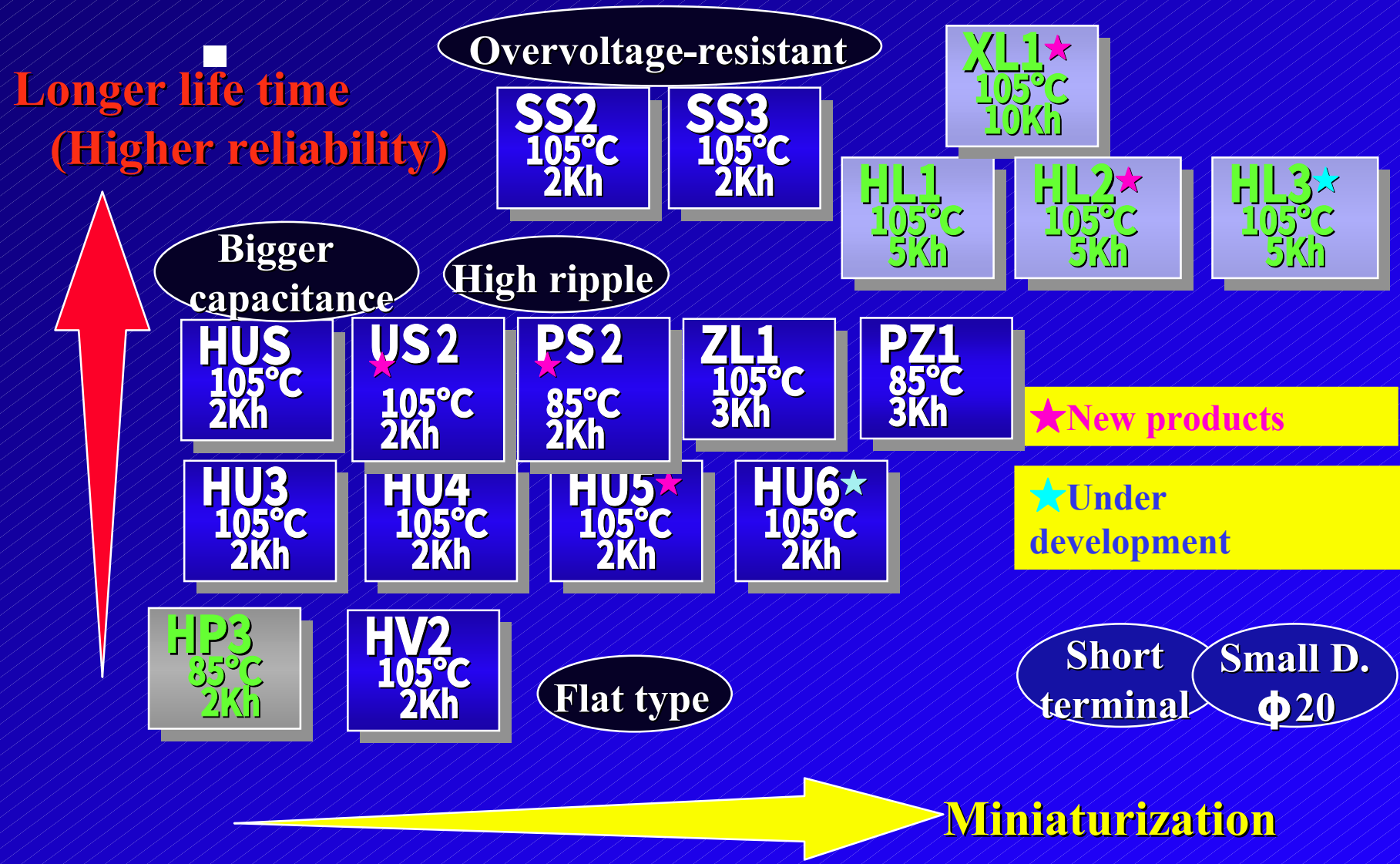
Products chart for screw type

Products chart for snap-in type



Capacit verter

Capa tance

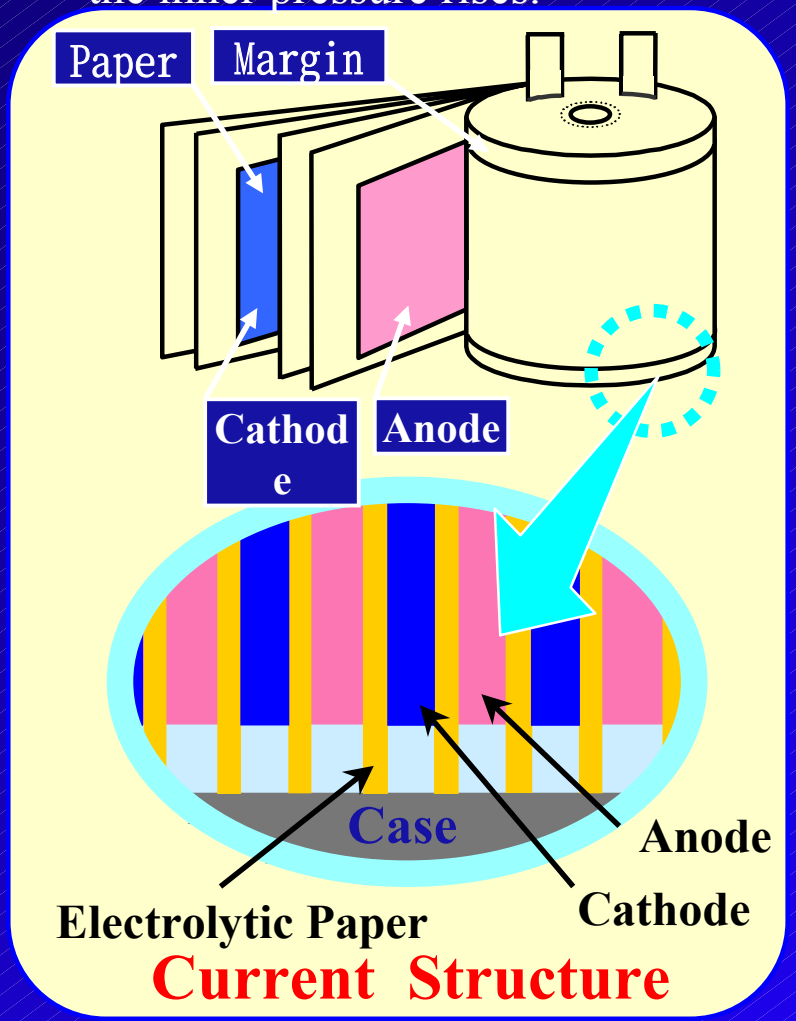
Snap—in Type
470μF*10P

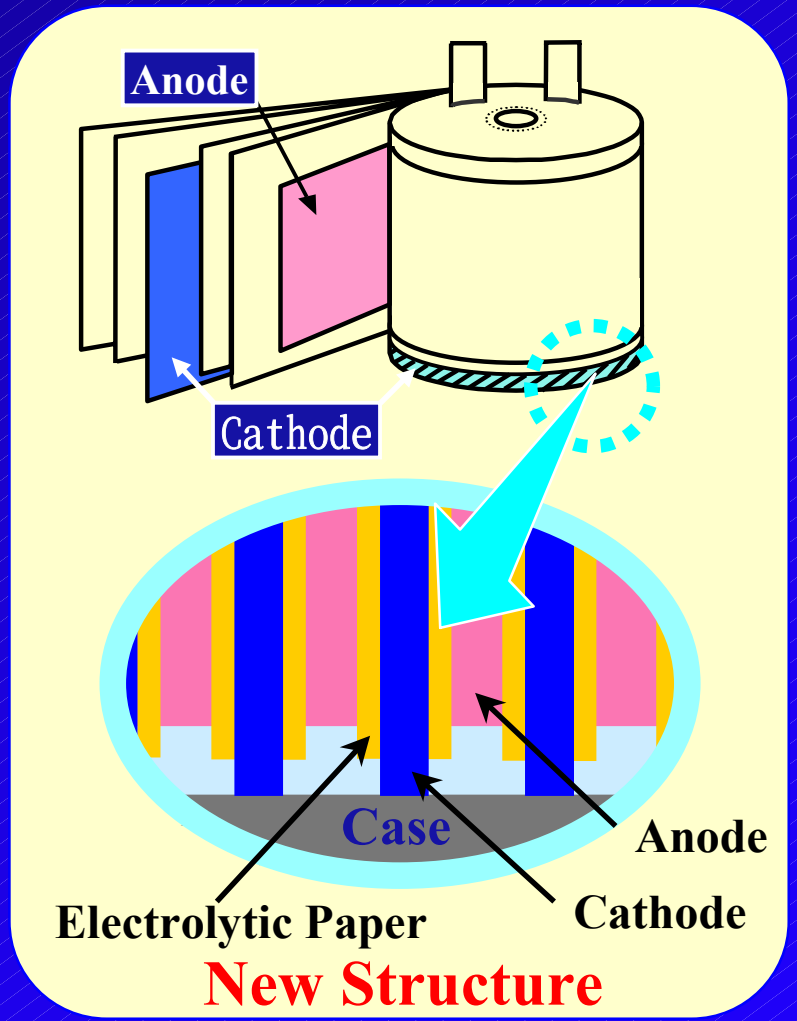
Screw Type
2700μF*2P

New-series
1500μF*3P

