![Sodick]

Cooling Holding Bin (CHB)

Patent No.JP6541863

Quick Cooling Device of Granular Powder (by Vacuum)

Industry First!

Sodick Co., Ltd.,
Food Machinery Division
(2019/July)

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What is CHB?

A device to quickly cool Powdery and granular raw materials of food homogeneously.

To improve and stabilize dough quality control in producing bread, cookie, noodle.

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Powdery Raw Material
Corn, Flour, Rice, Potato, Sweet Potato, etc

Granular Raw Material
Sugar, Salt, Rice, Soy Bean, etc

Bread   Cookie   Noodle

Why Granular Materials Need to Be Cooled?

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In the case of Flour of High-temperature:

Sticky and expandable gluten (protein) is formed when kneaded with added water.

Added water does not permeate

evenly well, thus affecting the quality

of final product.

Dough Temperature 27℃ ⟹ Dough Temperature 15℃

Water mixed evenly because of lower temperature

Traditional Cooling Method

By Air Conditioning

Reducing the production site temperature to keep low the raw material's temperature.

By Use of Cold Water

Using chilled water (water is easy to be Temperature-controlled).
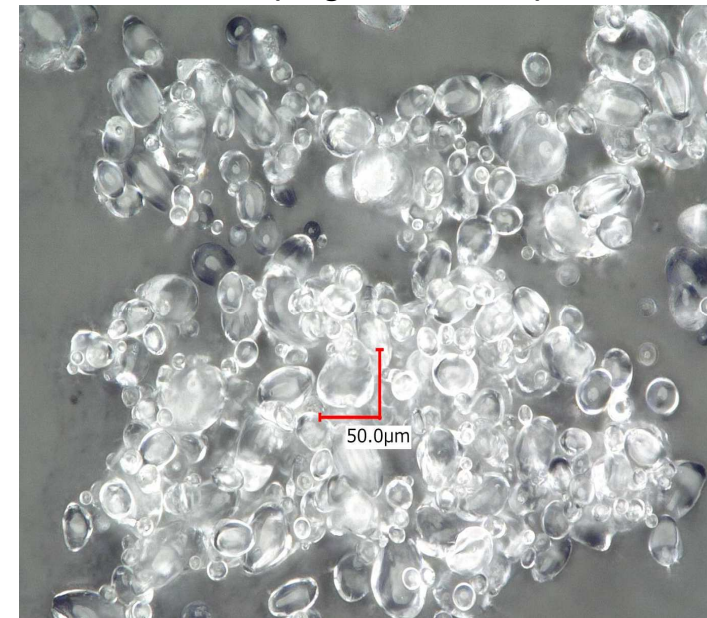This method is common.

Why Is Quick and Homogeneous Cooling of Granular Materials Difficult?

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Low Heat Transfer ⇔ Quick Temperature Control is Difficult.

- Tiny powdery particles only have point-to-point contacts between each one, not giving enough contact area for heat transfer.

- Heat transfer rate of these materials is originally low.

- Almost impossible to run cooled air through evenly as it is a mass of tiny particles stuck together.

⇒ **Traditional Cooling Method by Heat Transfer requires a long time of cooling process, and is a bottleneck in production efficiency while not guaranteeing homogeneous cooling.**

Flour (magnification: 500)

50.0μm

CHB Principle

By forcibly vaporizing part of the moisture content of the granular material,

➡ Latent Heat Exchange is used for cooling.

Analogy: Water-sprinkling the garden to cool the atmosphere temperature, or feeling cool when antiseptic alcohol is rubbed on your arm before injection.

Water-sprinkling on a hot summer day

Feeling cool by antiseptic alcohol

How Does Water Vaporization Happen?

・By virtue of a lowered water boiling point

temperature in below-the-atomosphere-pressure,

perform vaporization forcibly under reduced pressure

(set to below saturated steam pressure of target temperature).

・Reduced pressure permeates throughout the mass of

granular particles

→ Kneading will be perfect (the moisture content of the material

will be affected to reduce by 1.0 ~ 1.5% only).

