

# Development of Folding Test Machine with Strain Measurement Function

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*YUASA SYSTEM Co., Ltd.*

# Topics

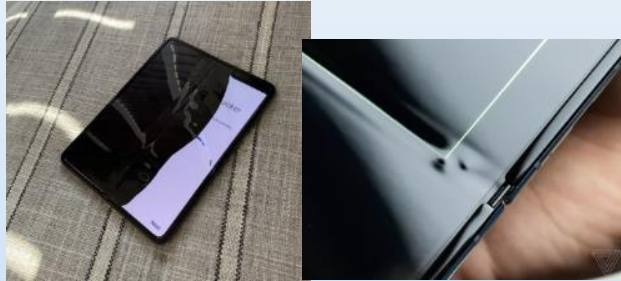
## ◆ Royole Flex Pai

Released in October 2018,  
but has not been widely spread



## ◆ Samsung Galaxy Fold

Release postponed due to  
display problems (Apr. -> Sep.)



## ◆ Huawei Mate X

Release postponed  
(Jun. -> Sep.)



Both material and device manufacturers suffer from material and device test inconsistencies, therefore, reliability testers that resolve these inconsistencies are drawing attention

## ◆ THE WALL STREET JOURNAL introduced Yuasa system on May 13

Web Article

Newspaper

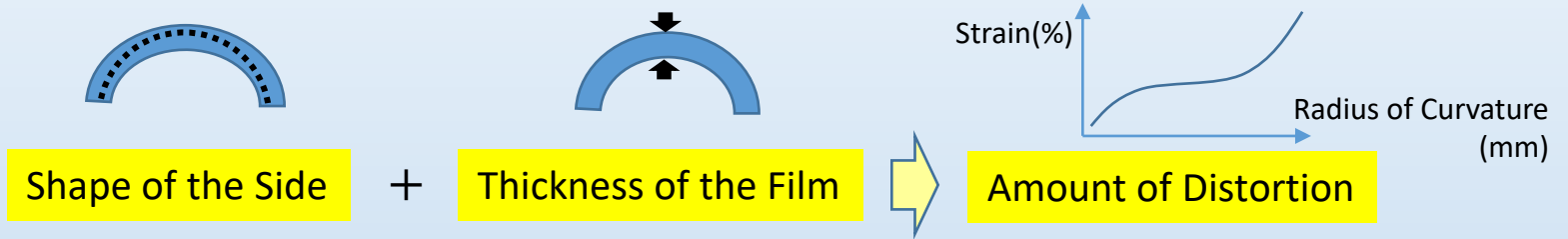


“Even if a layer is durable enough when tested alone, it could face another issue when it becomes part of the screen because the distance from the rotation center changes,” Mr. Okazaki said.

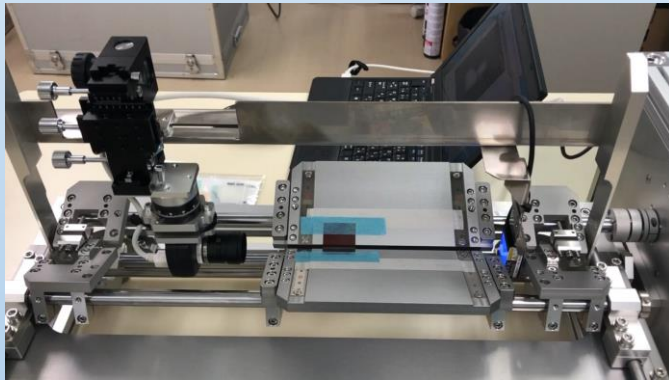
# Folding Test Machine with Strain Measurement Function

## ◆ Shape Analysis

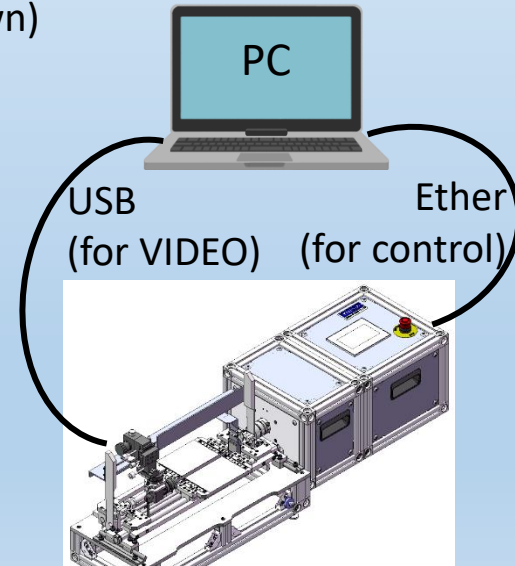
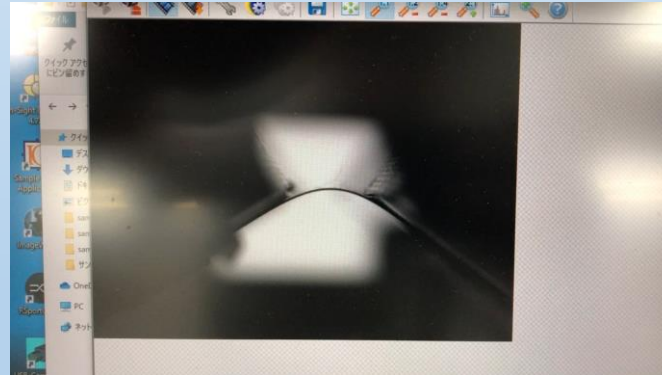
The technology to calculate the amount of distortion of the film from the shape of the side of the folded film and the thickness of it