PS2,US2 New Structure of cathode foil

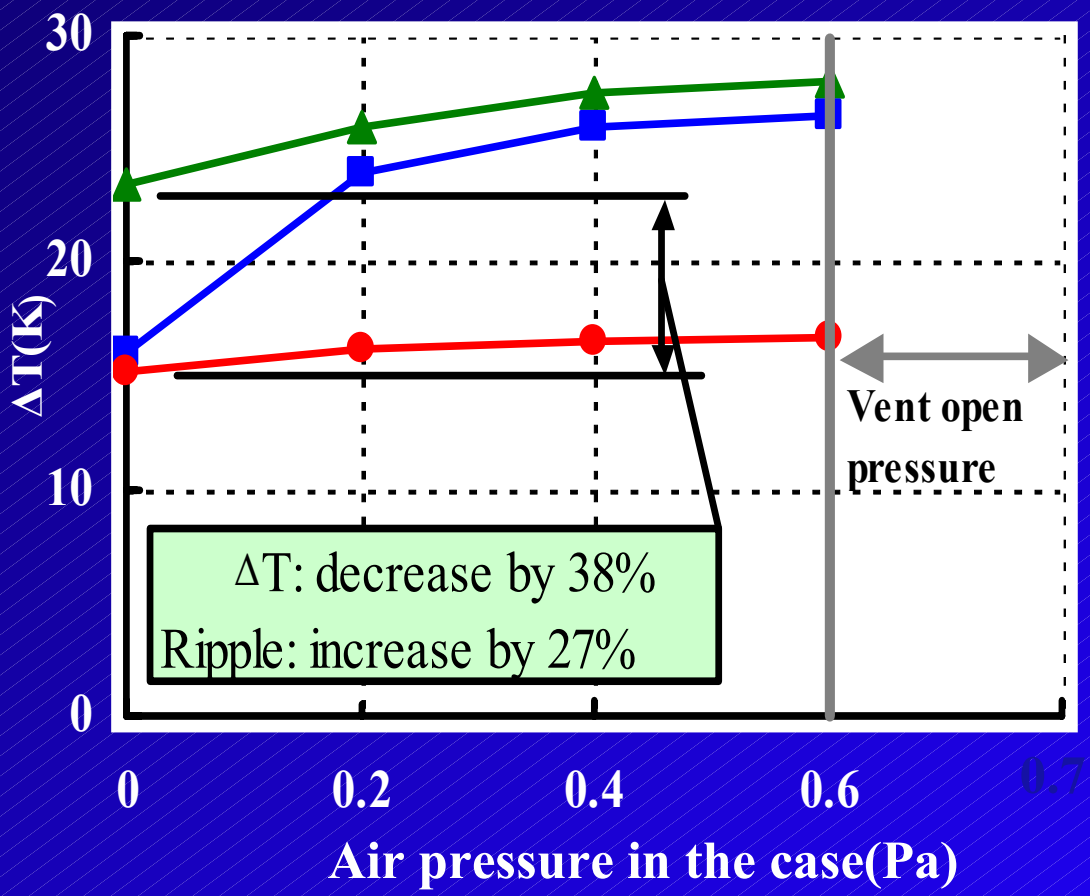
- Improvement of heat radiation by making the cathode foil attached to the aluminum case inside.
- Maintain the heat radiation level by preventing the case deformity when the inner pressure rises.