Analogy: In high mountains where it is below normal atomospheric pressure,

rice cannot be cooked well and tasty due to the lowering of water boiling point.
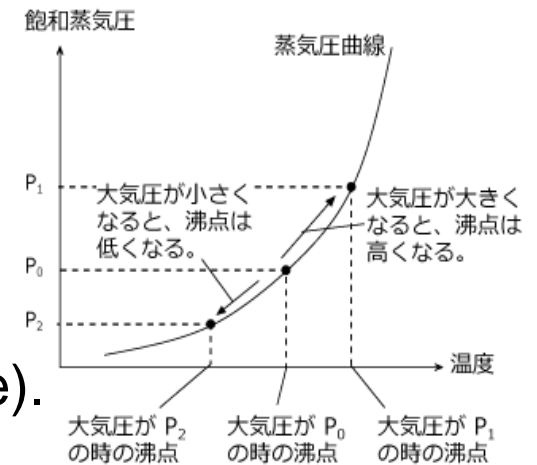
私立・国公立大学医学部に入ろう！ドットコム HPより

トレイン・ジャパン株式会社 HPより
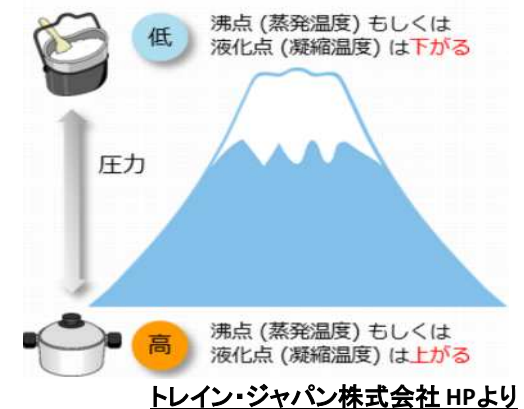
Benefits of CHB

・Cooling a mass of granular particles homogeneously

　by latent heat exchange of part of moisture contained in

　the material.

・Pressure reduction permeates throughout the mass

　because materials are powdery or granular.

➔ Stress on the material is minimum because

　the process is performed at a lower temperature than

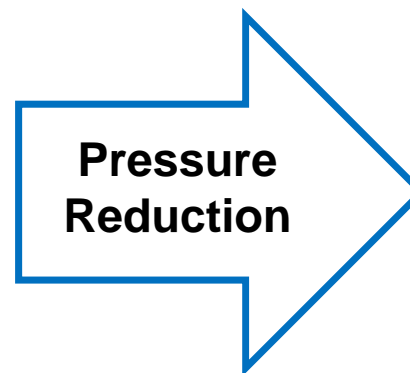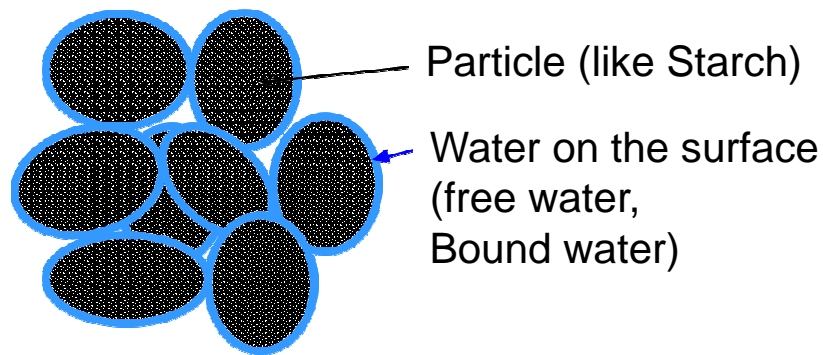　normal, and almost no changes to material characteristics.
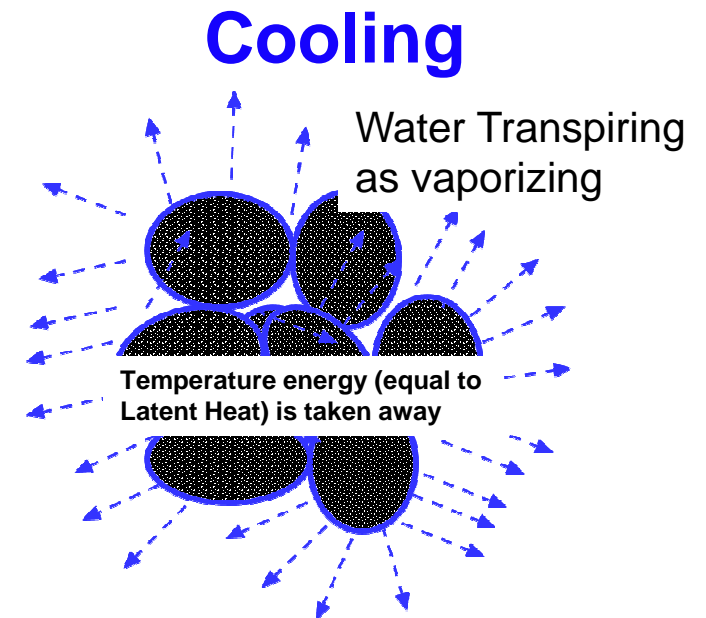
Phenomenon during Pressure Reduction

When reducing pressure, the moisture on the surface of material particles vaporizes taking away heat energy

→ Particles temperature will decrease (Cooling).

