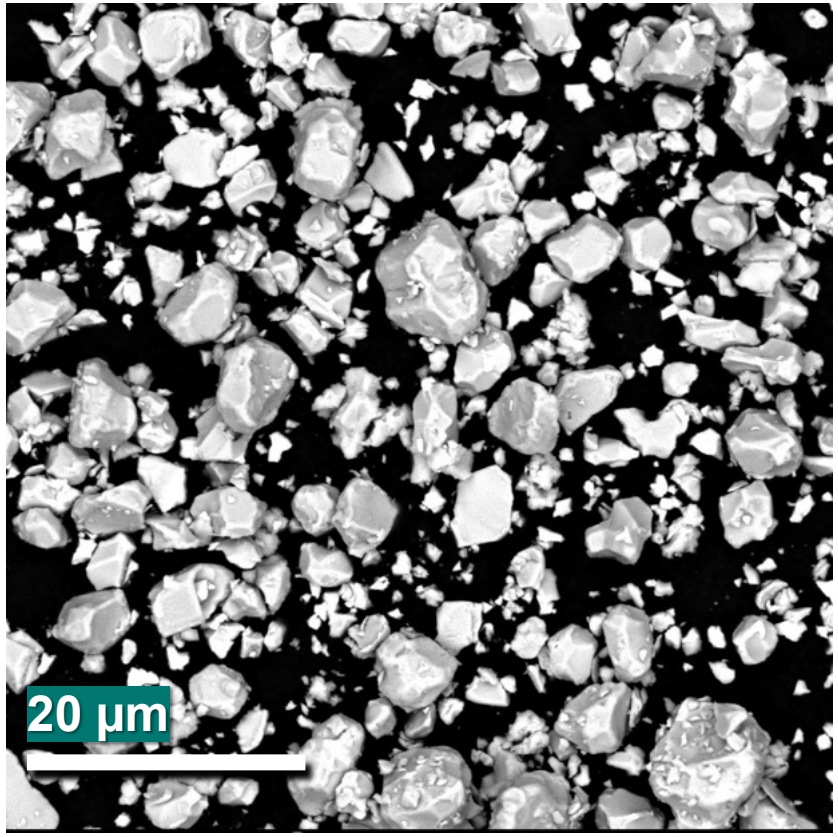
Extremely sharp cut and dispersing improved separation of fine product