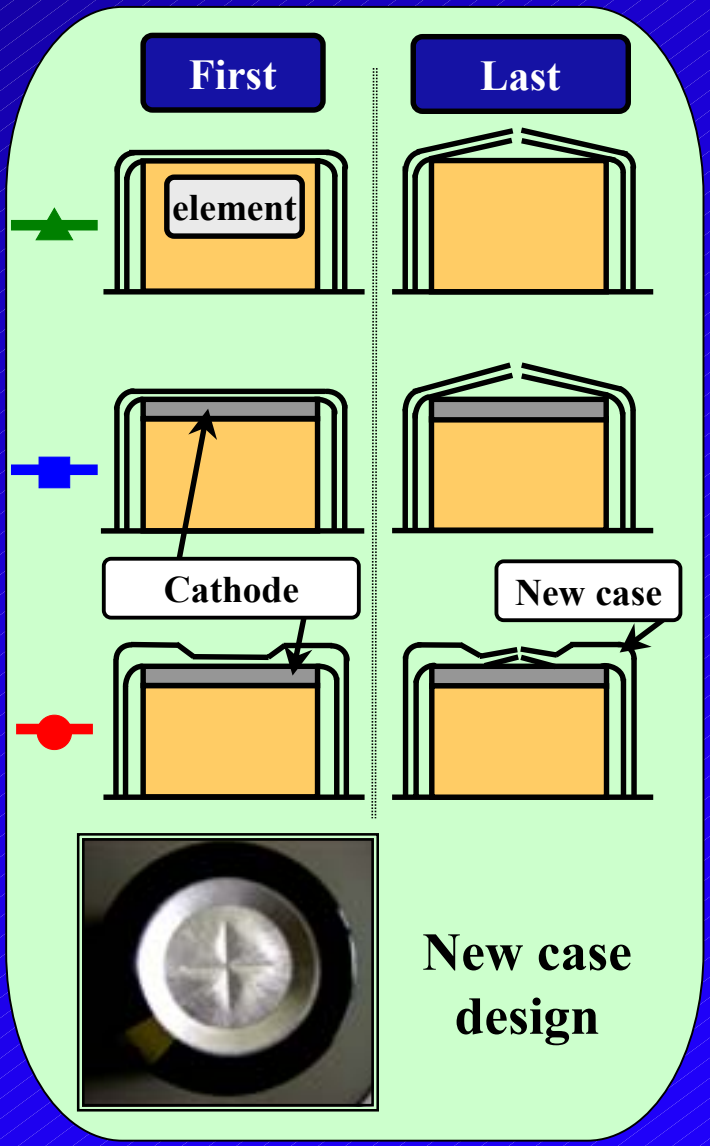




PS2,US2 Comparison of temperature rise

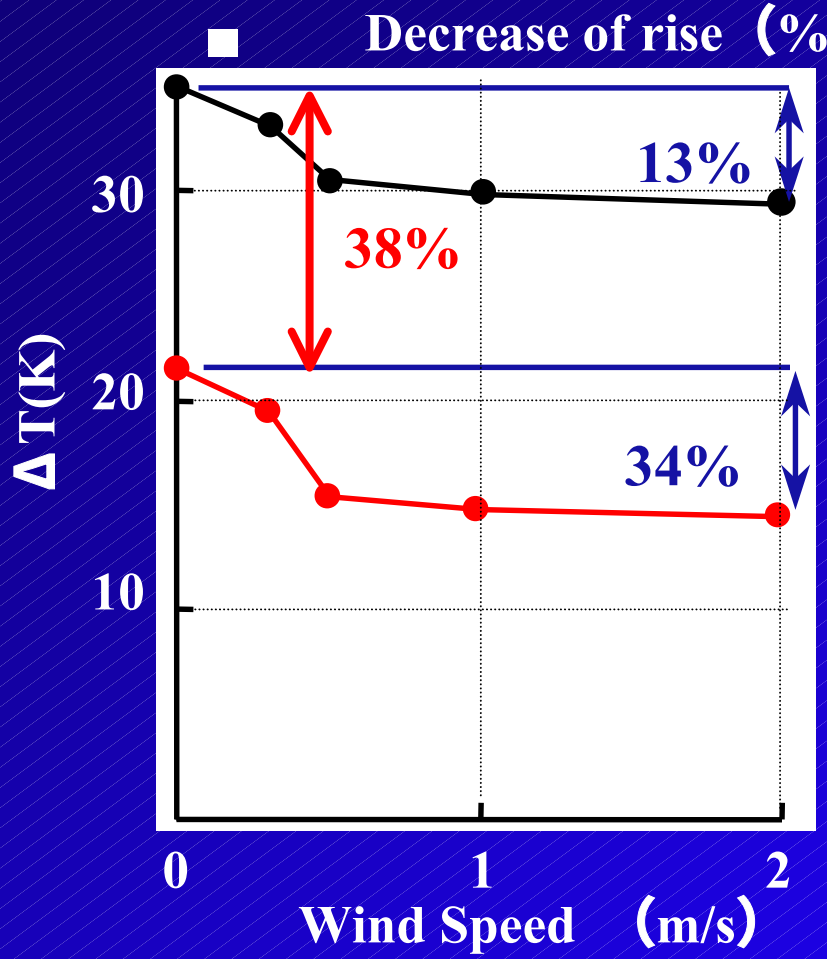
New Structure of cathode foil
and New case design



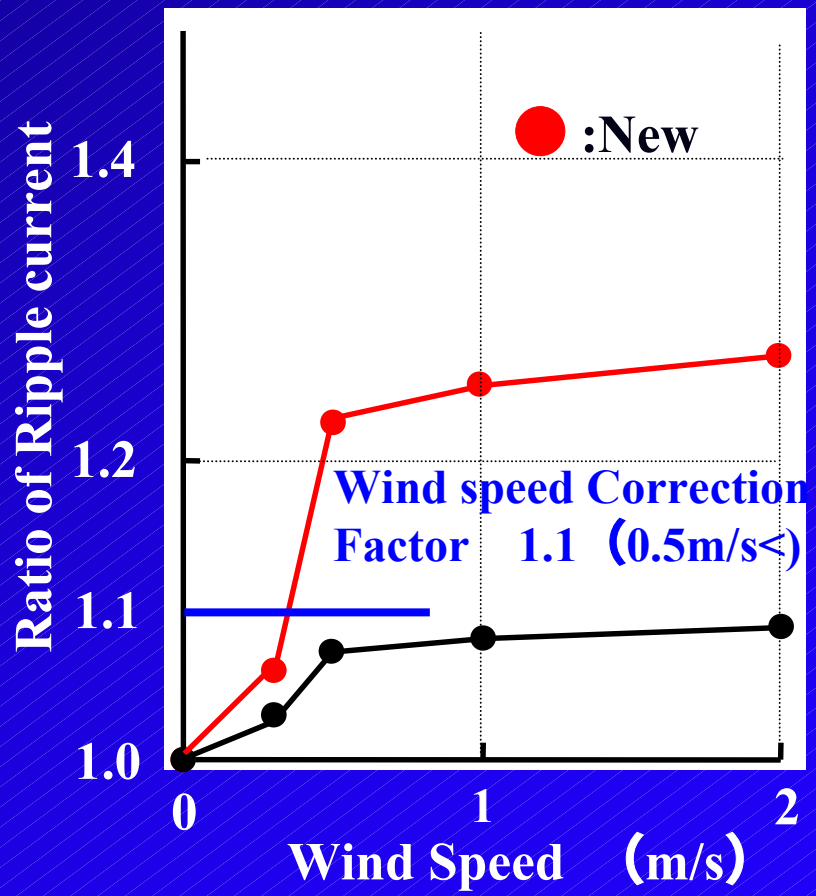


PS2,US2 Comparison of temperature rise

・Wind speed Correction factor



Temperature rise test



Ratio of Ripple current

Features(1)

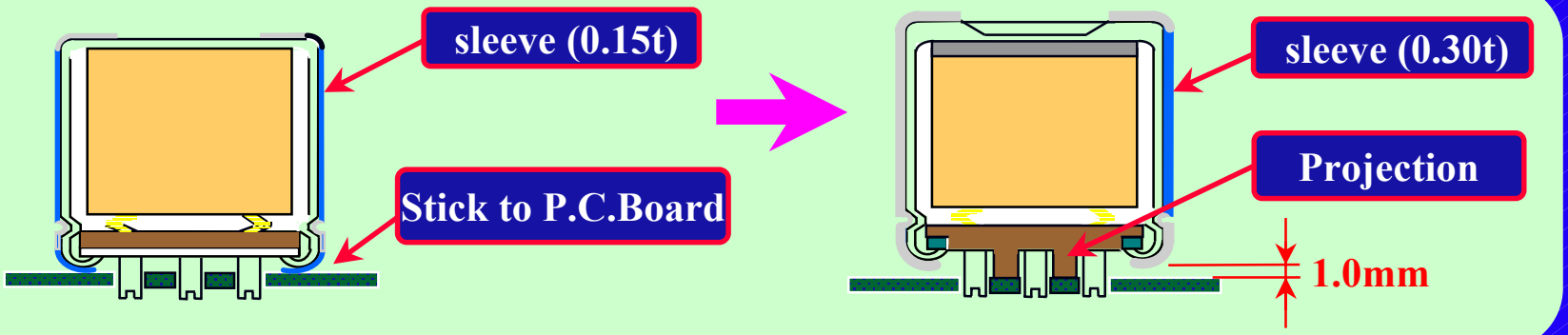
Insulated inner side of the cap of the cap contributes to simplifying pattern design.

Conventional rubber multiplayer cap

New cap design

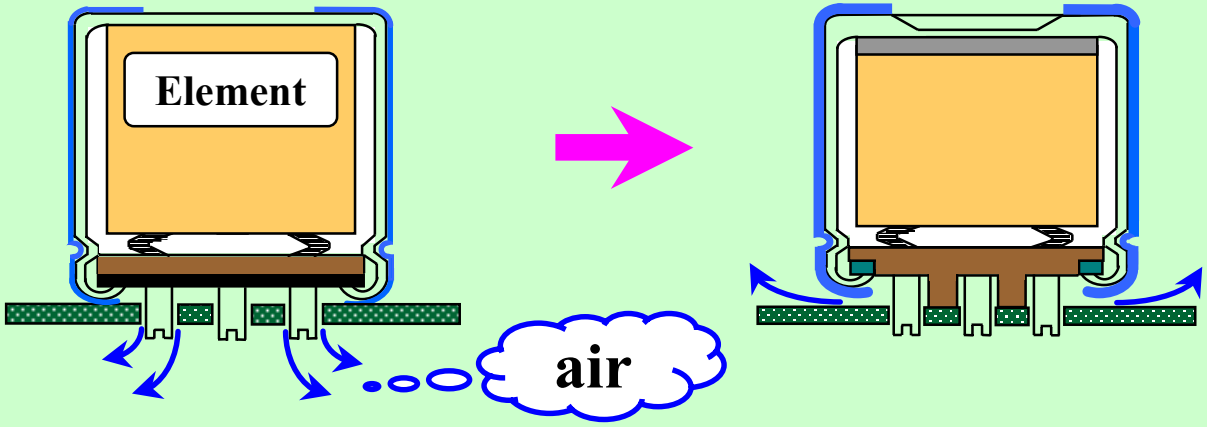
Features(2)

Insulated by making more space between capacitors in the P.C. Board.



