

PLASTIC FOAM COMPOSITE
composed of plastic skin and two types of
foamed core

Shiinakasei.co

Intended purpose of development

heat insulation containers

industrial parts

Toys

etc.

what is stated ?

- 1、 Process
- 2、 Property of products (mechanical, heat-retaining)
- 3、 Applications
- 4、 Cost
- 5、 Intellectual property
- 6、 Supply of pellet for testing

Process of producing

1 Material

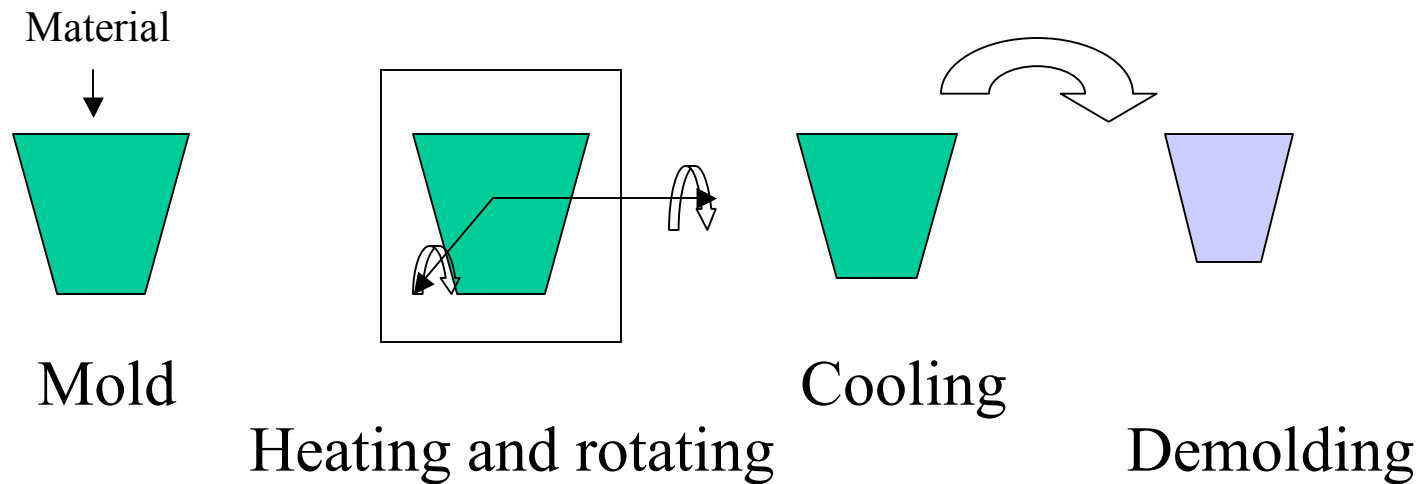
Foaming pellets 1, and 2 (LDPE base)

1: LDPE + ADCA + XL-Agent

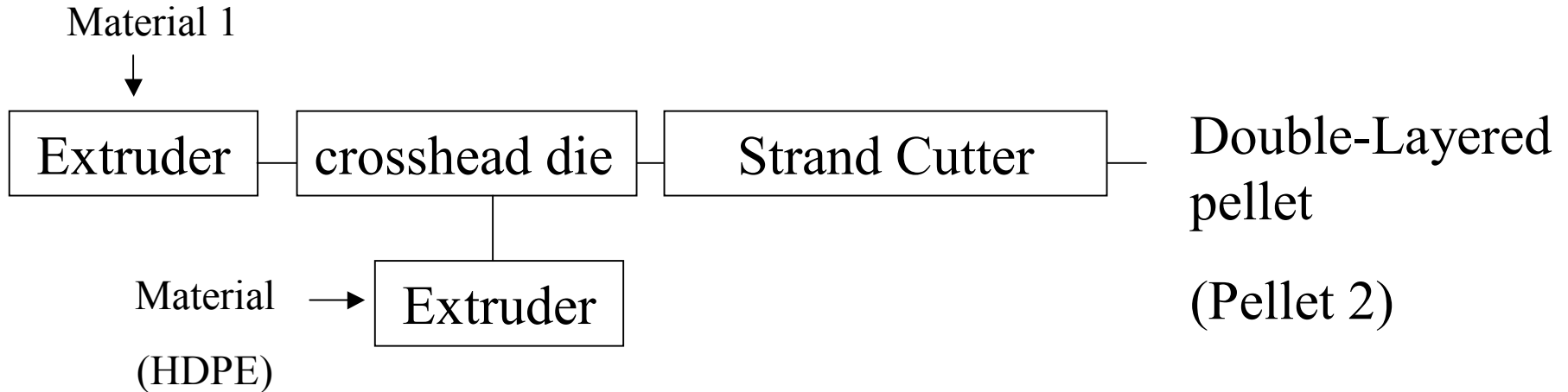
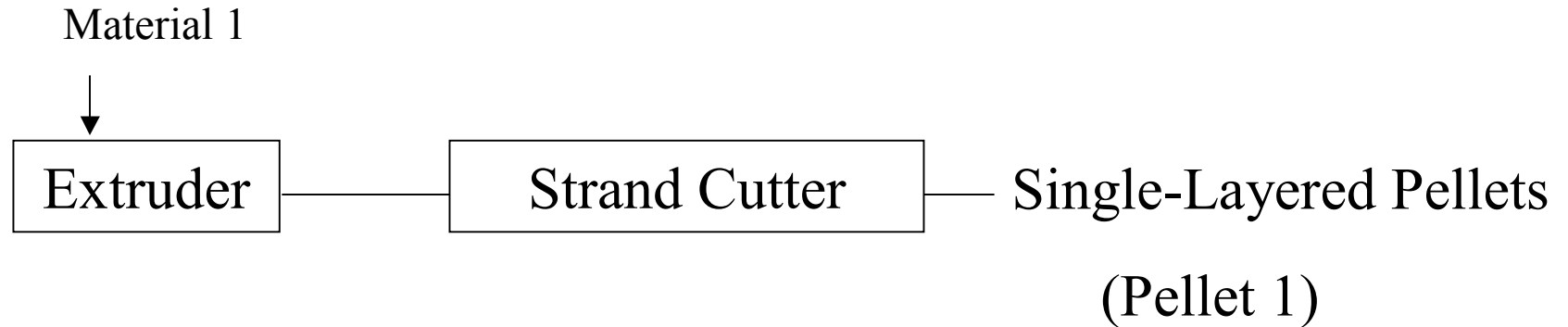
2: (LDPE + ADCA + XL-Agent) HDPE

