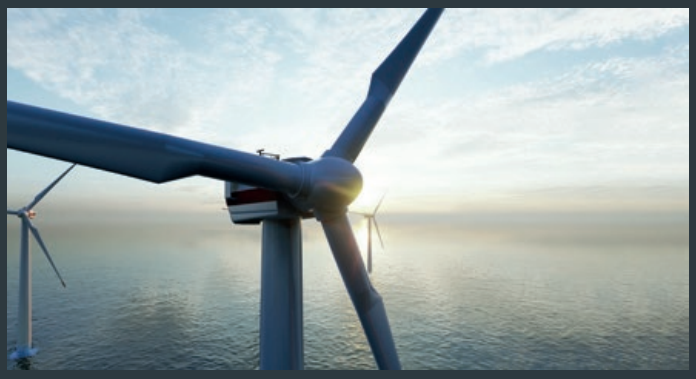
RARE EARTHS

Jet milling for high-performance permanent magnets

HOSOKAWA MICRON GROUP

Process technologies for tomorrow.

APPLICATIONS FOR RE MAGNETS



Wind turbines

Electronics

Medical technology

Electric motors

ON: THE NEW PRODUCT LINE TO PRODUCE ENERGY PERFORMANCE MATERIALS –
made by Hosokawa Micron Group

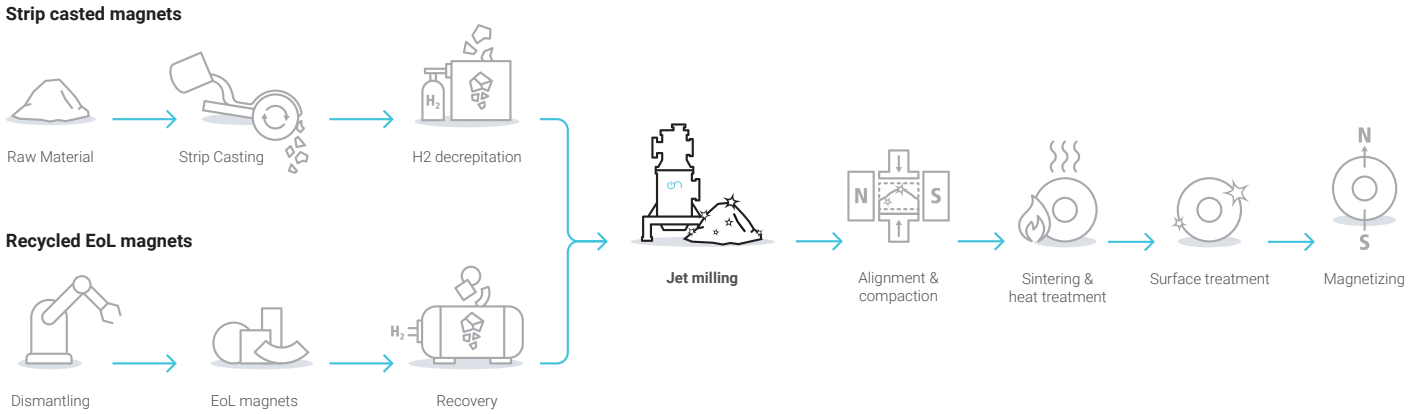
Energy performance materials are highly optimised powders whose particle properties improve end products for various applications. Whether rare earths for magnets or graphite or lithium for batteries: With ON systems, you get the best out of your energy performance materials!

www.on.hosokawa.com

PRODUCTION PROCESS FOR SINTERED NDFEB MAGNETS

Neodymium-iron-boron (NdFeB) or Samarium-Cobalt (SmCo) alloys are used to manufacture magnets, which are an essential component in electric motors. This means that rare earths are important energy performance materials in electromobility, aviation and wind turbines and therefore link the rare earth elements industry to the energy transition.