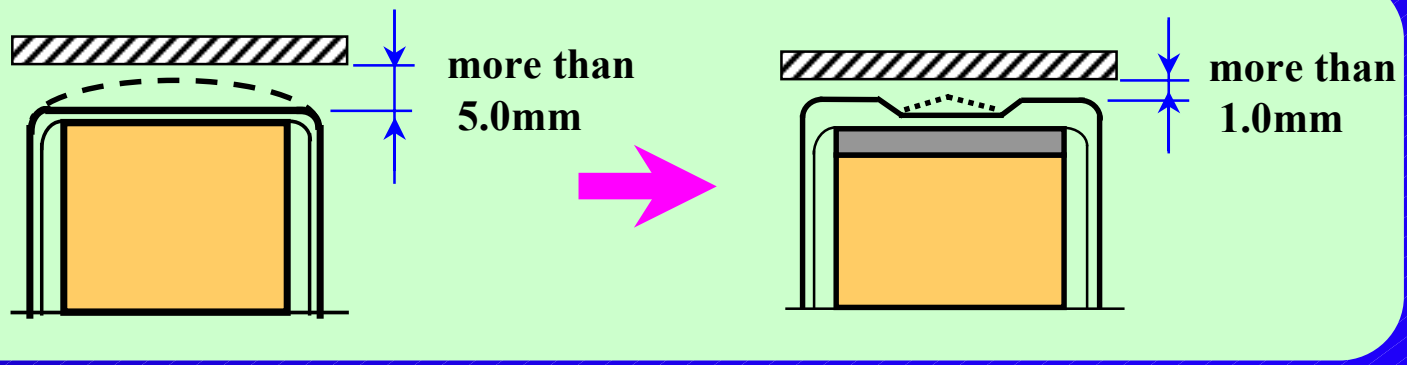
Features(3)

•Prevention of throw-hole phenomenon.



Features(4)

•The decrease of the vent opening specified value from more than 5mm to more than 1mm.



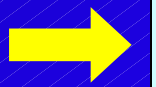
Replacement

(Example)

(at40℃/120Hz)

Current(Screw type)			New Series		
HCGF6 400V(85℃/2kh)			PS2 400V(85℃/2kh)		
Size	Cap(μF)	Ir(A)	Size	Cap(μF)	Ir(A)
φ 51×115	2200	16.5	φ 51×51	1000	11.11
φ 64×96	3300	20.7	φ 51×61	1200	12.30
φ 64×130	4700	27.8	φ 51×71	1500	13.70

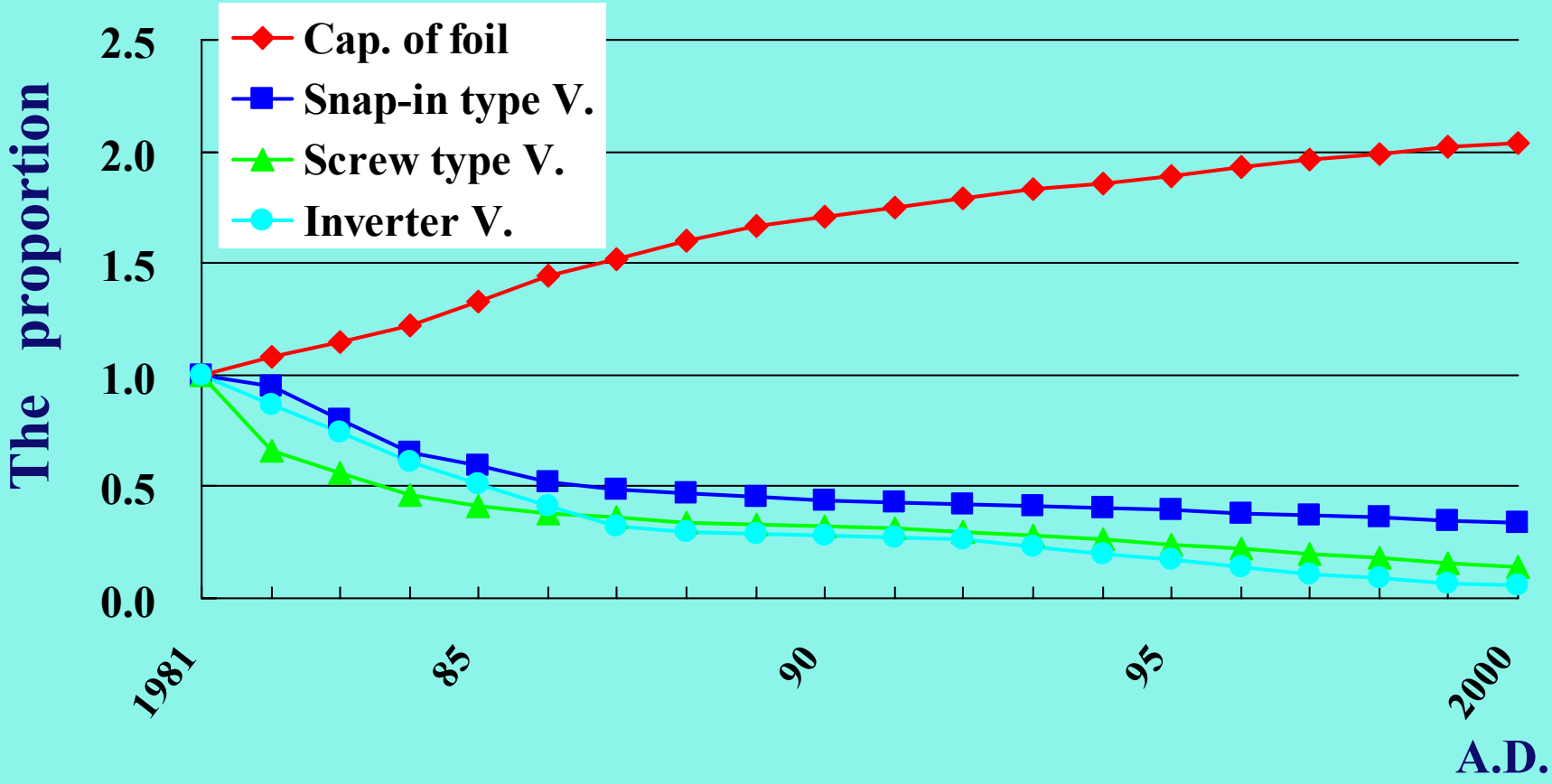
Current(screw type)	
Rated	400V-3300μF
Size(ΦD×L)	φ64×96L
Capacitors array	2S×1P
Pieces	2
T.Cap(μF)	1650
T.Ir(A)	20.70
T.Volume(cm^3)	618



New	Volume	Cost
400V-1000μF		
φ51×51L		
2S×2P		
4	0.67	0.80
1000		
22.22		
417		

Capacitor for Multipurpose Inverter

Miniaturization



Miniturization for our capacitor

Snap-in Type (400V150μF)

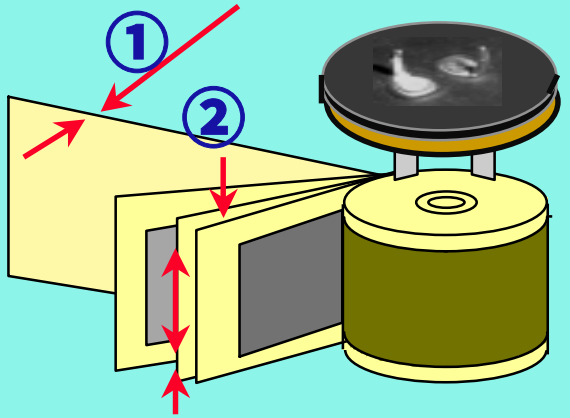
Series	HPU	HU1	HUR	HU3	HU4	HU5
						'99.7
Size						22*35
volu						0.38

Screw (400V)

S						F6
A. D.	'81.4	'82.4	'84.4	'85.4	'87.4	'92.4
Size Φ*L (mm)	90*160	77*144	77*100	64*130	64*115	64*96
volume ratio	1.00	0.66	0.46	0.41	0.36	0.30