Plastic powders (HDPE: MFR 1 or less than 1)

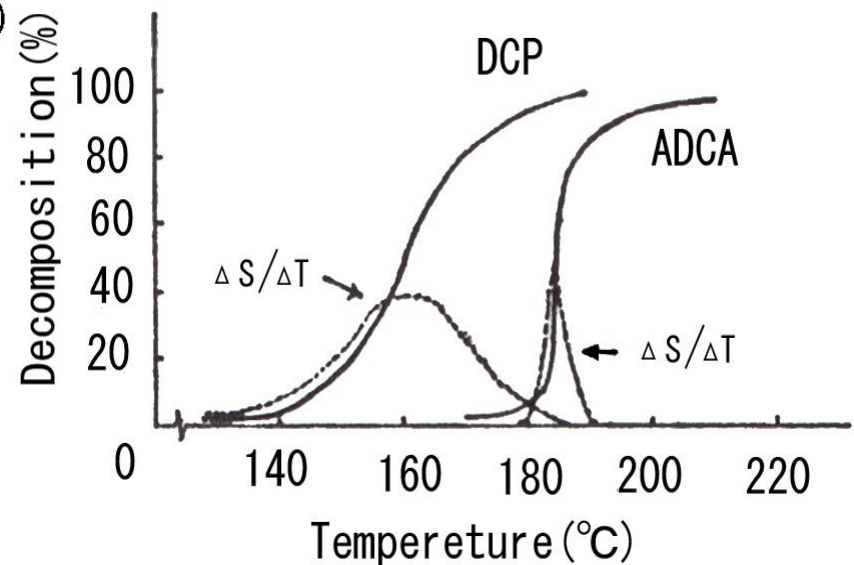
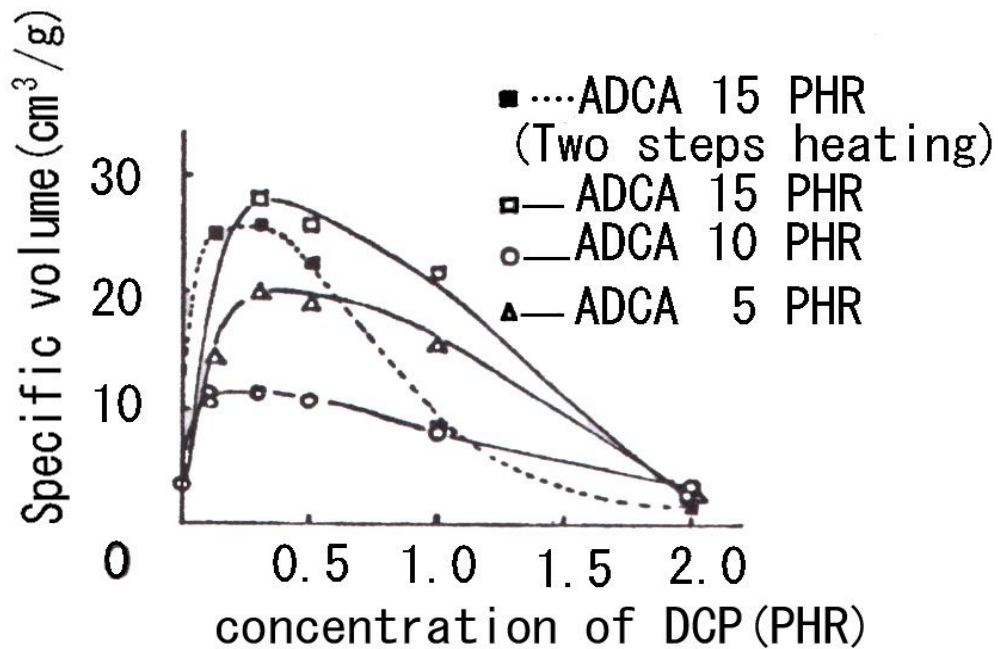
2 Process



