



Future Screenprinting Applications

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Sakurai Graphic Systems Corp.

More than 5,000 installation in the world-wide market since 1968
for Sakurai's acknowledged quality screen presses



Sakurai Gifu Plant

(320 kw solar power-generation
on the rooftop)

1. Established in **1946**
2. Started production of cylinder type screen press in **1968**
3. Over **5,000** machines installation in the world
4. Sakurai is also the manufacturer of sheet-fed **offset press**
5. Sakurai **keep evolving** the future of screen printing technologies

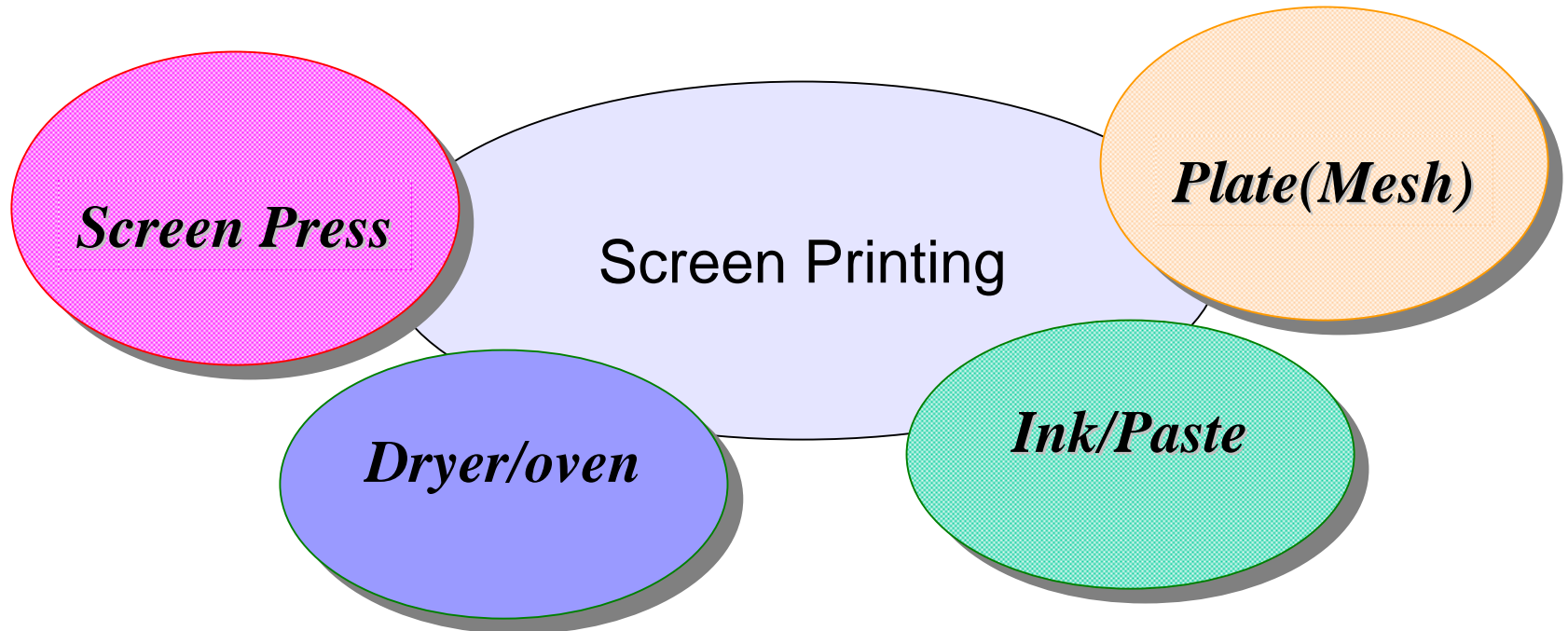
What is screenprinting ?

Purpose of print : To make the designed shape on varying printing substrates

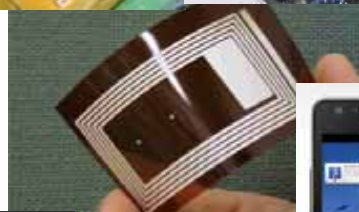
Type of print : **Solid printing** : An even ink film can be made on
Coating/light shield/gluing/decoration

Dot/pattern printing : Different size and height dot or lines
can be made

Graphic/lens/spacer/electrode/decoration



What is Screenprinting products?



Market Trend of screen printing in EU/USA and Japan

Increase demand

Direction to high accuracy and fine pattern image

Touch panel,
Flat Display
Solar Cell
RFID, etc.