1 Feed inlet
2 Air inlet
3 Guide vane basket
4 Classifier wheel
5 Separating wall
6 Coarse outlet

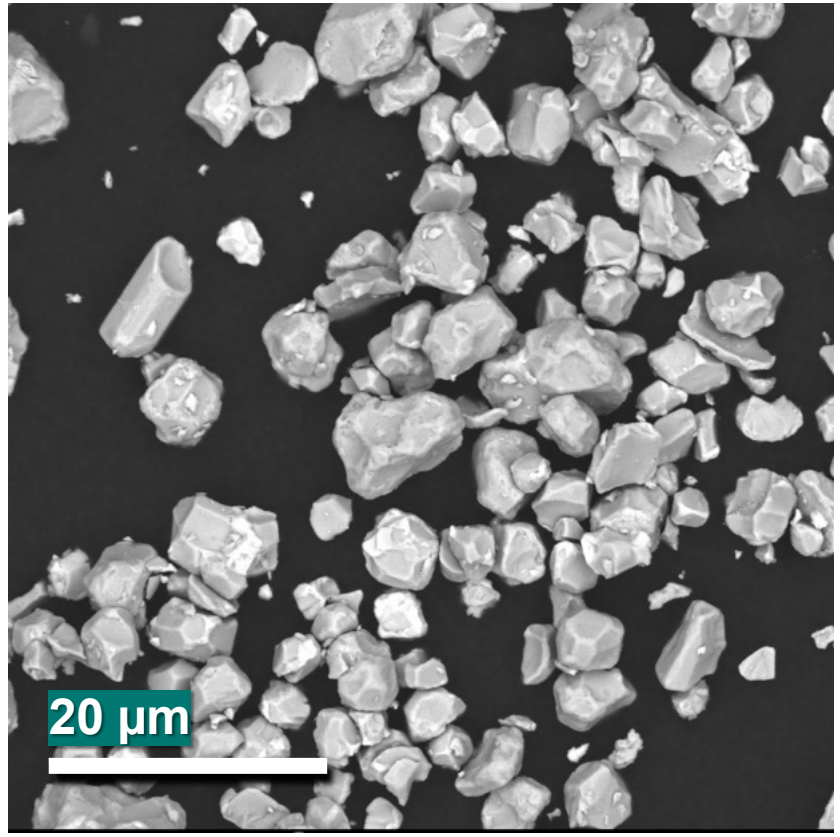


Solution to produce a product with a narrower PSD: NETZSCH *M-CLASS*