CHALLENGES IN THE PROCESSING OF RARE EARTHS FOR HIGH-QUALITY SINTERED MAGNETS



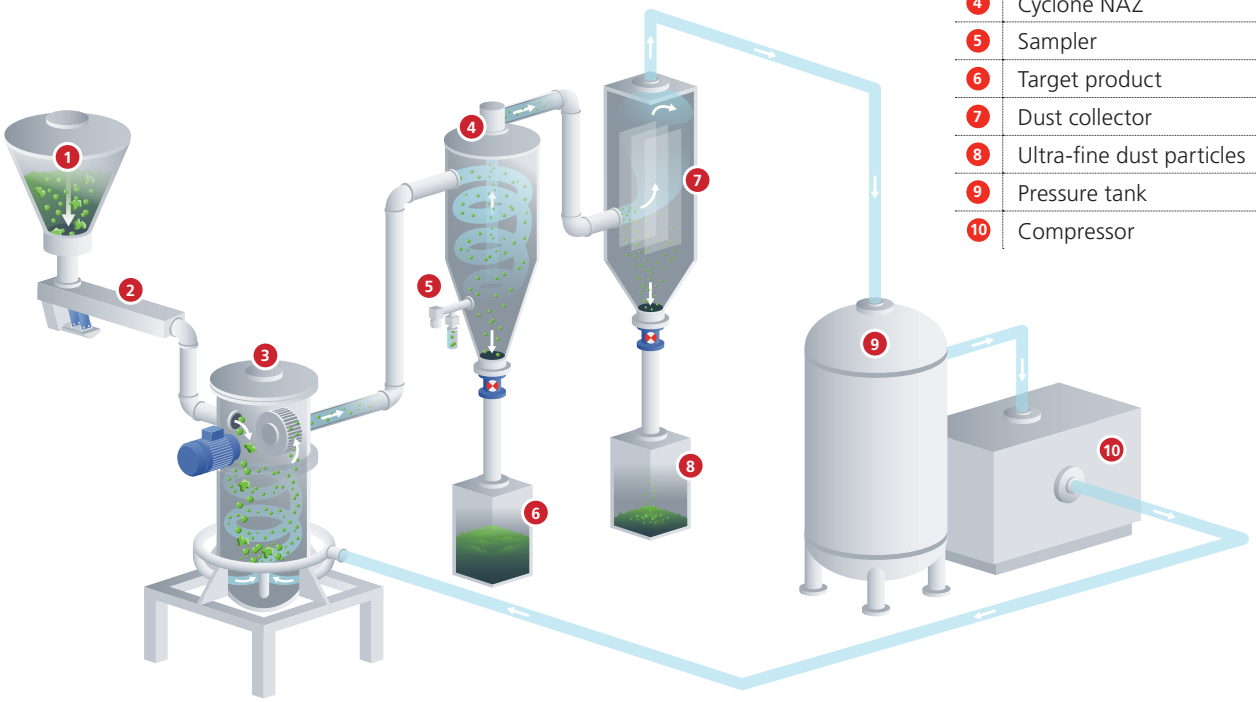
The special properties of NdFeB pose a number of challenges for magnet production. The main problem is that neodymium is pyrophoric: very fine particles start to oxidise on their own when they come into contact with oxygen. At the same time, however, a steep particle size distribution is required (d_{50} < 3 – 5 µm).

For this reason, a system for processing neodymium must be operated gas-tight and run with inert gas (nitrogen or argon). An integrated passivation process is also necessary: if the system needs to be opened (e. g. for cleaning or maintenance), it must be passivated, i. e. filled with air in a controlled manner. This allows the smallest particles to oxidise in a controlled manner without causing any harm.

JET MILLING OF RARE EARTHS

Your advantages with a system from Hosokawa Alpine

- Maximum efficiency with minimal nitrogen consumption
- Perfect for research and development in laboratory settings with our 100 AFG model.
- Scale-up for high capacities up to 250 kg/h
- Trusted for over 40 years in processing pyrophoric rare earth materials, ensuring reliability and proven performance
- Minimized product waste with advanced cyclone technology



1	Feeding station
2	Dosing system
3	Alpine AFG-R jet mill
4	Cyclone NAZ
5	Sampler
6	Target product
7	Dust collector
8	Ultra-fine dust particles
9	Pressure tank
10	Compressor

TRIALS IN OUR TEST CENTRE – LET'S FIND THE PERFECT SOLUTION!

Would you like to find the ideal solution for processing your rare earth materials? We would be happy to carry out trials with your materials in our test centre in Augsburg/Germany. Together we will find the ideal solution for your process. Thanks to a co-operation with a renowned institute, we can also produce magnets for you using your finished powder.

- **UNIQUE PARTICLE SIZE DISTRIBUTION D_{50} < 3 – 5 µm LEADING TO A BETTER SINTERING PROCESS**
- **LOW PPM RANGE OF O_2**
- **HOMOGENEOUS GRINDING FOR CONSISTENT PRODUCT QUALITY**
- **EXTREMELY LOW CONTENT IN THE SUBMICRON RANGE**

Would you like to improve the performance of your rare earth magnets?
Start now and get in touch with us!