Miniaturization

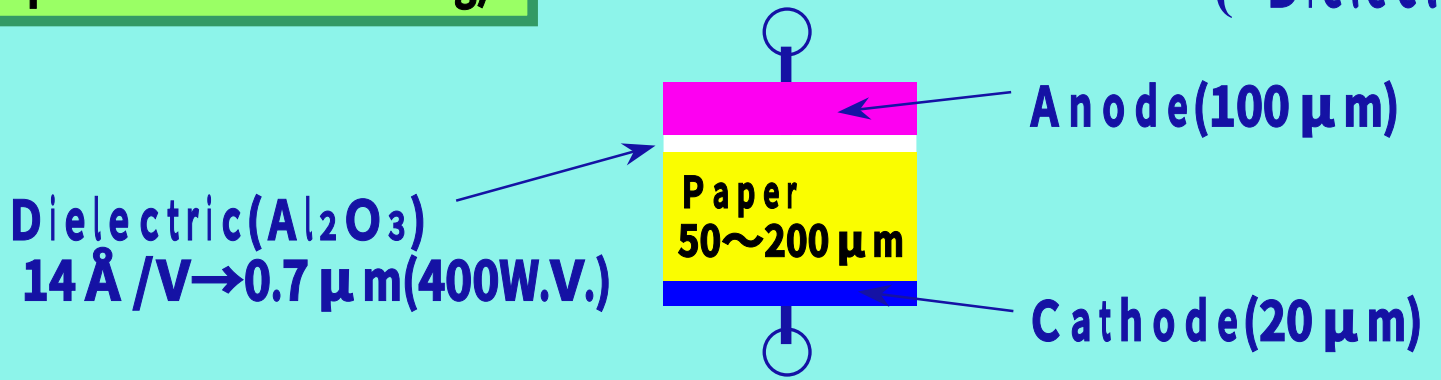
①Method of miniaturization



Miniaturization

- **Inner space** — ①Thickness of paper ②Margin of paper
- **Relative permittivity of the dielectric** — Improvement for forming
- **Spread of the plate (Improvement for Etching)**

$$Cap = \frac{\varepsilon_0 \times \text{Area of the plate}}{\text{Distance between the plate (=Dielectric)}}$$

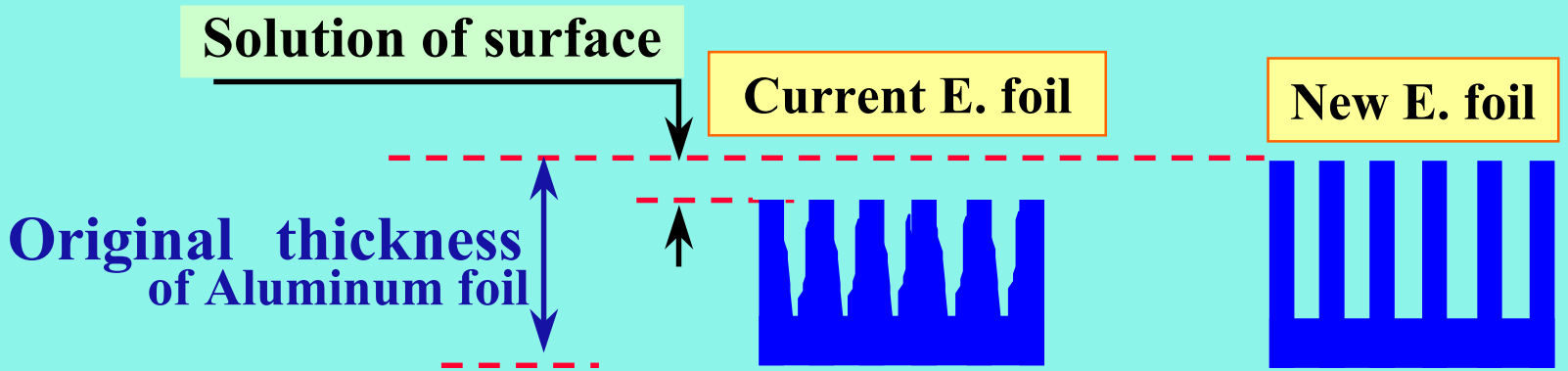


Miniaturization

②Improvement of Etching

Spread of the plate
(Improvement for Etching)

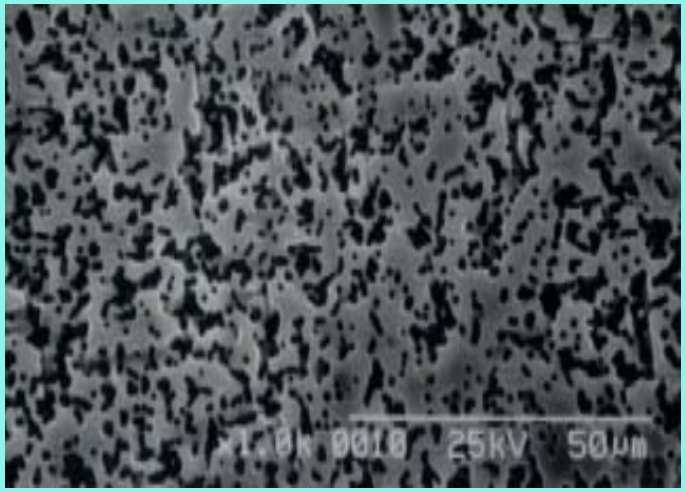
- Raw Aluminum foil
- The class of purity
- Suitable direction of the crystallization
- Pre-treatment(Clear of Al_2O_3)
- Density of Etching pit
- Shape of the Etching pit