Cooling

Particle (like Starch)

Water on the surface
(free water,
Bound water)

Pressure Reduction

Water Transpiring as vaporizing

Temperature energy (equal to Latent Heat) is taken away

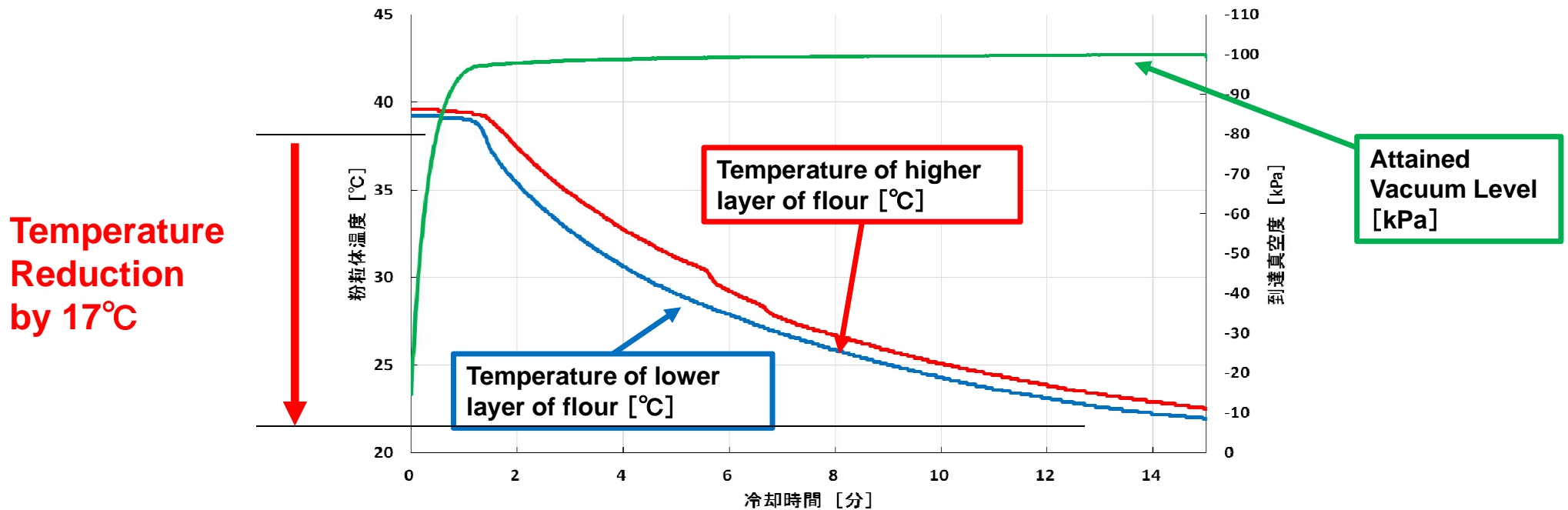**Conditions of Particles and Water, comprising granular material**

Water Vaporizing and Transpiring under lower pressure

Test Data

- **Material used: Flour (medium-strength flour)**

- **Input: 125kg**

- **Test Method: Applying Vacuum Cooling to Flour of approx. 40℃ for 15 minutes**

⇒ **Flour Temperature reduced to 17℃ evenly after a short time (15 minutes).**

Temperature Reduction by 17℃

Temperature of higher layer of flour [℃]

Temperature of lower layer of flour [℃]

Attained Vacuum Level [kPa]

粉粒体温度 [℃]

到達真空度 [kPa]

冷却時間 [分]

Most Effective for Below Materials

Food Materials

- Containing Free Water of over a few %,
- Granular Particle Mass, allowing Vacuum Conditions to permeate throughout the mass,

  (Option for Mixing or Non-mixing)

Materials tested as Effective

Flour, Buckwheat Flour, Rice Flour, Rice Grain, Buckwheat Seed, Soy Bean, and others.