NdFeB Powder ground to a D_{50} = 5 µm

M-CLASS



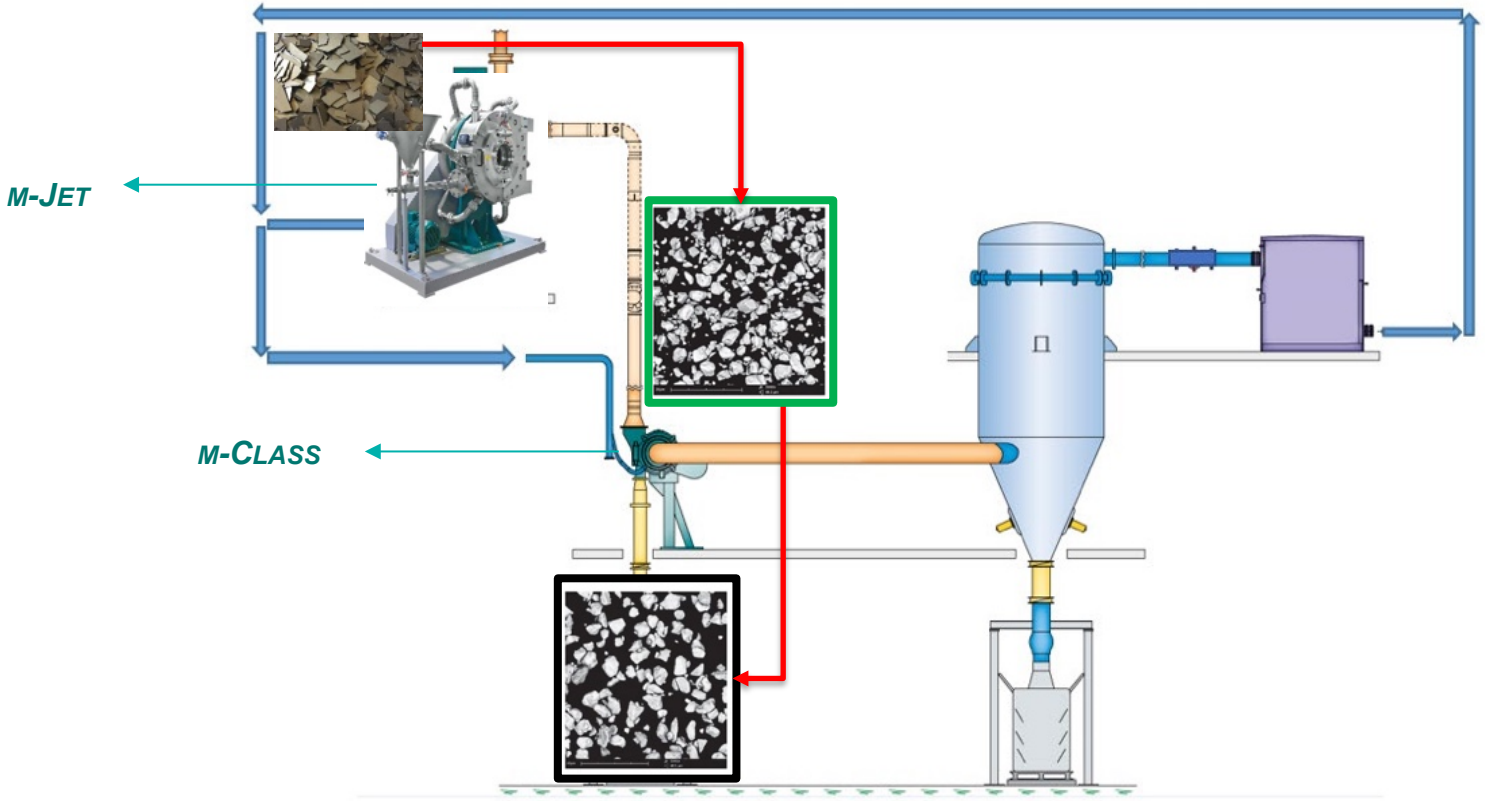
NdFeB Powder ground to a D_{50} = 5 µm and additionally classified

