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NETZSCH *PAMIR*

The Agitator Bead Mill for finest Dry-Grinding

Business Unit
GRINDING & DISPERSING

NETZSCH *PAMIR*

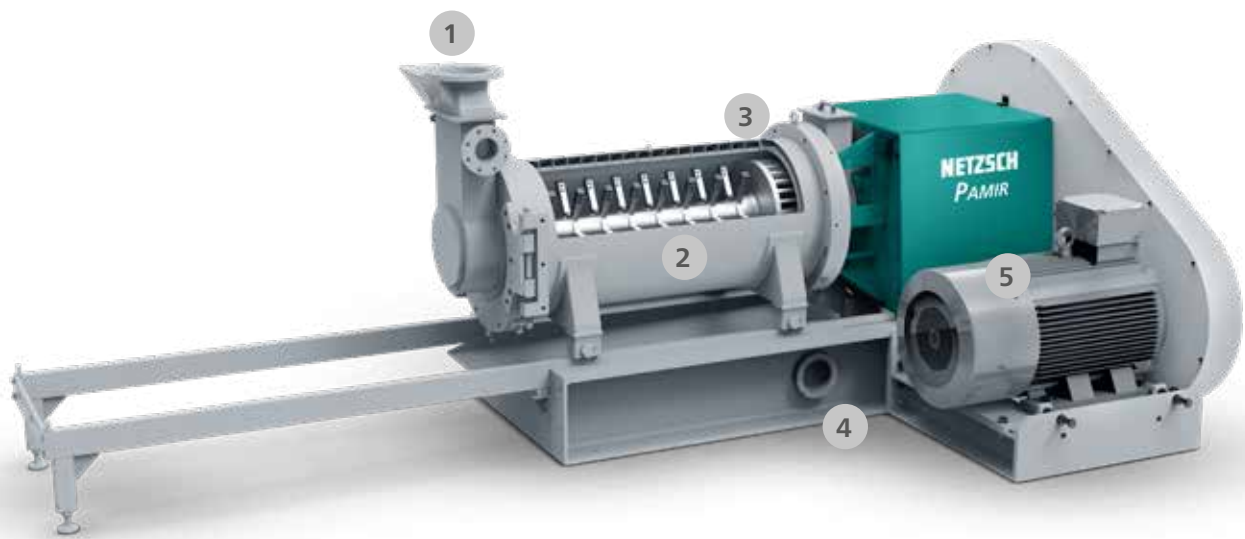
The Agitator Bead Mill for finest Dry-Grinding

The NETZSCH Group's Business Unit Grinding & Dispersing is one of the world market leaders in wet- as well as in dry-processing technology. For many years NETZSCH Agitator Bead Mills have been used successfully and reliably for the size-reduction and dispersing of suspended solids in many different industries. Numerous new- and further developments in the areas of wet- and dry-grinding technologies confirm NETZSCH's leading position in these technologies.

Especially in the area of dry grinding there are many applications which demand extremely fine products and at the same time require high throughput capacities and low energy consumption. Therefore, it only seemed natural to apply NETZSCH's worldwide frequently proven agitator ball mill technology to the dry-grinding area and to supplement the machine program with a dry, horizontal agitator bead mill: The *PAMIR*.

Compared to conventional ball mills, with the *PAMIR* it is possible to obtain extremely fine products combined with very high throughput capacities at low specific energy consumption levels thanks to its operating mode and stress characteristics. In combination with a classifier tailored to the application, particle sizes of less than 2 µm can be produced in a grinding/classifying circuit.





- 1 Product inlet
- 2 Grinding vessel
- 3 Separation system
- 4 Product outlet
- 5 Drive

Design and Functional Principle

Single Passage without Classifier

The *PAMIR* Dry Agitator Bead Mill is continuously fed via a rotary airlock valve. A shaft equipped with exchangeable agitator tools is mounted inside the horizontally installed grinding vessel. The grinding media which are distributed in the grinding vessel are kept in constant motion by the agitator tools and the resulting shearing / pressure- and impact stress ensures a very fine grinding result with a relatively low coarse fraction.

Due to the high energy density and the possibility to get a lot of comminution energy into the ground material, fineness around 50 µm are achieved even in one passage without classifier. A potential gradient causes an axial movement of the product through the grinding vessel and its vertical discharge out of the product outlet into a downstream conveying system.

Patented separation system for the smallest grinding media

The separation system developed and patented by NETZSCH makes the use of smaller grinding media possible. This means higher stress intensities can be applied resulting in higher fineness and a higher activation potential of the product being ground.