Process of producing Foaming Pellet



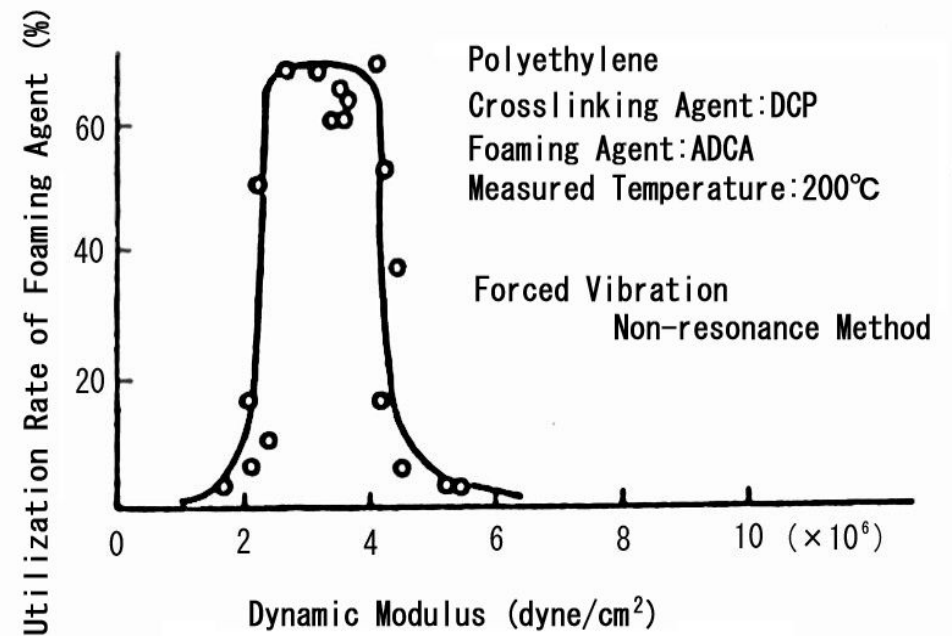
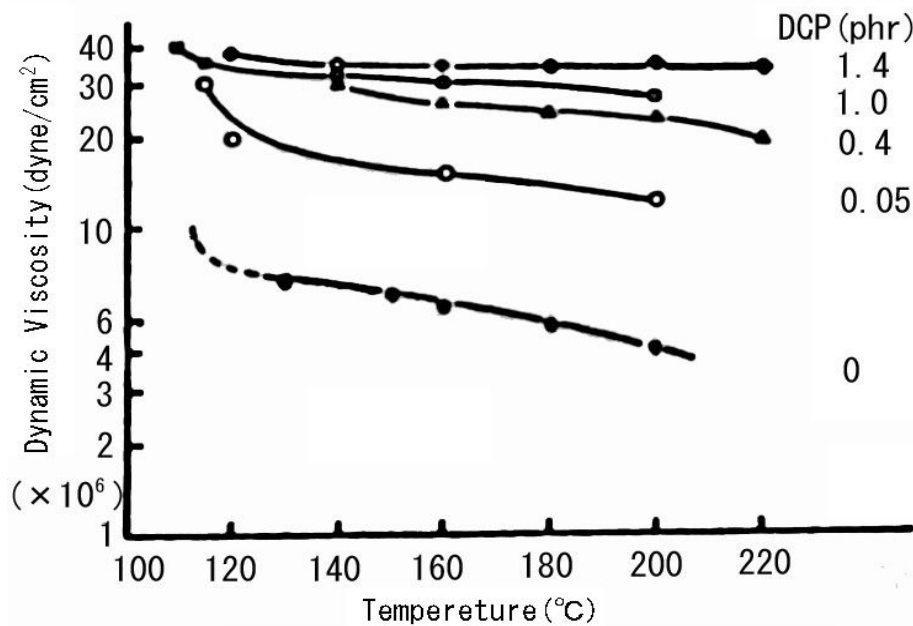
Principle of foaming 1 Relation of foaming rate to cross-linking agent



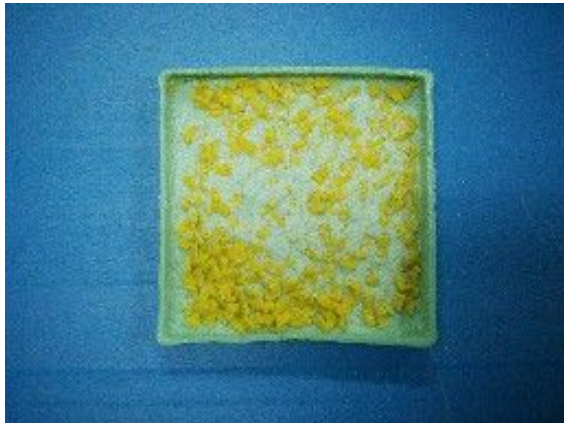
Foaming is made by holding foamable sheet in gear oven at 220°C during 3 mins. The foamed sheet is cooled in water, and the Sp.gr. is measured.