Graphic screen

Compete with digital
printing

2010

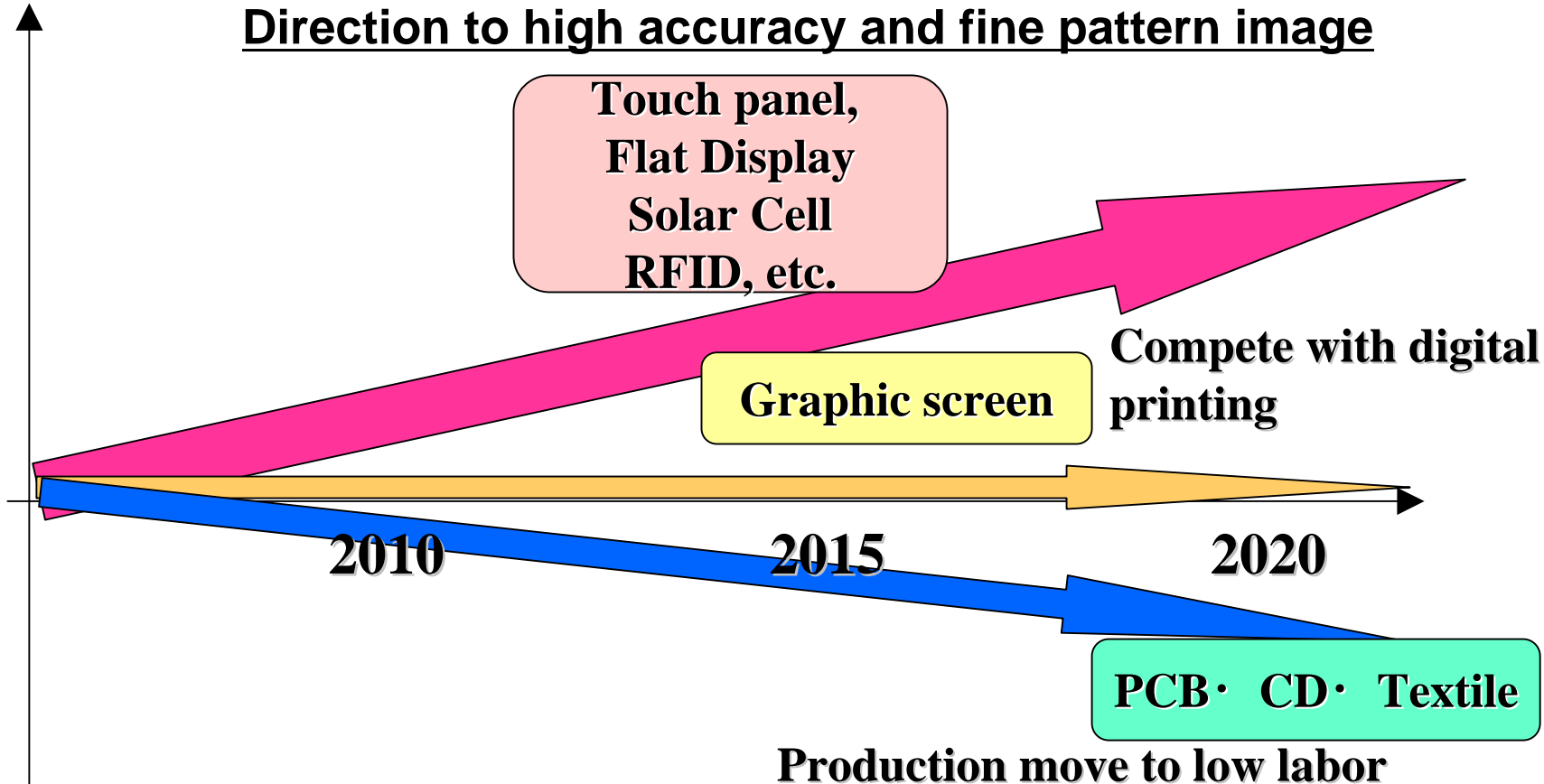
2015

2020

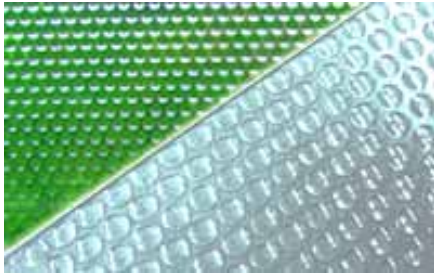
PCB · CD · Textile

Production move to low labor
Area of countries

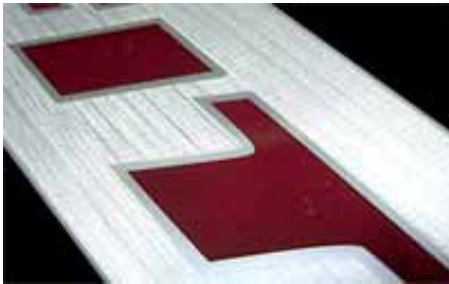
Decrease demand



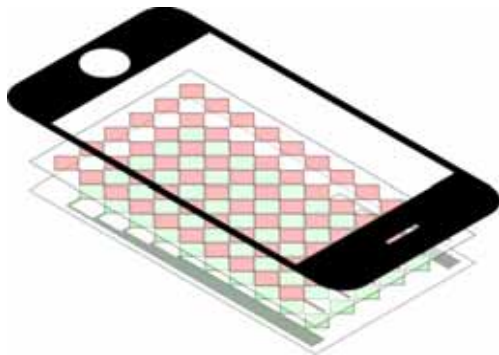
What is new for screenprinting



Dot Lens(lenticular) printing: 3D effects, Braille, Spacer effect.