AFG-R FLUIDISED BED OPPOSED JET MILL

The perfect machine for enhancing rare earths

Jet mills are impact mills which are used to achieve maximum fineness values at maximum product purity. Such particle sizes can only be achieved in connection with an air classification process step . Fluidised bed opposed jet mills are equipped with a dynamic deflector-wheel classifier.

› *AFG-R Fluidised Bed Opposed Jet Mill*

The AFG-R fluidised bed opposed jet mill is used especially for processing neodymium-iron-boron alloys and has become a reference in the world of high-quality magnet production. This version of the AFG jet mill has a bottom nozzle so that even particles that are difficult to grind can be ground. Thanks to ultra-fine particles with a fineness of d_{50} < 3 – 5 µm, super-strong magnets can be produced.

The mill can be operated gas-tight with inert gas (nitrogen or argon). The jet mill is available on a laboratory scale – a scale-up to a production plant with throughputs of up to 250 kg/h is possible. This also makes it the ideal solution for research and development.

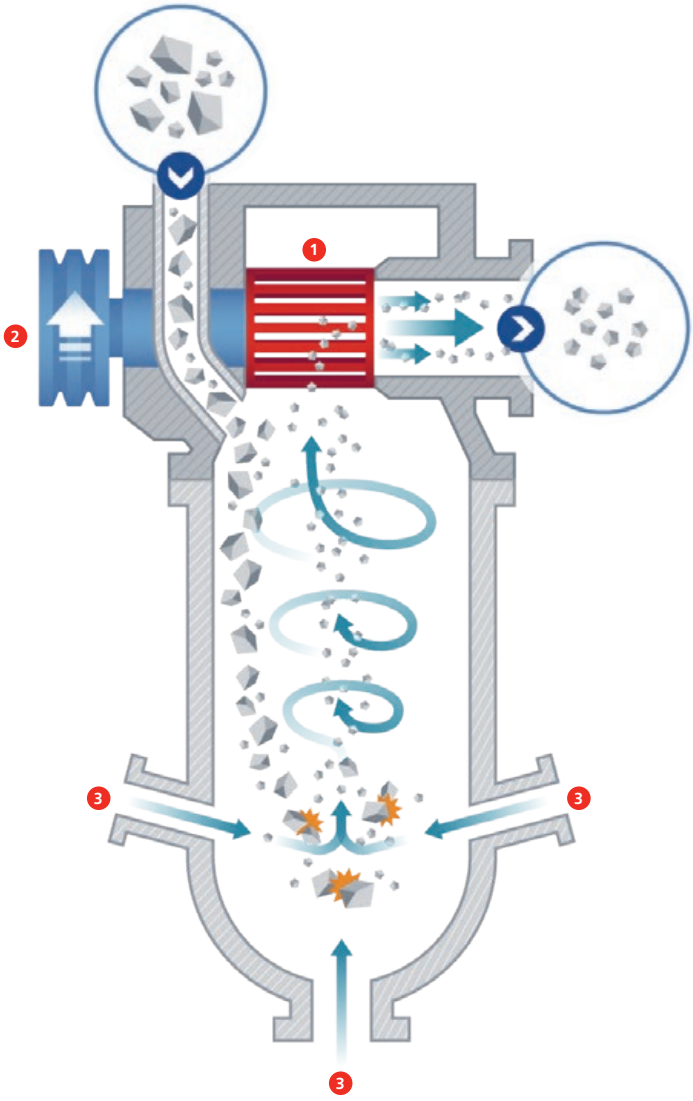
- Inert operation: nitrogen/argon
- Gas-tight

TYPE	*THROUGHPUT*	*FINENESS*
100 AFG (Lab size)	0,5 – 1,5 kg/h*	D_{50} < 3 – 5 µm
200 AFG	65 kg/h*	D_{50} < 3 – 5 µm
280 AFG	125 kg/h*	D_{50} < 3 – 5 µm
400 AFG	250 kg/h*	D_{50} < 3 – 5 µm

* Depends on hydrogen decrepitation

OPTIMUM PROCESSING OF RARE EARTHS

Principle of operation



In a fluidised bed opposed jet mill, the product is fed via a feed lock. A product fluidised bed then forms in the grinding chamber, which is fluidised by the gas jets. From there, the particles enter the gas jets and are accelerated. They collide with each other again and again and are thus comminuted. A classifier wheel rejects those particles that are still too large and conveys them back into the fluidised bed. The particles that are fine enough are separated from the grinding gas by a separator or dust filter.