DSC of ADCA and DCP(XLagent)

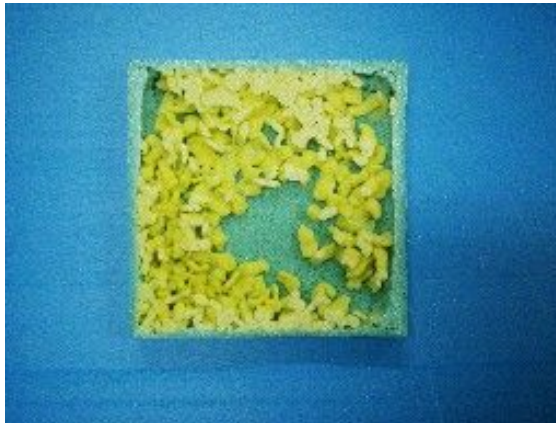
Principle of Foaming² Effect of cross-linking agent



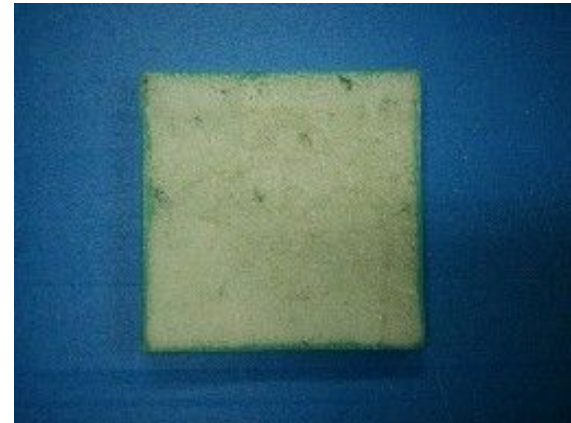
Production Process & Blowing Feature
(Roto-molding : 230°C 15rpm 6swings/min)