Grinding-/Classifying Circuit with inline-classifier

In addition to single-pass operation, the *PAMIR* dry agitator bead mill can also be operated with a NETZSCH inline-classifier, such as the high-performance fine classifier *INLINESTAR*. In this combination, it can make perfect use of its advantages and, with the separating sharp inline classifier, achieves the highest fineness with low energy consumption at the same time.

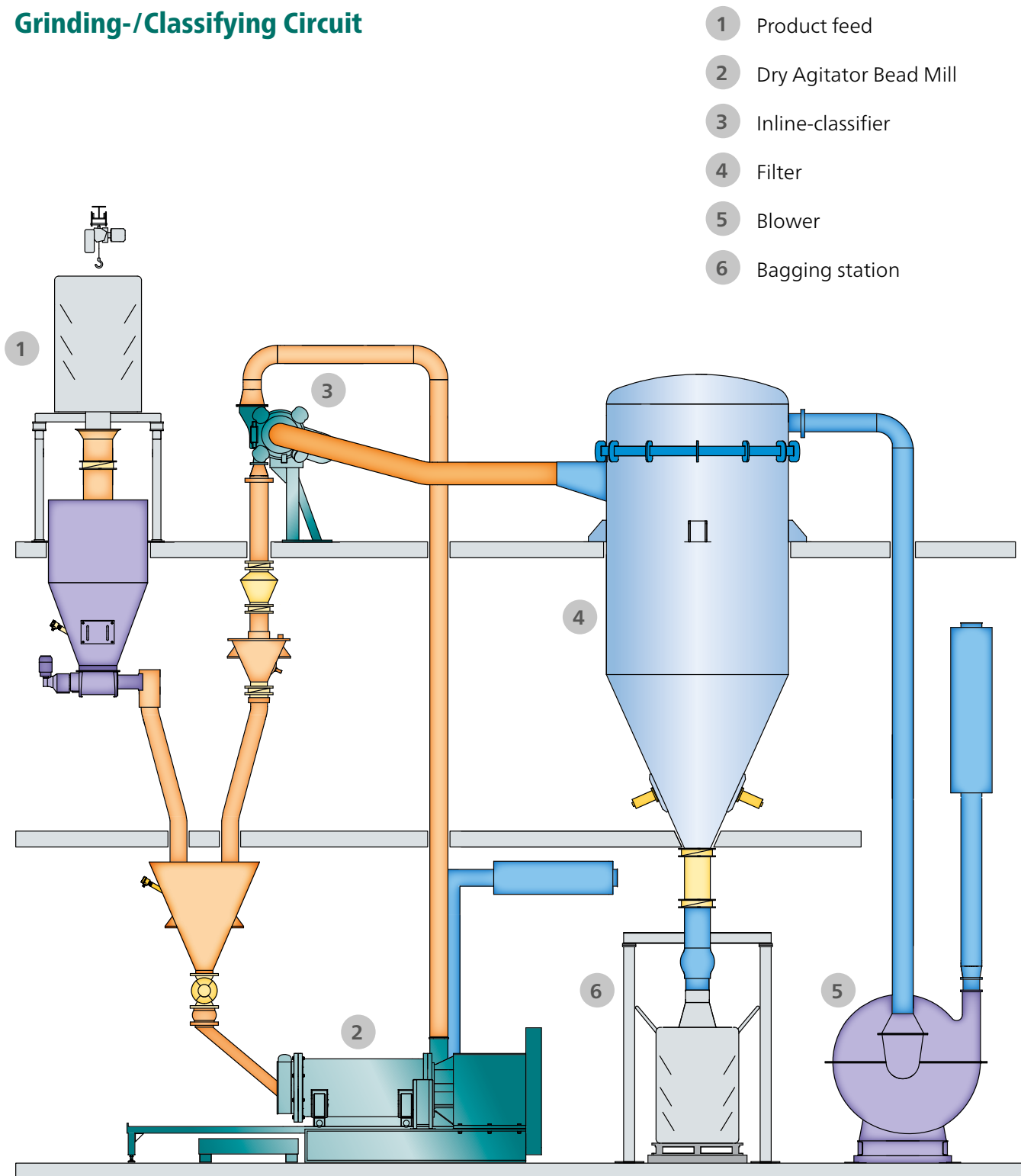
Low energy consumption – highest fineness

In circuit grinding, the product is fed into the mill via a feeding station and a gravimetric dosing system. Via a pneumatic conveyor system the finely ground product enters the air classifier, which removes the fine product from the grinding circuit. The finished product is discharged via a filter into a downstream handling system. The coarse product which has not yet been sufficiently ground is transported via a coarse product return chute back to the circuit together with the fresh feed product coming into the mill. Thanks to the optimized operation mode a comparatively low number of circuits are required to obtain the specified and adjustable particle size distribution.