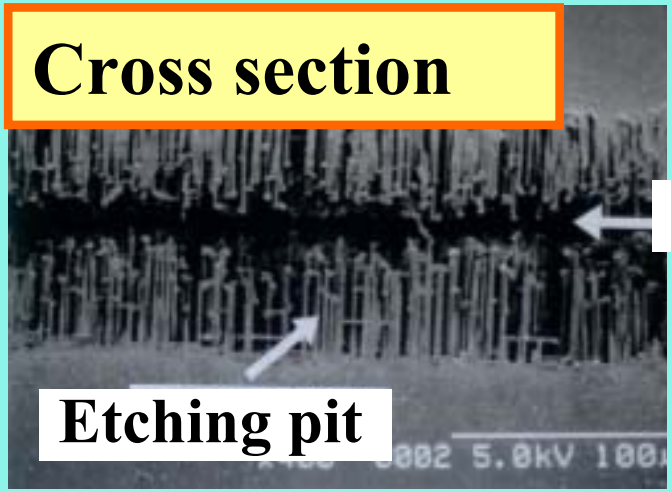
Up to now

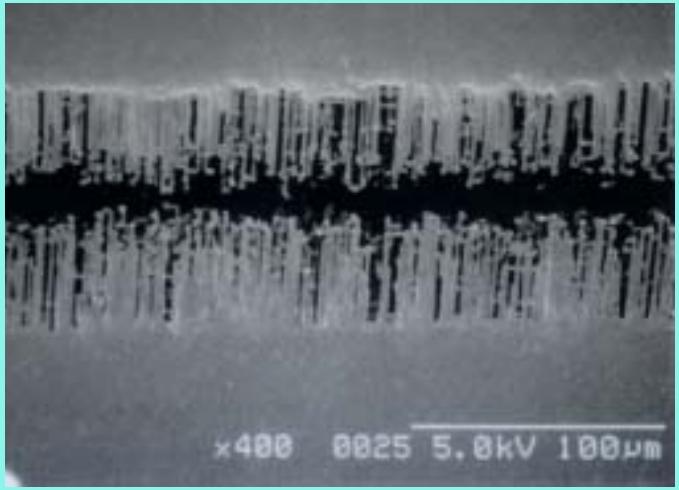
Improvement

Surface

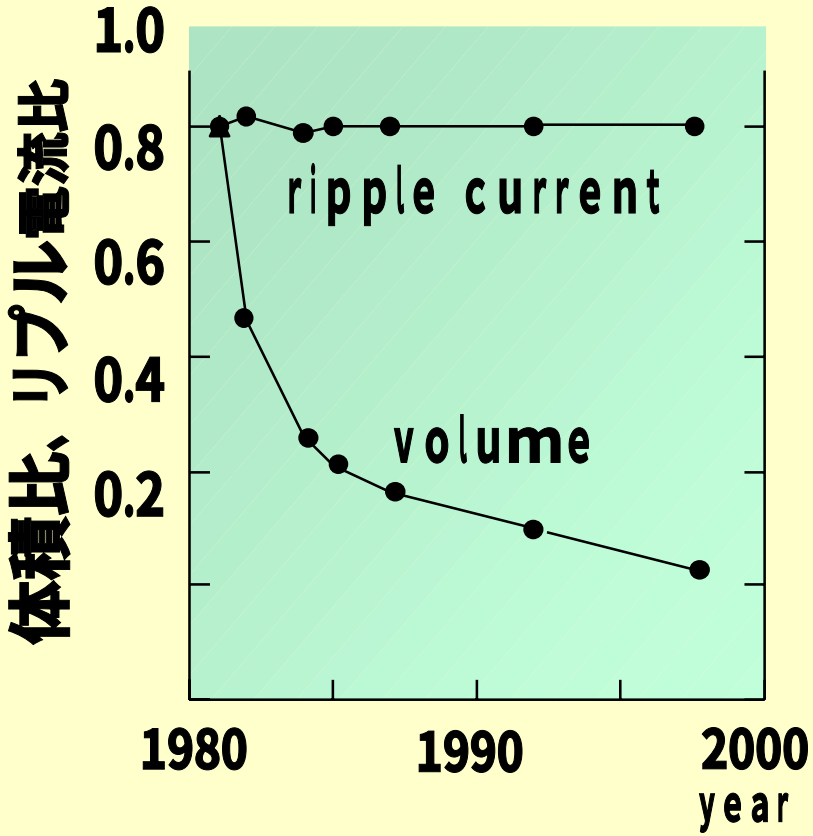


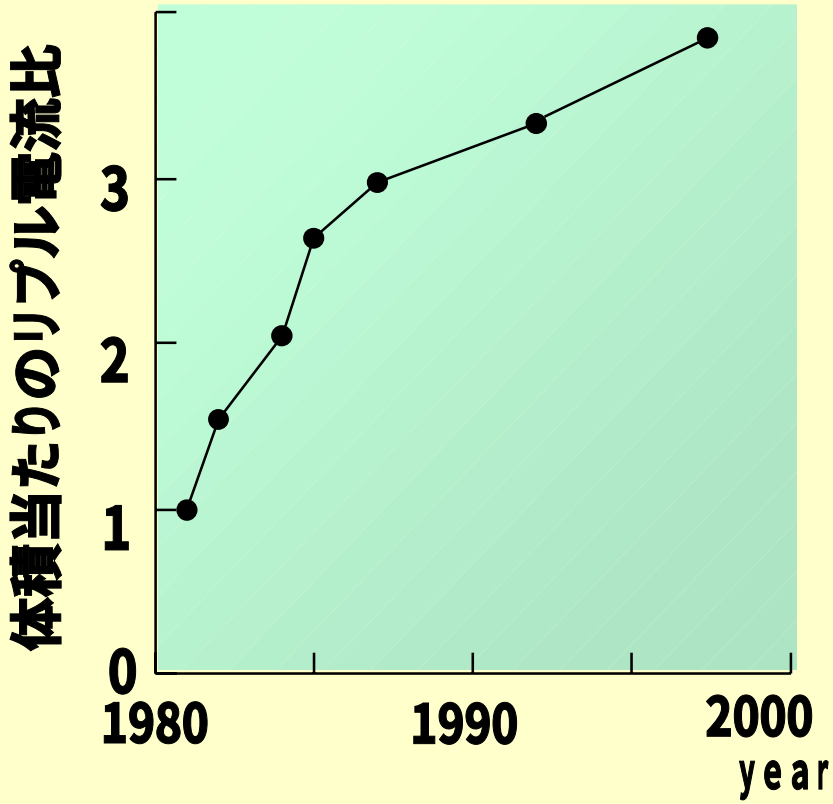
Cross section





これまでの技術動向
①許容リプルと体積の推移



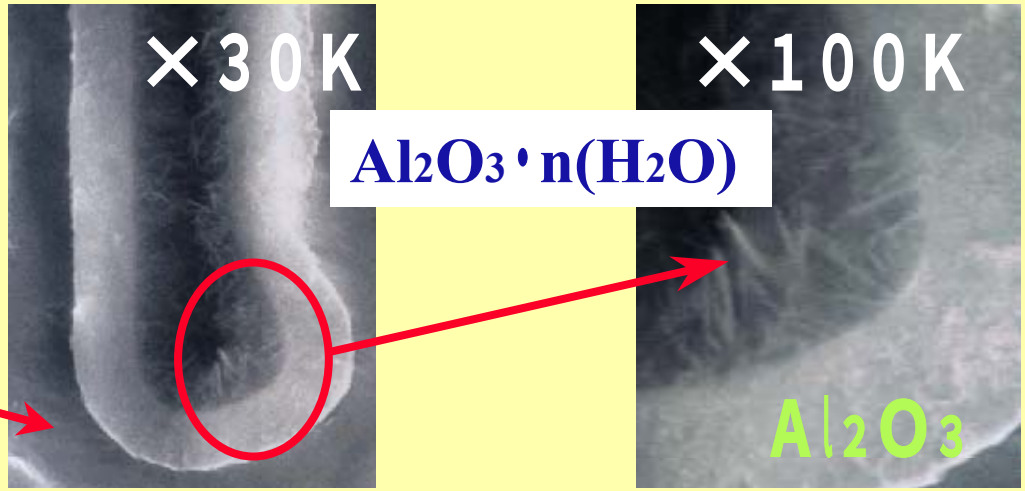


Higher ripple current

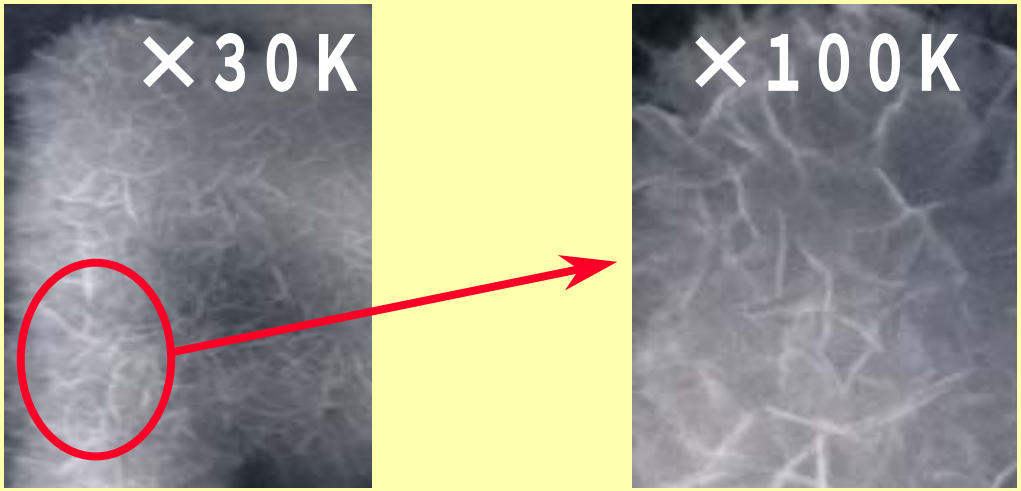
②R. of Oxidize Al.(Al_2O_3)