15min



23.5min



25min

Inner Structure of Composite



Product by Single Layered Pellets

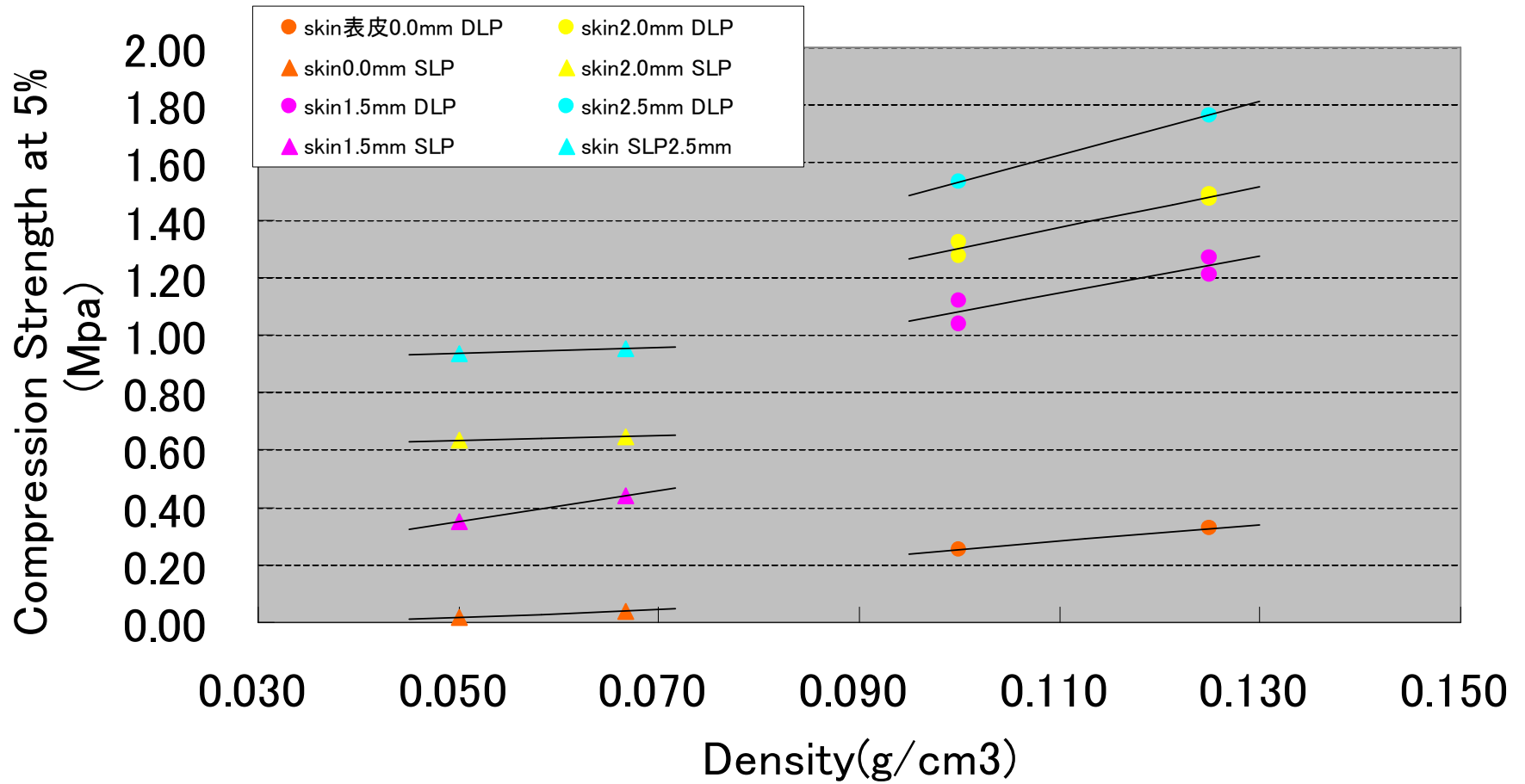


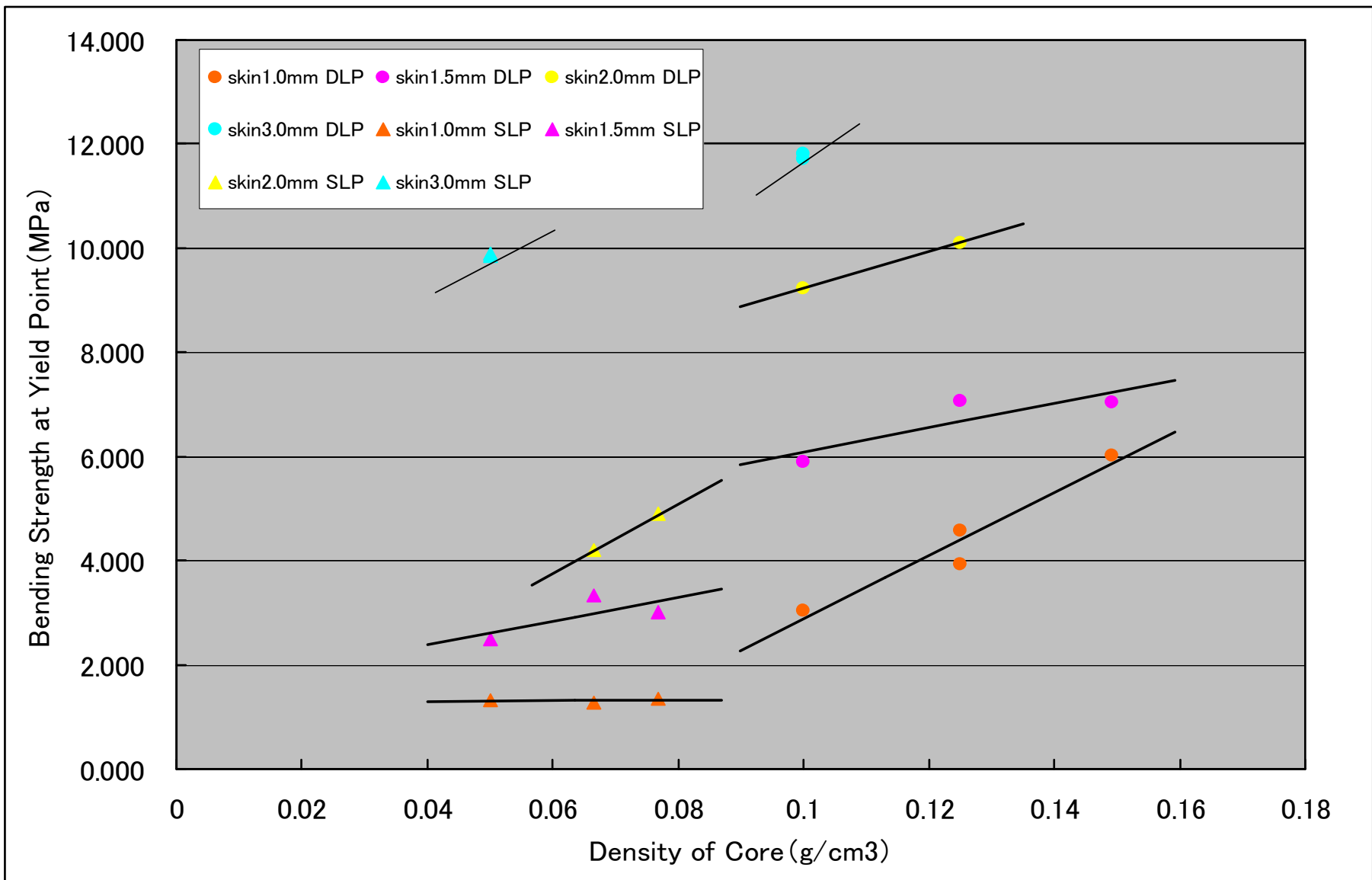
Product by Double-Layered pellet

Table Effect of Skin Thickness on Water Absorption

Products	Thickness of Skin (mm)		Quantity of absorbing water (weight%)				
	Average	Smallest	0 day	7days	14days	30days	60days
Invented Foam Composite	1	0.3	0	1.7	4.4	8.7	14
Invented Foam Composite	2	1	0	0	0	0	0
Invented Foam Composite	3	1.5	0	0	0	0	0
Polystyrene Foam	nothing	nothing	0	29.6	90.7	112	118.1