NETZSCH can deliver the *PAMIR* Dry Agitator Bead Mill as an individual machine or as a complete plant



Grinding-/Classifying Circuit



Energy Efficiency

Due to the use of a larger amount of smaller grinding media and the resulting increased surface area, the stress frequency and, in combination with the speed, stress intensity is correspondingly higher. This means that it is also possible to fine grind comparatively coarse feed products at relatively low energy consumption levels.

High Product Yields

The self-adjusting steep particle size distribution has a positive effect on energy consumption and the yield when operating in a grinding-/classifying circuit in combination with a NETZSCH inline-classifier.

Compact Construction

In comparison to conventional ball mills the specific energy in the grinding chamber is substantially higher (approx. 400 kW/m³) and results in smaller footprints and foundations.

Open Mode of Operation

Even if it is used without a downstream classifier, the dry agitator ball mill can obtain attractive fineness with a respectable particle size limit.

High Finenesses

The patented separation device allows the use of very small grinding media and as a consequence in combination with a classifier tailored to the application the manufacture of extremely fine products.



FOCU

Separation System

A patented separation system allows the use of various grinding media with minimum diameters of up to 2 mm. This separating unit ensures that none of the grinding media can reach the product outlet. This prevents crushing of the grinding media and reduces the amount of maintenance work required and stoppages.

Ideal Replacement for Existing Ball Mills

Designed as a next-generation replacement for conventional ball mills, the *PAMIR* is delivered largely pre-assembled, requires minimal installation space and typically eliminates the need for large new foundations. This allows efficient upgrades of existing grinding plants while significantly improving product fineness and energy efficiency.

Horizontal Design

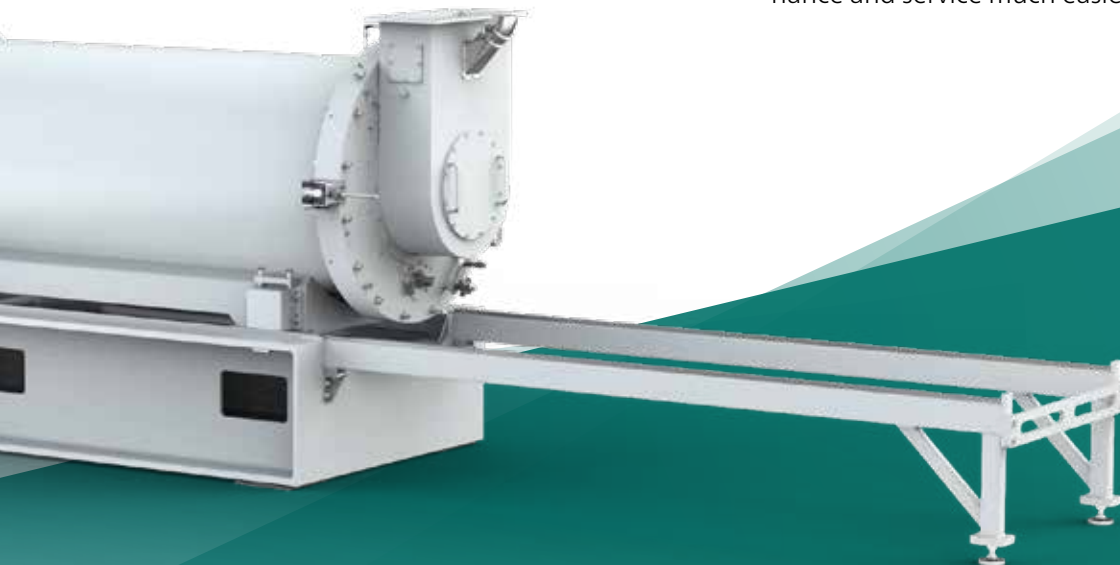
The horizontal execution enables a stable process and makes it possible to restart the mill under load.

High Throughput Capacities

The variety of different sizes ensures the design of the appropriate machine for each task and adaptations to customer requirements.

Simple Execution

A simple and robust execution enables a rapid change of the grinding media and the agitator elements and makes maintenance and service much easier.



