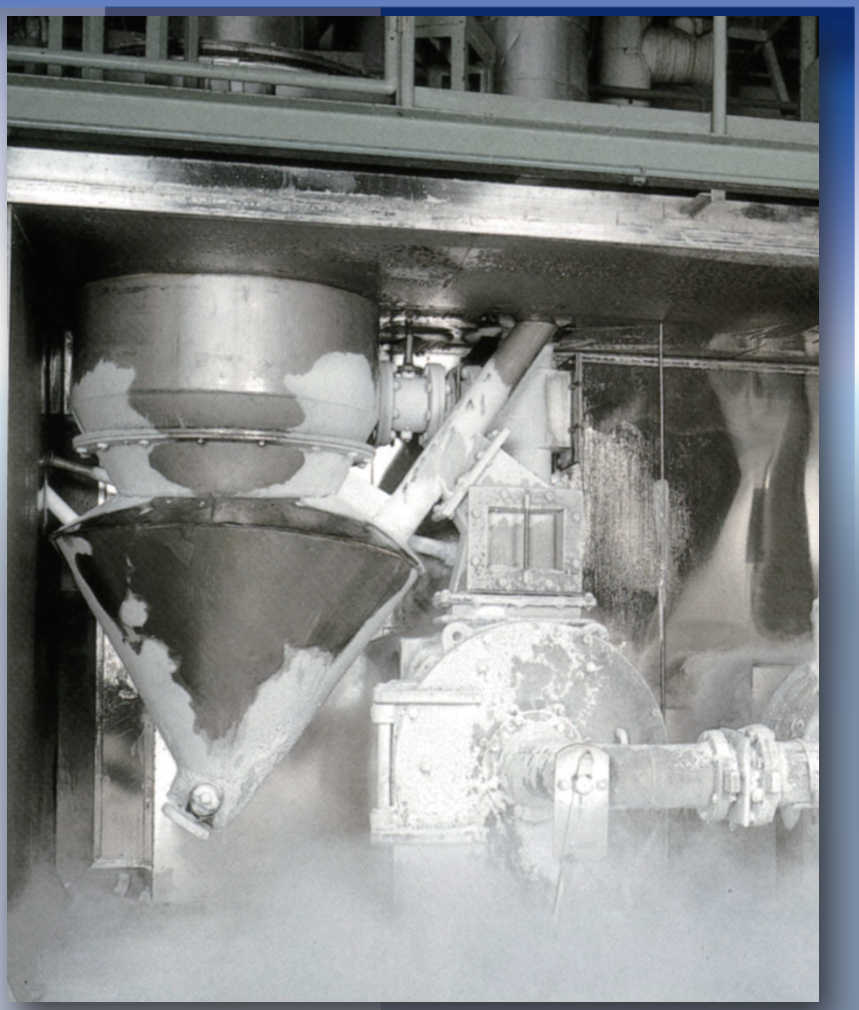
HOSOKAWA/MICRON
Cryogenic Grinding Unit　Linrex Mill　LX



Process Technologies for Tomorrow

HOSOKAWA MICRON CORPORATION

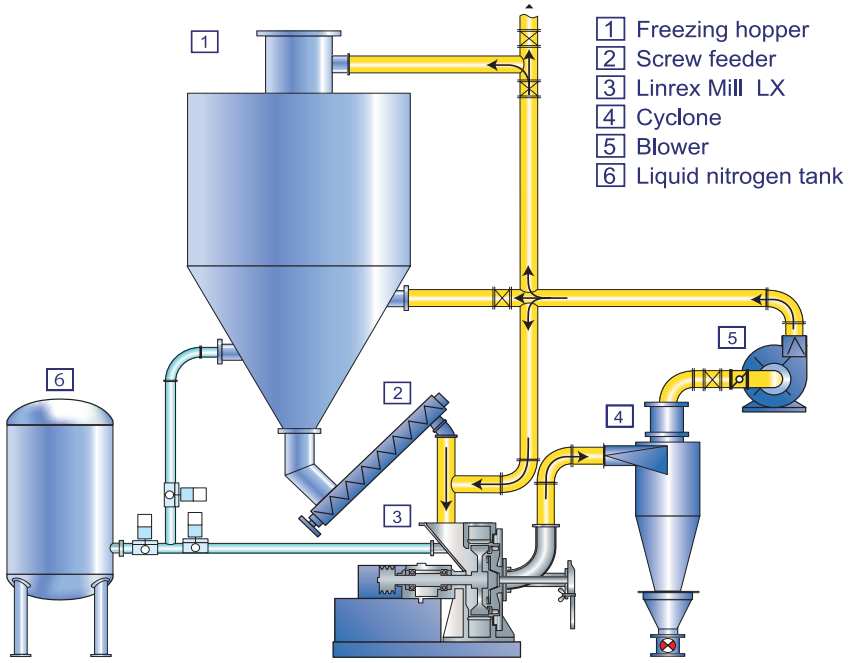
Linrex Mill LX:

LX has an internal classifier and utilizes an impact cryogenic grinding method to efficiently grind the materials such as food, polymer, rubber etc.