Bridging Polyethylene Foam	nothing	nothing	0	2.1	10.3	12.2	14.5

Compression Strength of Composite





Thermal conductivity of Products

Skin	Foaming Core	K(w/mk)
2mm	20mm	0.0572
2	25	0.0528
2(× 2 exp.)	25	0.0506
2	50	0.0503

Products by Single Layer Pellets (core foaming rate:20 times)

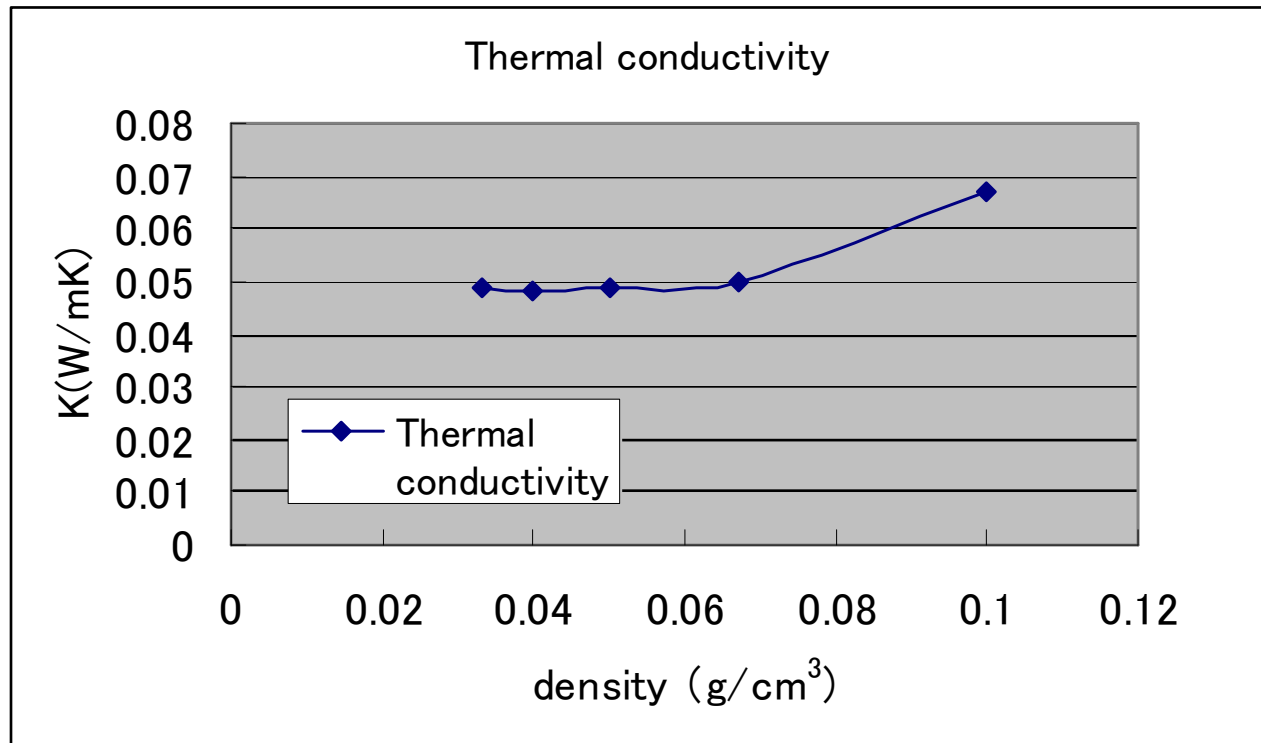
Thermal conductivity of Products

Skin	Foaming Core	K(w/mk)
2mm	20mm	0.0820
2mm	25	0.0761
2mm	25 (divider x2 exp.)	0.0665
2mm(x2exp.)	25 (divider x2 exp.)	0.0589

Product by double-layered foaming pellet (core foaming rate:20 times)