US ON YOUR ADVANTAGES

The *PAMIR* opens up new

The agitator bead mill *PAMIR* is an energy-efficient plant for a wide range of applications in the field of dry grinding. In the versions both with and without classifier, robust continuous operation is possible, as demonstrated by plants of various sizes in different industrial applications in daily use.

The main field of application of the dry agitator bead mill *PAMIR* is real comminution of different products. Product finenesses d_{98} in the range of 2 μm to 70 μm are typical.

The discussion of the product qualities and results obtained shows that the shear stressing of *PAMIR* entails special features. In multilayer product structures, such as layered silicates, delamination is to be expected.

Furthermore, activation in downstream processes has been observed for some products. The reactivity of the products could be significantly increased compared to other grinding technology, which is defined as the main objective in some applications.

Application example: Ceramic pigments

Ceramic pigments are used as colorants in inkjet inks. Here, the most finely divided dispersion and narrow particle size distribution are important. The *PAMIR* Dry Agitator Bead Mill, which is used in combination with an *INLINESTAR* in the grinding/classifying circuit, is ideal for the energy-efficient production of different ceramic pigments.

During the production runs, it was possible to evaluate the behavior of the mill and classifier and to design the plant. Depending on the product and the desired fineness, throughputs in the range of 150 - 1200 kg/h are achieved.

Examples of Applications

- Activated carbon
- Aluminum oxide
- Baryte
- Bauxite
- Bentonite
- Calcite
- Calcium carbonate
- Calcium hydrate
- Cement
- Ceramic material
- Ceramic pigments
- Clay
- Clinker
- Dolomite
- Feldspar
- Fly ash
- Graphite
- Hydraulic binder
- Mineral fillers
- Perlite
- Petroleum coke
- Pumice powder
- Quartz sand
- Talc
- Titanium dioxide
- Wollastonite
- Zeolite