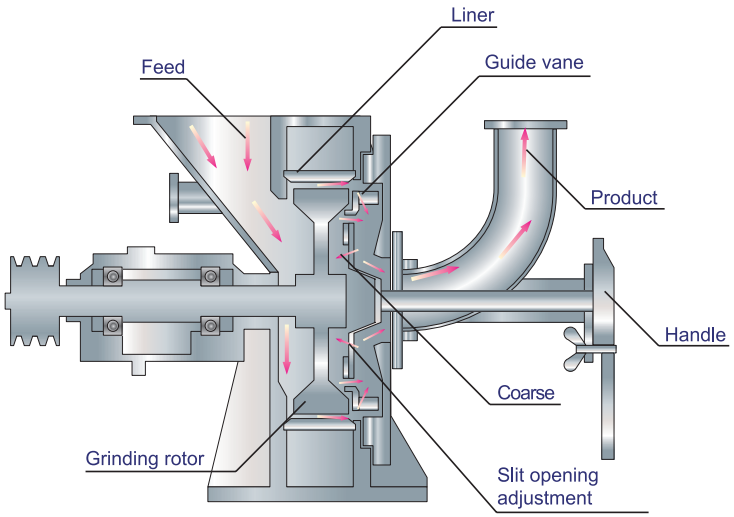
Summary

Materials such as rubber have elastic characteristics and are difficult to grind under normal conditions. However, by chilling them to below the brittle point, the material becomes fragile and can be ground by impact. By utilizing the low temperature grinding method, the Linrex Mill takes advantage of this characteristic and can grind such materials effectively while preventing degeneration of the material from the heat generated during grinding.

A standard low temperature grinding unit consists of a raw material chilling section, feed section, grinding section, product collecting section, cool temperature (sensible heat) collecting section, coolant feeding section, and control section. Out of these sections, selecting an appropriate grinding method is the most important. The Linrex Mill has an innovative energy-saving design where the freezer and cyclone are stored in a compact cold insulation box to minimize cool temperature loss.



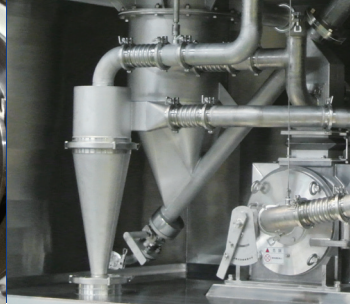
Flow



Structure

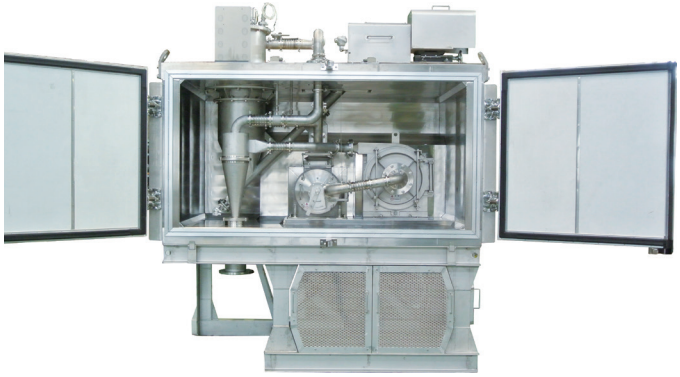
Model		LX-	0	1	2	3
Motor	Mill	(kW)	2.2 (~3.7)	7.5 (~11)	15 (~22)	37
	Blower	(kW)	(built-in)	2.2	7.5	11
	Feeder	(kW)	(Manual feeding)	0.4	0.75	1.5
Dimensions	L	(mm)	1200	1500	1900	1800
	W	(mm)	1400	2400	3200	5200
	H	(mm)	1600	2800	3600	3900