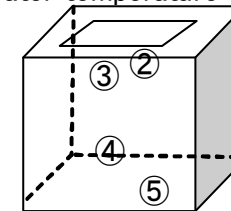
Thermal conductivity of Products

2mm skin-thickness 50mm (Single Layer Pellets)

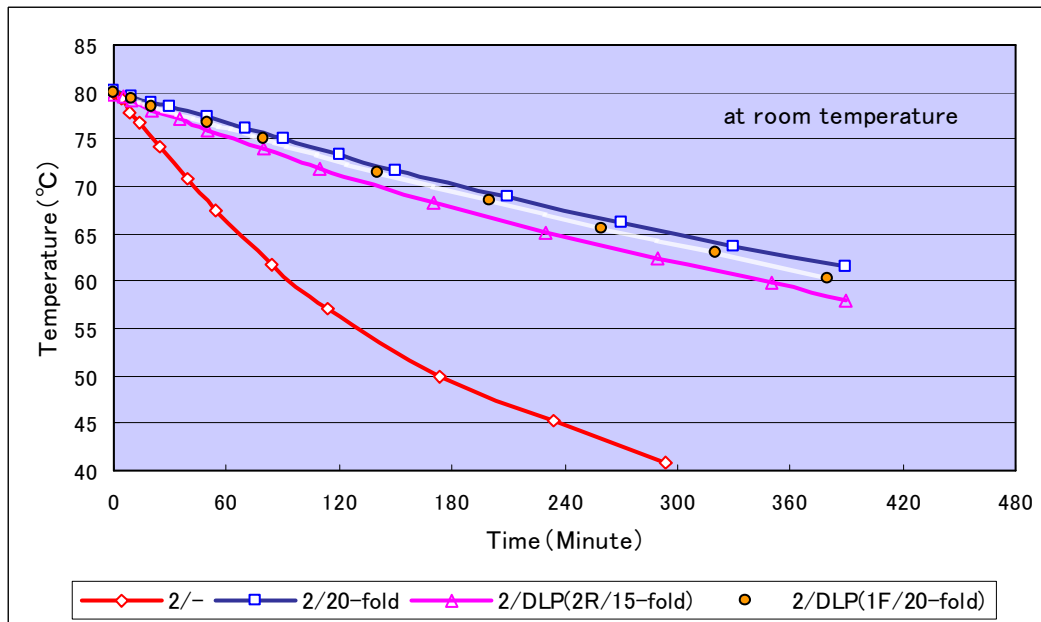


Thermal Retaining of Hot Water in Insulation Box

Inner Dimension of the ves: 146x146x146mm
 Wall thickness: 45mm
 Measure of water temperature change



- ② wall 1
- ③ wall2 top of wall
- ④ wall3, side wall
- ⑤ wall4, bottom

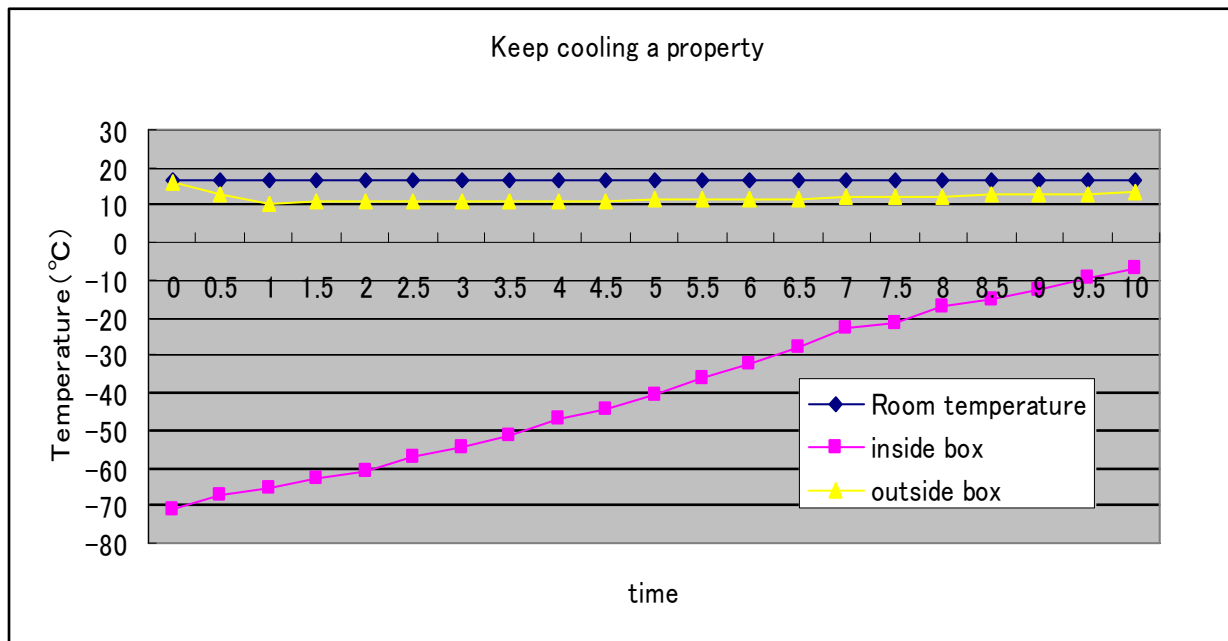


Thermal Retaining Experiment

(skin 3mm — thickness 50mm, 7times Foaming)