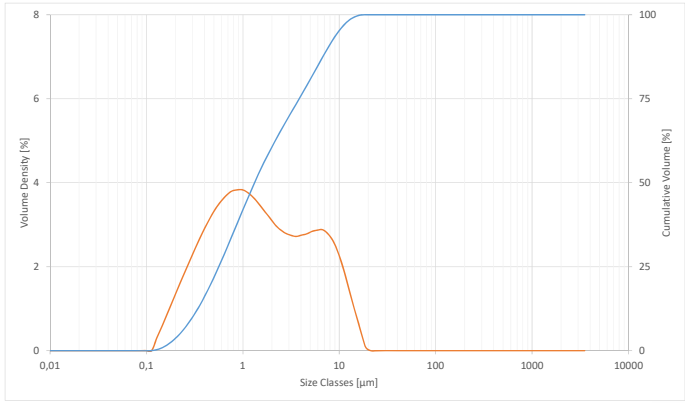


possibilities for your company

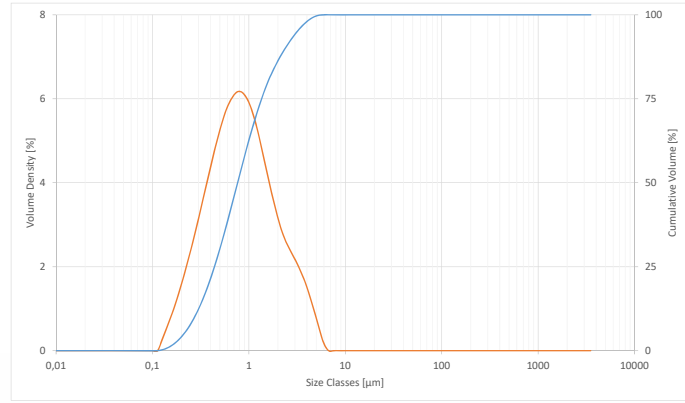
Examples of Applications

Comminution of Al_2O_3

Without Classifier

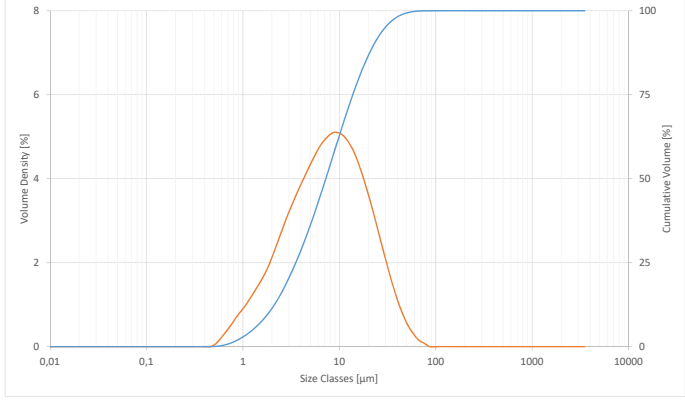


With Classifier

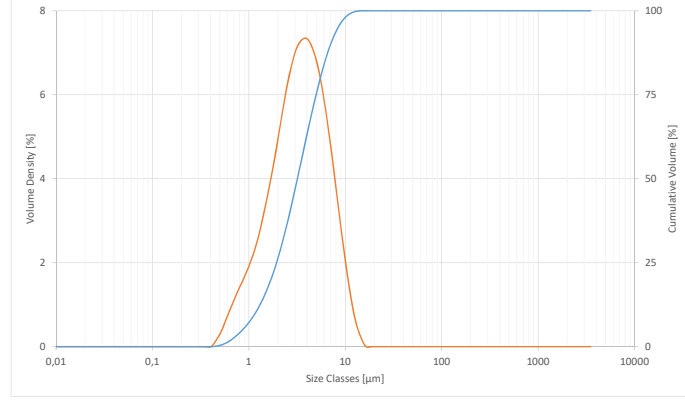


Comminution of CaCO_3

Without Classifier



With Classifier



Technical Data

<i>PAMIR</i>		6	40*	400	1200	1500**	4000	6000	12000
Max. Motor Power	kW	5.5	22	132 - 166	315 - 355	315 - 355	710 - 800	1120	3200
Expected absorbed Power***	kW	3 - 4	12 - 20	80 - 150	200 - 250	200 - 250	500 - 600	750 - 900	2500 - 3000
Throughput Capacity	t/h	0.02 - 0.2	0.02 - 1.2	0.6 - 6.0	1.25 - 12.5	1.25 - 12.5	2.5 - 30	3.75 - 45	12.5 - 150

* also available in PU/Ceramic design

** only in PU/Ceramic design

*** depending on process parameters like filling level or rpm as well as on specific product properties

Accessories and Options

Wear Protection

Wear-protected execution in hard metal or PU/Ceramic for abrasive and highly wearing products means a significantly longer service life of the machine and lower maintenance costs.

Additives

To improve the grindability of finest powders, dry or liquid grinding agents can be added via a suitable additive system.

Cooling

Temperature-sensitive products can be processed below the critical temperature limit by using a water-cooled double-walled grinding vessel.

Agitator Tools

Depending on the product to be ground and the application, various agitator tool executions are available. The plug-in design of the agitator elements on the shaft allow their easy and rapid exchange.

NETZSCH-BEADS®

The selection of suitable grinding media is an excellent optimization characteristic for dispersing- and grinding processes. Optimum results can be obtained with NETZSCH-BEADS®.



Order your NETZSCH-BEADS® in our [Customer Portal](#).

Test Center and Testing

State-of-the-art test plants in NETZSCH's test center in Hanau and Barcelona are available for carrying out dimensioning tests. Within these plants the *PAMIR* Agitator Bead Mill can either be operated on its own or in combination with a classifier.

A multitude of equipment options with regard to various agitator tools, grinding media and the possibility of using additives enable us to test the grindability of many different products and to determine the optimum operation conditions for a production plant. The machine series based on geometrical similarities guarantees a reliable scale-up to larger production plants.

The plant in our test lab in Hanau is designed for mass flows from approx. 25 kg/h up to 800 kg/h and can also be used for small production amounts to bridge production bottlenecks.

The laboratory version of the Dry Agitator Bead Mill is also available for you in our technical center for initial tests with small quantities of product.



The owner-managed NETZSCH Group is a leading global technology company specializing in mechanical, plant and instrument engineering.

Under the management of Erich NETZSCH B.V. & Co. Holding KG, the company consists of the three business units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems, which are geared towards specific industries and products. A worldwide sales and service network has guaranteed customer proximity and competent service since 1873.

Proven Excellence. ■

Business Unit Grinding & Dispersing – The World's Leading Grinding Technology

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NETZSCH Vakumix | Germany
NETZSCH Lohnmahltechnik | Germany
NETZSCH Feinmahltechnik Polska | Poland
NETZSCH Mastermix | Great Britain
NETZSCH Broyage | France
NETZSCH Macinazione & Dispersione | Italy

NETZSCH España | Spain
NETZSCH Machinery and Instruments | China
NETZSCH India Grinding & Dispersing | India
NETZSCH Tula | Russia
NETZSCH Makine Sanayi ve Ticaret | Turkey
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NETZSCH Equipamentos de Moagem | Brazil

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