Standard specification



Principle

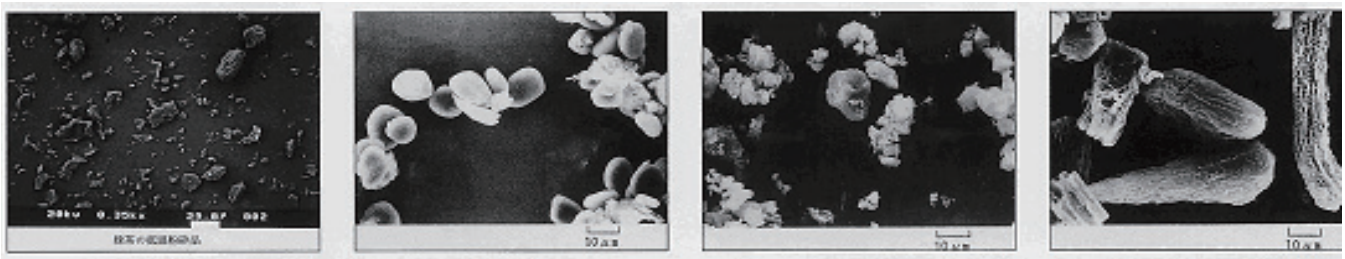
The feed material is first fed into the freezer to be chilled by Liquid Nitrogen (LN_2). Once frozen, the material is then fed to the grinding chamber by a screw feeder. The grinding chamber itself is maintained at a low temperature by liquid nitrogen as well, allowing the materials to be ground and classified in a chilled environment. The ground materials become suctioned by the blower (installed within the grinder for the LX model) into the cyclone, where the products are collected and discharged by the rotary valve (LX model: Receiver tank only). Once the vaporized nitrogen gas flows through the cyclone and blower, they become reused within the grinder and freezer for sensible heat collection. Excess vapors are discharged out of the unit.



Compact cold insulation box

Features

- Materials that are difficult to grind at normal temperatures can be easily ground.
- Can produce particles with high flowability and acute angle shapes.
- Degeneration due to heat and oxidization, as well as flavor and aroma loss of foodstuff and spices are prevented.
- Can prevent odor, dust explosion, combustion, and noise that are accompanied with grinding.
- Has an excellent cold insulation effect, with minimal loss of liquid nitrogen (LN_2). (insulation box type)
- Low power consumption for grinding.
- Easy maintenance, inspection, and cleaning.



Green tea | Yam | Sweet rice | Meat (Freeze dried)

Grinding references

Material	Grinding temp. (˚C)	Energy consumption (kg/kWh)	LN_2 consumption ($kg\text{-}LN_2/kg\text{-}feed$)	Product size	Product	Application
Brown rice	-100	10.0	1.9	85%<47μm	Powder	Noodle/Bread
Raw soybean	-100	12.3	3.5	d_{50}=14μm	Paste	Tofu/Soy milk
Roasted coffee bean	-100	8.8	1.9	d_{50}=15μm	Powder	Coffee
Coffee bean	-100	11.6	0.9	d_{50}=50μm	Powder	Coffee
Peanut	-140	7.0	2.5	500μm	Paste	Frozen dessert
Raisin	-100	5.2	2.7	74μm	Paste	Confectionery substances
Pepper	-100	9.6	1.9	94%<190μm	Powder	Seasoning
Hot pepper	-100	13.2	2	96%<74μm	Powder	Seasoning
Green tea	-100	1.3	7.5	98%<35μm	Powder	Instant tea
Mandarin orange	-100	8.2	2.2	74μm Supple texture	Liquid (Frozen)	Frozen dessert
Kelp root	-100	3.2	3.7	97%<74μm	Powder	Soup stock
Edible sea alga	-100	2.3	4.5	92%<74μm	Powder	Soup stock
Crab with shell	-120	6.6	2.5	Supple texture	Paste	Paste product
Scallop	-120	5.9	2.5	Supple texture	Paste (Frozen)	Soup
Pike with bone	-100	5.7	3.4	Supple texture	Paste (Frozen)	Soup
Chicken with bone	-100	12.7	1.7	Supple texture	Paste	Soup
Beef with bone	-100	8.7	1.9	Supple texture	Paste	Soup
Pork with bone	-100	7.0	2.8	Supple texture	Paste	Paste product
Kale	-100	4.8	2.8	Supple texture	Paste	Seasoning
Mushrooms	-100	2.6	2.3	74μm	Powder	Soup stock
Spinach	-50	7.9	2	74μm	Powder	Baby food
Cabbage	-80	5.9	2.8	74μm	Powder	Baby food
Onion	-100	5.5	2.5	Supple texture	Paste	Soup stock
Yam	-100	8.5	2	Supple texture	Paste	Health food

Applications

- Low melting-point materials
- Materials that degenerate under heat
- Wet/oily/fibrous material
- Dust explosion, Combustible materials
- Others

ISO 9001 BUREAU VERITAS Certification

UKAS MANAGEMENT SYSTEMS 008

Process Technologiues for Tomorrow

HOSOKAWA MICRON CORPORATION

URL http://www.hosokawamicron.co.jp/

Osaka Sales Group., Sales Dept., Powder Processing System Div.

1-9, Shodaitajika, Hirakata-shi, Osaka 573-1132, Japan
TEL : +81-72-855-2224

FAX : +81-72-855-2679

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