## ◆ Remodeled CS-tcam to implement an optical system and made a prototype



Video taken with camera (upside down)

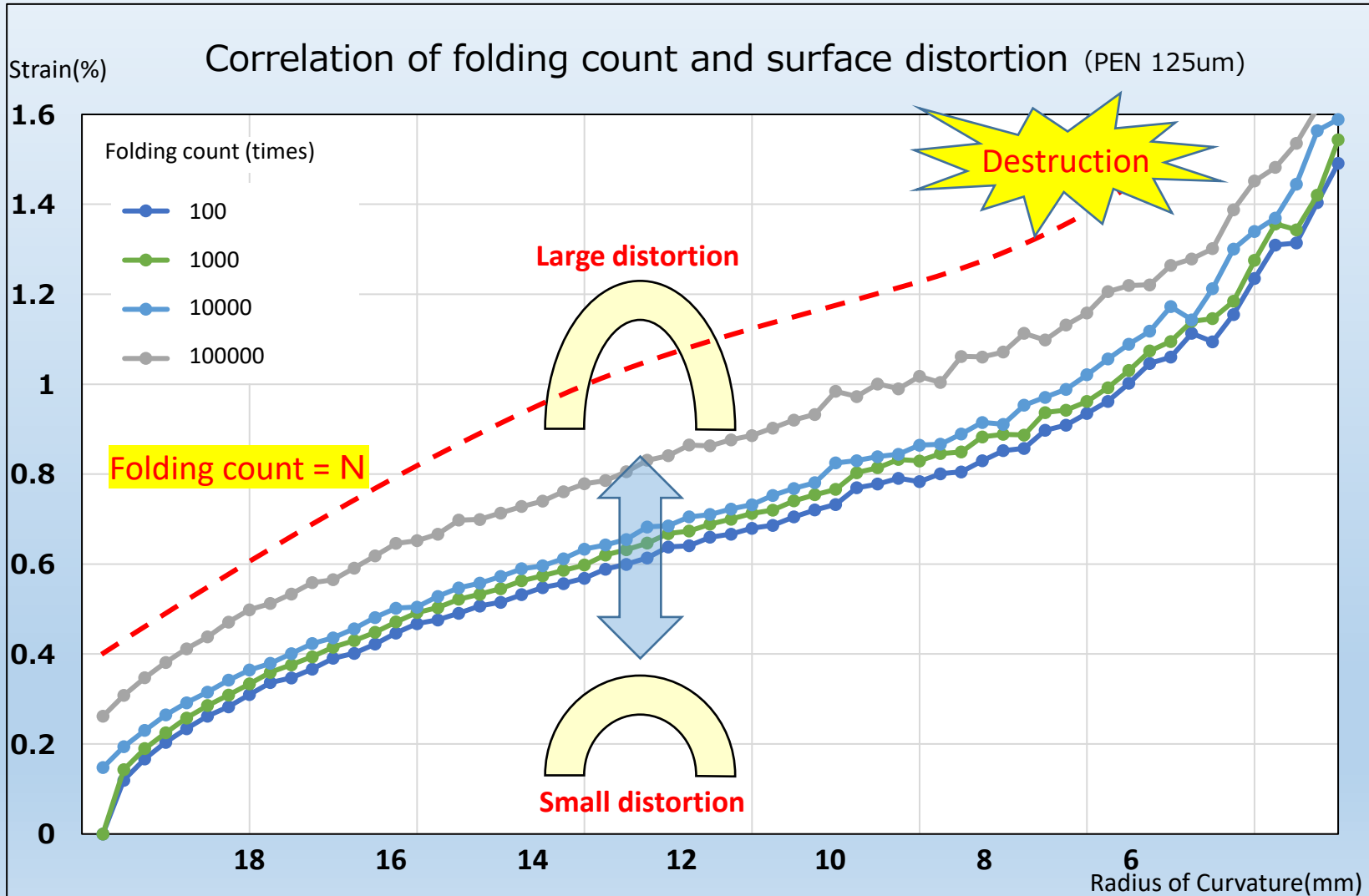


Remodeled CS-tcam

# Effect of Strain Measurement with Shape Analysis -1

## ◆ Expected Function

To predict failure time from the correlation of bending count and surface distortion



# Effect of Strain Measurement with Shape Analysis -2

## ◆ Expected function

To detect delamination due to folding

We assumed that the side shape changes due to the delamination generated in the inner layer (under consideration)

Samsung Galaxy Fold Stack

Function	Supplier	Layer	μm
Changeable Window	SKC,Segyung	Hard Coat/Anti Finger	6
	SKC	PET	45
	SDI	OCA	40
Cover Window	Dongwoo	Hard Coating	5
	Sumitomo Chem.	CPI	40
Black Matrix	Biel	Black Matrix	8
	SDI	OCA	50
Polarizer	Nitto	Polarizer	31
		PSA	50
Panel	SDC	Flexible Panel (w/ YOCTA)	30
Adhesive	Innox	PSA	10
Additional PI	Ube -> Kolon	PI(Yellow)	50
Adhesive	SDI	PSA	25
Cushion Film	Utis	Cushion Film	100
Adhesive	SDI	PSA	25
Frame	SEWON	Frame	20
Total			535

Source: DSCC's Foldable Display Technology and Market Report

OCA... Optical Clear Adhesive  
CPI..... Colorless Polyimide  
PSA.... Pressure Sensitive Adhesive