Temperature change of

-70°C 3L dry ice-methanol in 10L insulated pail



3 Application

(1) Thermal insulation Container

Big Size	1000mm class
Strong	Compression
Low Temp.	-60°C class
Usage	some hundreds times



3 (2) Industrial parts ▪ Machinery parts

strong

bending modulus

light weight

100~300Kg/M³



3 (3) toy and sports

light weight

strong and tuff



3 (4) other considerable application

Landing stage ▪ Floater

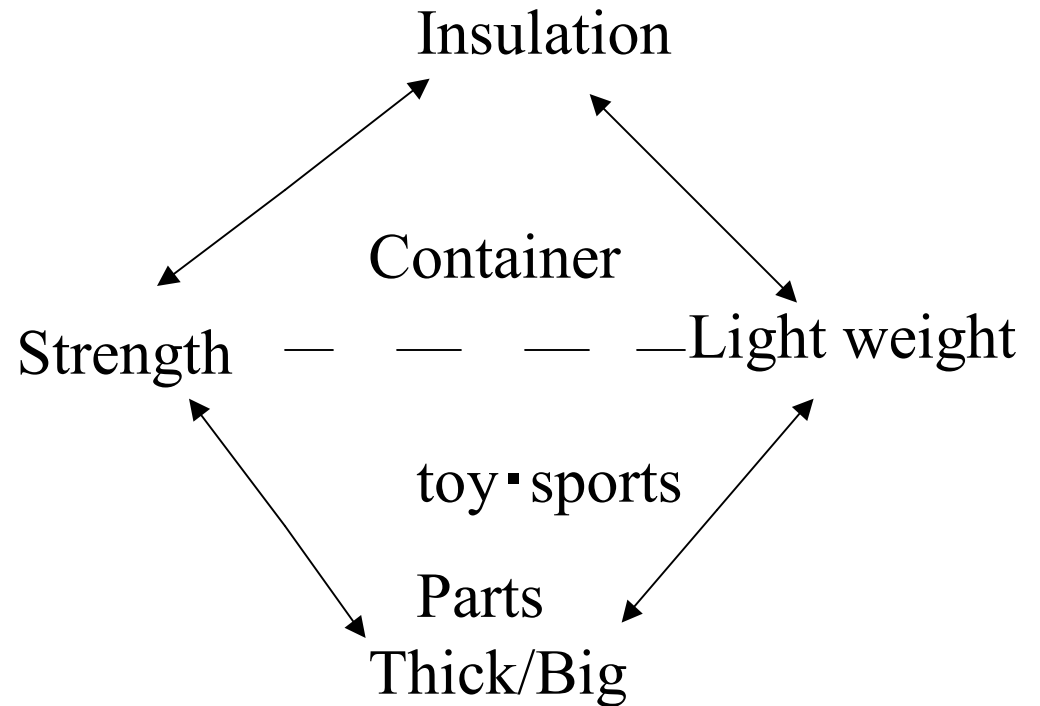
Surf Board

Small House for Storage

Table

Child Sheet

Etc.



Cost Calculation

(material cost)

- skin $2 \sim 6\text{mm} \times S \times V_{sx} @ \text{HDPE}$
- pellet (SLP、DLP) $\{ (V - V_s) / X \} x @ \text{Pellet}$

(processing cost)

- direct cost $\text{per hour cost} \times \text{time} \times \text{number}$
- indirect

Mold Cost Higher than normal cost of mold used
in roto-molding

Example of Cost Estimation

- | | |
|----------------------------|--------------------------------------|
| plate (1000 * 1000 * 50mm) | container (400L) |
| skin 3mm core 10times | thickness 50mm skin 3mm core 20times |
| DLP | SLP |

Material cost	3885Yen	15970
Processing	4900	19850
Total	8785	31820
Management cost	1317	4773
Total cost	10102Yen	36593Yen

Not including depreciation of molds

Intellectual Property Right

- Would-wide Patent Application to 5 Countries
(PCT/JPT2006/015228)
- In Japan SK has got Pat.No. 4074319
(Jpn. Pat.Appl.2005-513566)

SK's Technology Transfer Policy

- 1 Exclusive Right (Regional and Application)
- 2 Non-Exclusive Right

Please contact us

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Supply of 2types of foaming Pellet for Test
Molding at your site

Mitsufuku shall estimate cost(\$7.00/Kg) of
material, and shipment for you

You can purchase the pellets from IFoam of
Iceland if your site is in Europe.