Solution to produce a product with a narrower PSD: NETZSCH *M-CLASS*

NETZSCH

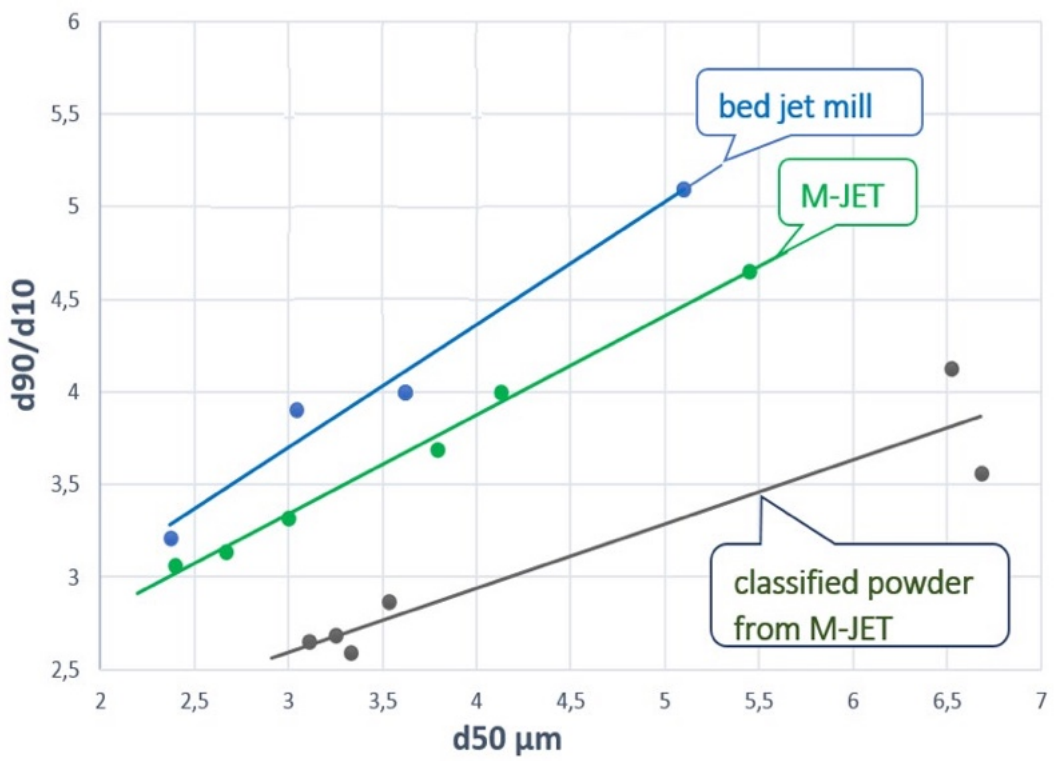
PROVEN TECHNOLOGY

***M-JET* + *M-CLASS* inline installation**



Solution to produce a product with a narrower PSD: NETZSCH *M-CLASS*

IT IS IMPROVING QUALITY



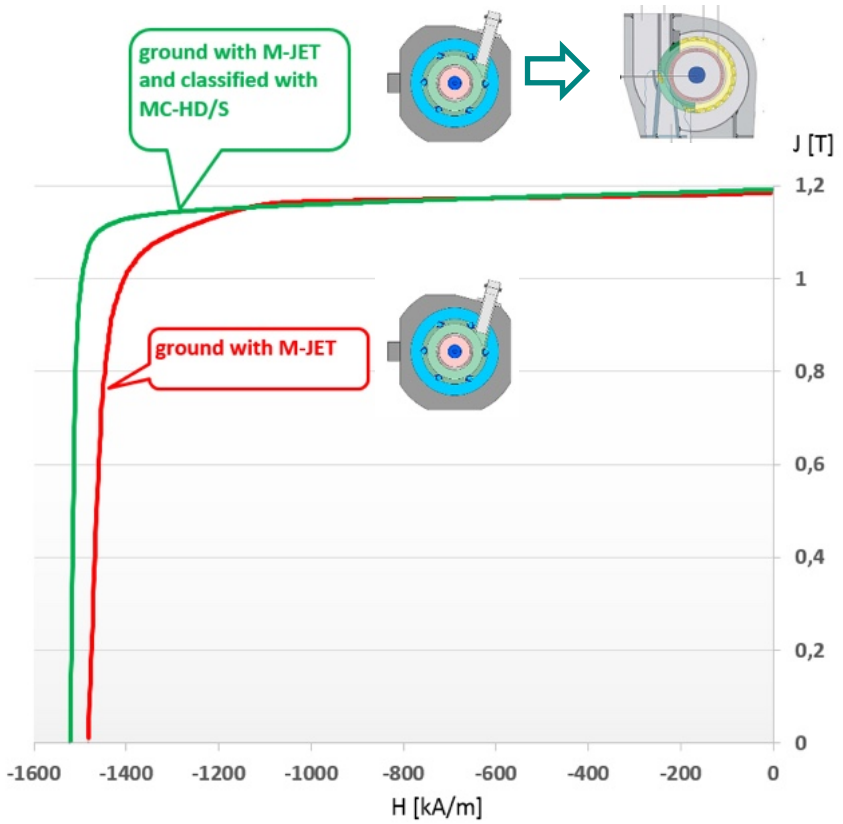
D90/D10 value from different types of jet mill and further processed with *M-CLASS*

M-JET
d50=3.5 µm
< 1µm <2.8%, d90/d10=3.6 µm

M-JET + M-CLASS
d50=3.5 µm
< 1µm =0%, d90/d10=2.6 µm

Solution to produce a product with a narrower PSD: NETZSCH *M-CLASS*

IT IS IMPROVING QUALITY



Increased Final Performance of Magnet

knee-field strength	Hk	+ 9,1%
Squareness	R= Hk/Hcj	+ 7%
intrinsic coercivity	Hcj	+ 3%