The fineness of the product is adjusted via the speed of the classifier wheel. All-important is a high product loading of the nozzle jets in order to obtain a high particle concentration and thus high impact probabilities. The product level in the machine is controlled by load cells or by monitoring the current loading of the classifier drive.

1	Classifier wheel
2	Classifier drive
3	Process gas

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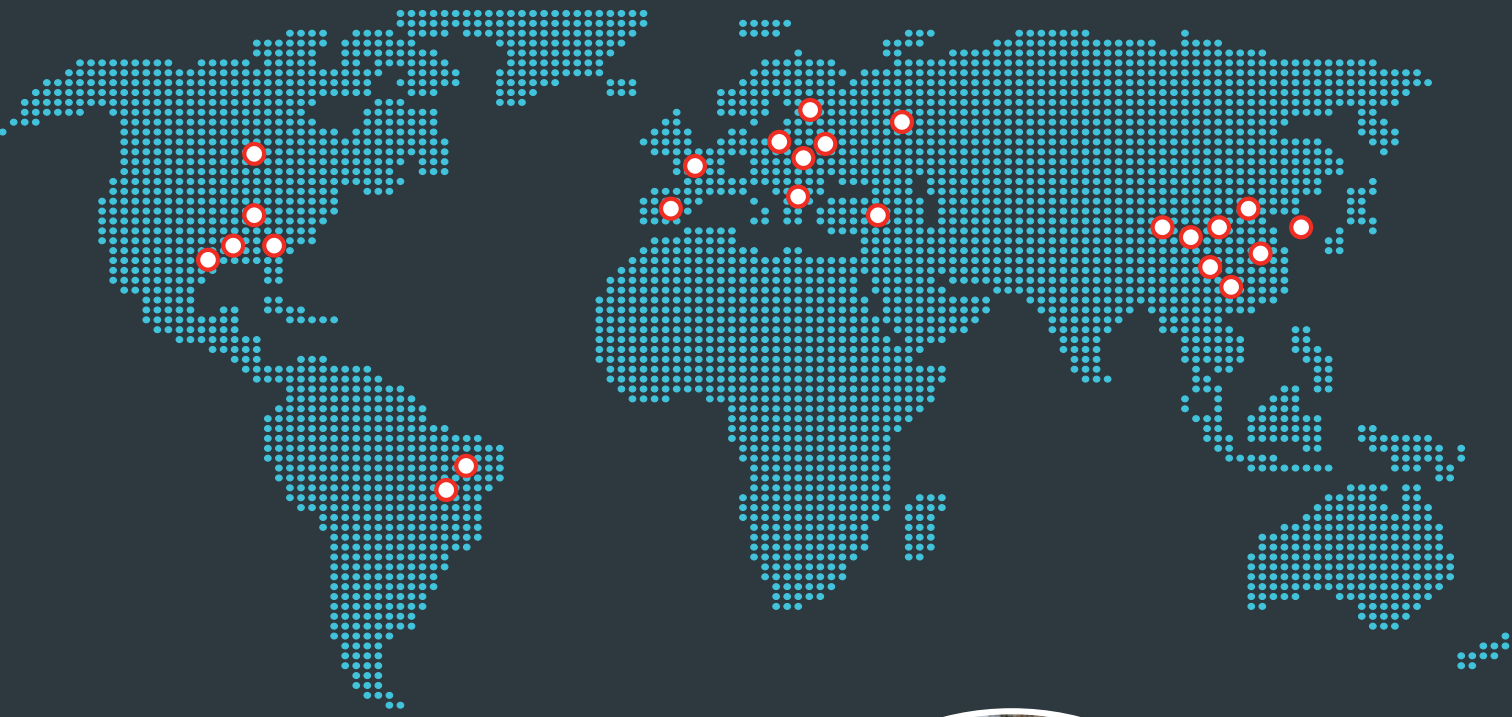
REFERENCE MAP FOR **NDFEB PLANTS**



READY TO LAUNCH YOUR **RARE EARTH MAGNET PLANT**

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HOSOKAWA MICRON GROUP

The **Hosokawa Micron Group** is a global leader in advanced processing systems and technologies for industries such as pharmaceuticals, chemicals, minerals, food, and plastics. With over a century of experience, the group offers innovative solutions for grinding, classification, mixing, drying, containment, recycling, analytical equipment and more, ensuring high quality and efficiency. Supported by a global network of R&D centers and manufacturing sites, Hosokawa Micron helps customers optimize processes, enhance product performance, and meet industry standards, solidifying its reputation as a trusted partner in high-performance processing solutions.

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