Cross section

Al

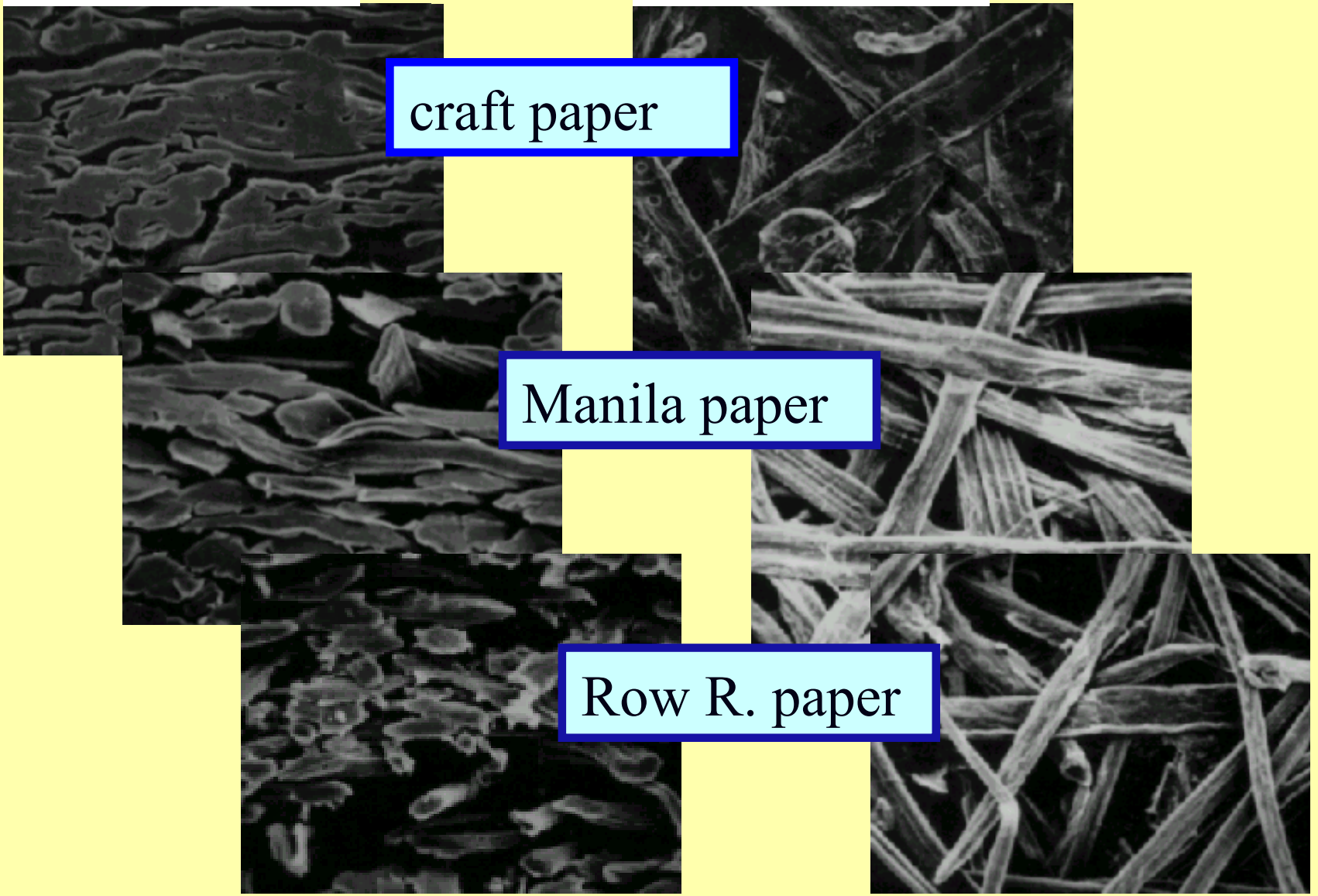


Surface



Cross section

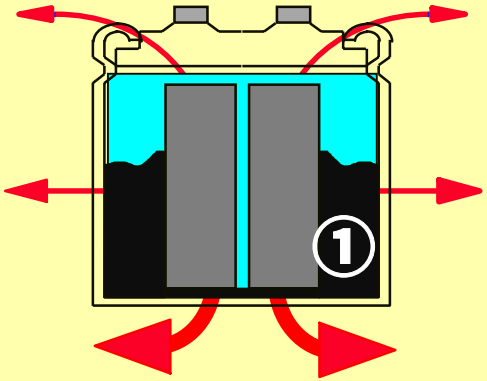
Surface



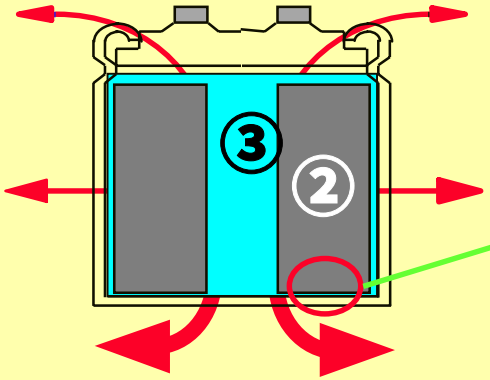
Higher ripple current

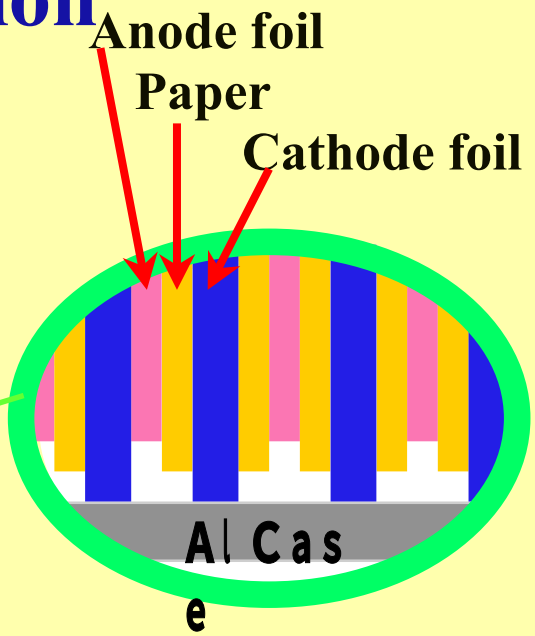
②New construction for radiation

Up to now



New construction





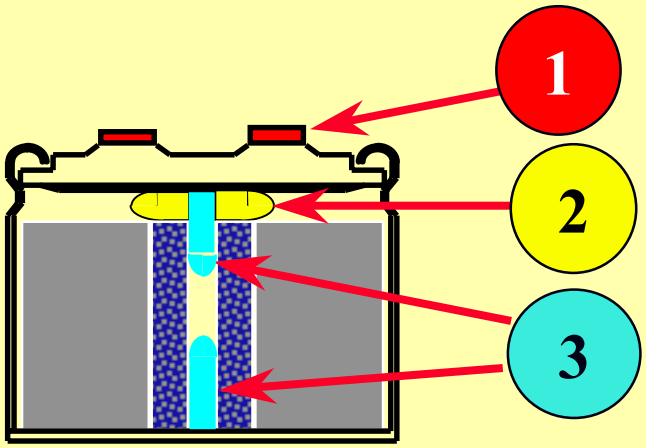
①Get rid of filling material for fixing

②Adoption of thick cathode foil

③Dispersion of intense heat part

Higher ripple current

②New construction for radiation



1 Terminal ⇒ Cope with High Ripple current(100A) (Φ10→16)

2 Rubber for fixing element ⇒ fix by elastic

3 Stud ⇒ guard against rotation of the element

Higher ripple current

④ New construction for radiation

Proposal of Change(FXA→ FXR)

Cap (μF)	FXA		FXR	
	Ir	Height	Ir	Height
5600	17.1	115	23.4	122
6800	19.6	130	26.9	137
8200	23.5	157	32.2	161

85℃5000hr 400W.V.（φ90）

Ripple	Size	Cost
FXR/FXA	FXR/FXA	FXR/FXA
1.00	0.78	0.84

Long life
(Operating condition)

$$L = Lo * 2^{(To - T/10)} * (W.V./V)^{2.5}$$

Lo is life(standard life) when working voltage is applied and permissible ripple current load(center temperature To)

To is at maximum operating temperature.

L is estimated life when the voltage V is applied at the center temperature T. (when W.V.≧ V ≧ 0.6∗W.V.)