Recent Publications by **Fraunhofer IWKS**

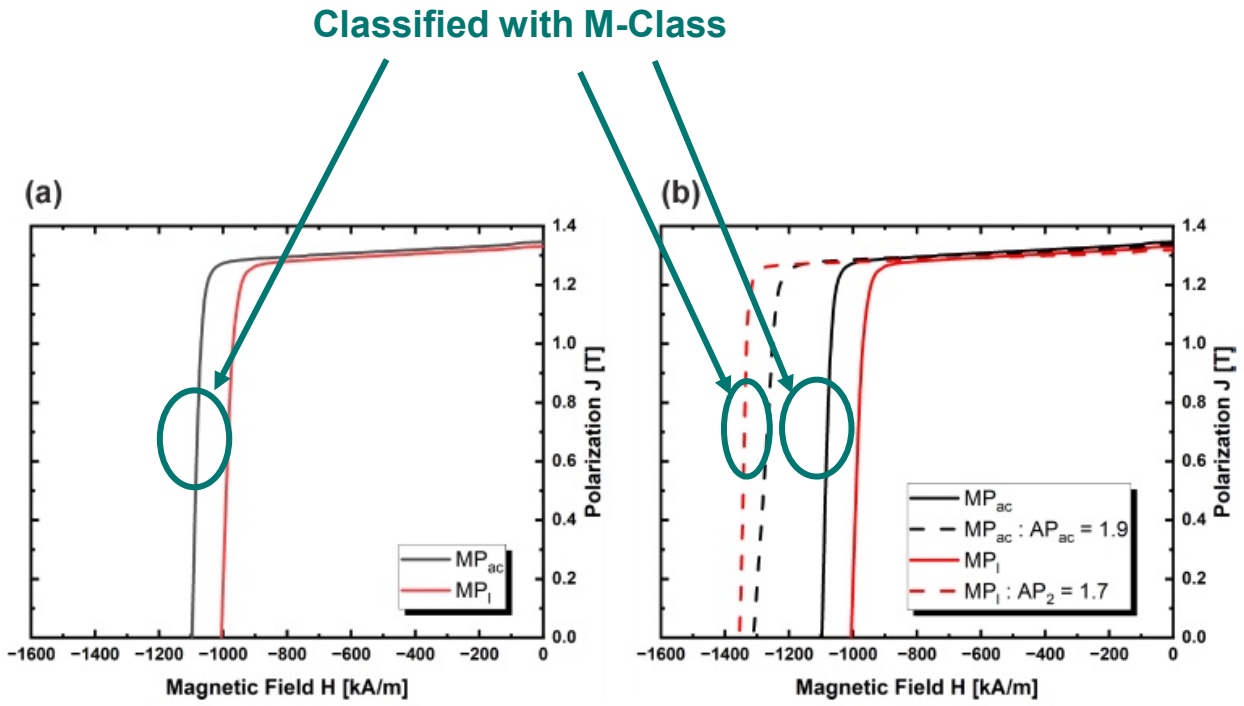


Figure 5.18: Demagnetization curves of (a) the magnets produced out of MP_{ac} and MP_I. (b) Comparison of the magnets using the 2PM for the blends MP_{ac} with AP_{ac} and MP_I with AP_2. All magnets produced by the 2PM have a Dy content of 2 wt.%.

Opelt, K., Gutfleisch, O., & Alff, L. **(2026).** Manufacturing of More Sustainable Nd-Fe-B Permanent Magnets using the 2-Powder Method

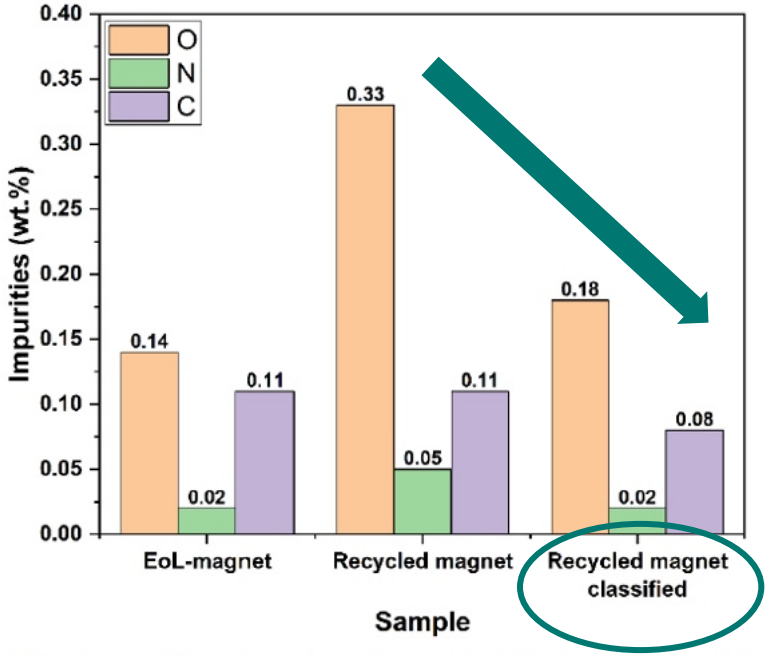


Figure 85: Impurity content of EoL-magnet, HD powder, and recycled magnets obtained from the as-milled and classified powder. Th classifying leads to a reduction of the oxygen, nitrogen, and carbon content compared to the recycled magnet without classifying.

Schönfeldt, M., Gutfleisch O. (2026). Increasing the sustainability of Nd-Fe-B permanent magnets used in wind power and electromobility through hydrogen-based functional recycling

NEW Gas Classifying Solution for Rare Earth Magnets

Customer benefits

Removing of finest and/or coarsest particles from ground powder to produce any desired particle size distribution

Creating narrower particle size distribution as ground product, lower d90/d10 values as only ground product

Improvement of the magnetic properties of sintered magnets

Model System for Laboratory Scale

IT IS AVAILABLE NOW

From lab to pilot production scale (1 – 15 kg/h)

No residue after the grinding stage

Modular system

Optional dedusting system M-class 5

Extract oxides / nitrides / other impurities

Enhanced Magnet properties

Model System for Production Scale

IT IS AVAILABLE NOW

Production scale up to 550 Kg/h

Close loop nitrogen recirculation

Optional inline dedusting

You can rely on NETZSCH.

NETZSCH
Proven Excellence.

Tayyab Ahmad
Application Manager RE Magnets

Zhenyu Duan
Regional Sales Manager

Frank Winter
R & D / Process development

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