Long life with operating condition

①Reduction of Ambient temperature
②Reduction of load ripple current
③Reduction of load Voltage

Longer life time

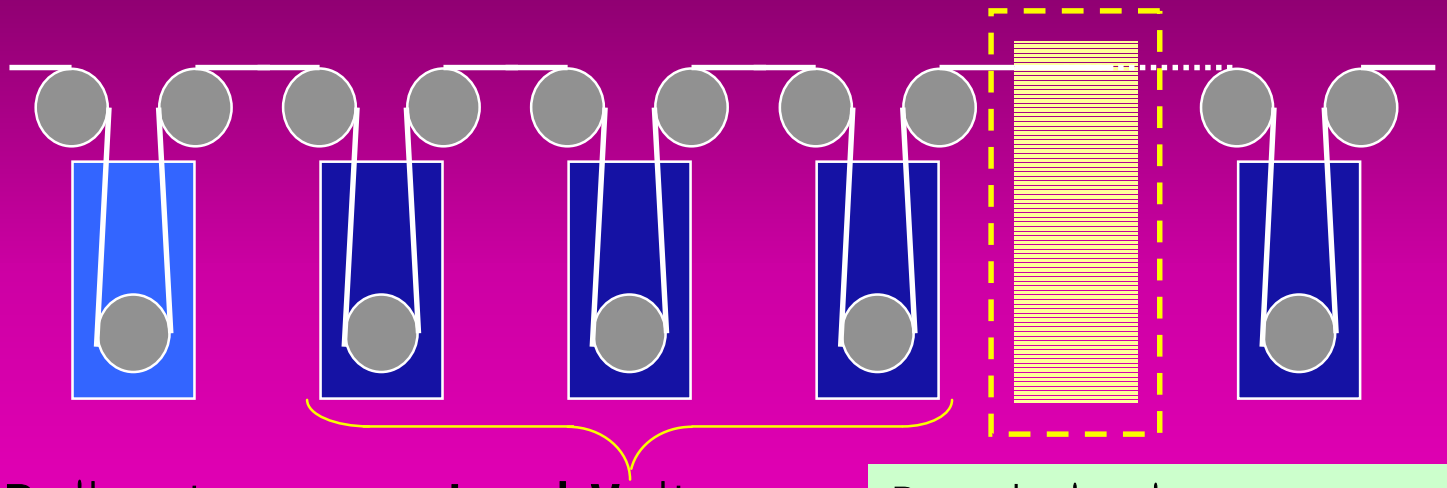
(Higher reliability)

- Longer life time (Higher reliability)
  - Oxidize Al. (Al_2O_3)
    (Improvement for Forming)
    - Suitable Depolarization
  - Electrolyte
    - Non-organic-acid ⇒ Organic-acid
      (Boric-acid) (Low-R. and long life)

Longer life time (Higher reliability)

Oxidize Al. (Al_2O_3)
(Improvement for Forming)

Suitable Depolarization



Boil water **Load Voltage**

Depolarization
EX. Leaving in weak acid(alcali)
Heat treatment

Technical Trend
▪ in Electric Automobile Industry

Important points in development

(1) High ripple current capacitors

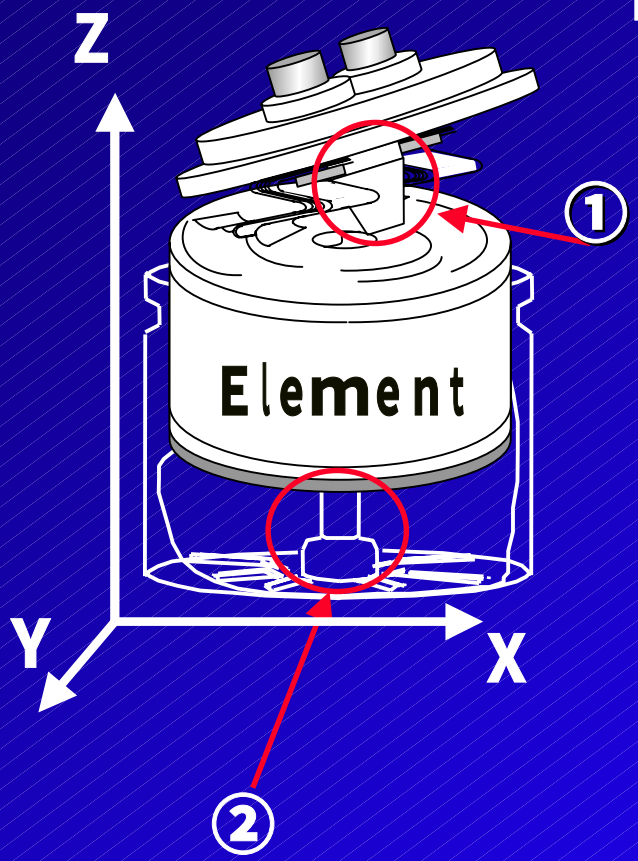
(2) High vibration endurance capacitors

(3) Low inductance capacitors

(4) High temperature endurance capacitors

(5) High voltage endurance capacitors

Development of High Vibration Endurance Capacitors



Fixing capacitor elements with resin cap (①), the stud of case (②).

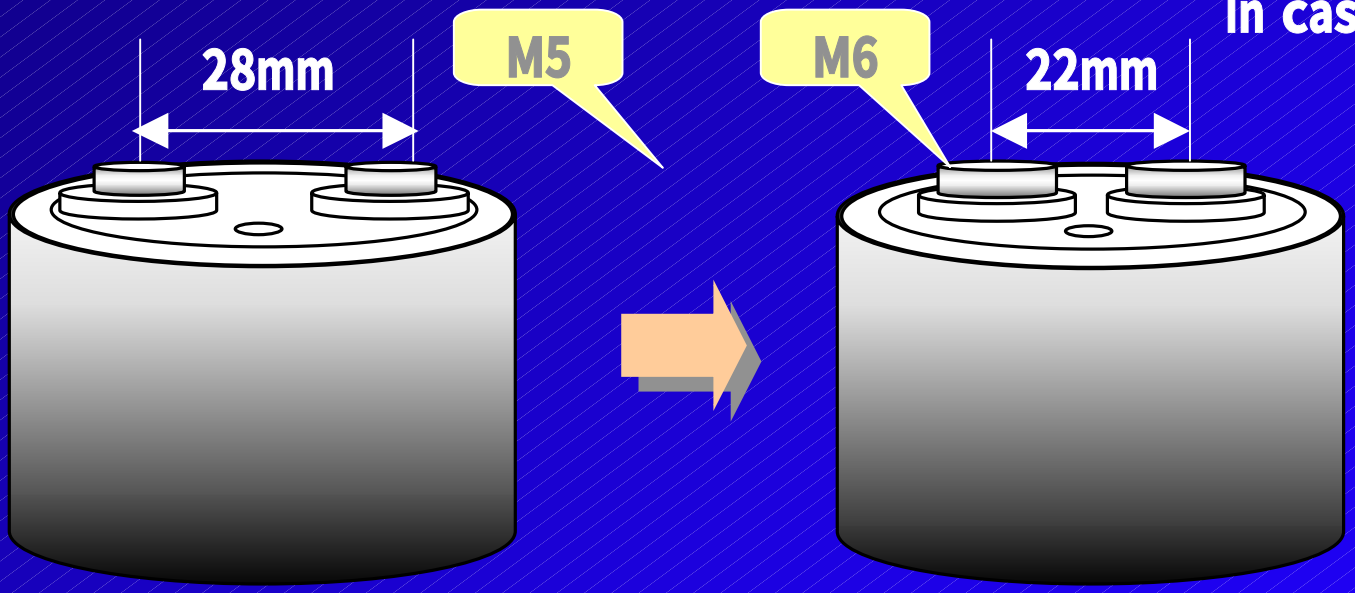
The condition about vibration .

Item	Direction
Direction of vibration	X、Y、Z
Testing time	X、Y : 2h 、 Z : 4h
Frequency	10～200Hz
Sweeping time	20min
Gravitational acceleration	4G

Development of low Inductance Capacitor

- Inductance is concentrated to terminal area.

In case of Φ64



About 20 nH

About 10 nH