Line UV coating : Hair line coating with ultra-smooth metallic Ink print to make plastic sheets look like metallic sheets.



Screen printing is very successful too in the display and touch panel manufacturing process.

Conductive ink for Printed Electronics : Detail explanation to follow later

Search for the quality of screen printing through the Printed Electronics

1. Apply for screen printing to make electrical component is considered as the cost saving way.
2. But, there are some issues to make it more accurate and productivity.
3. Details search(our tentative theory) will follow

Use of screen printing for electronics

Photolithography for patterning

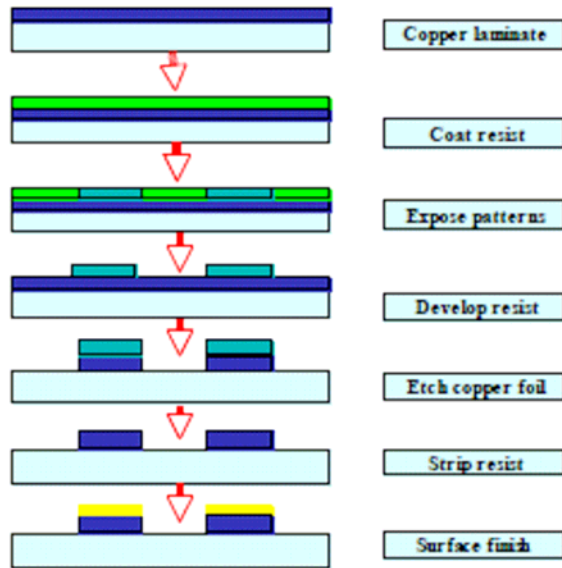


Fig. 2 Basic process of photolithography

Screen printing for patterning

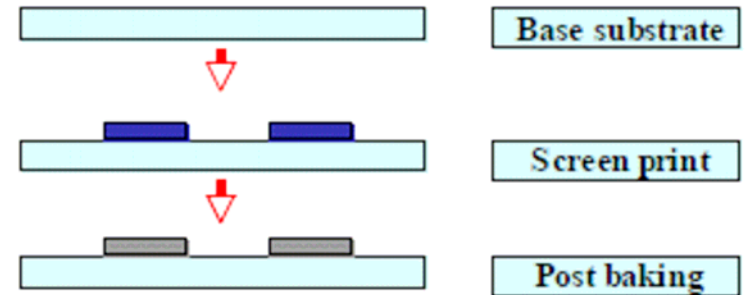
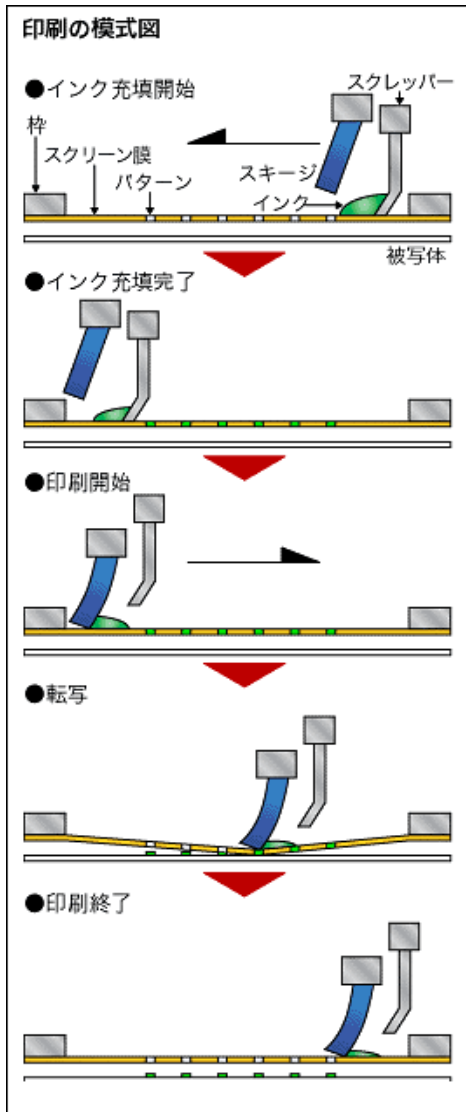


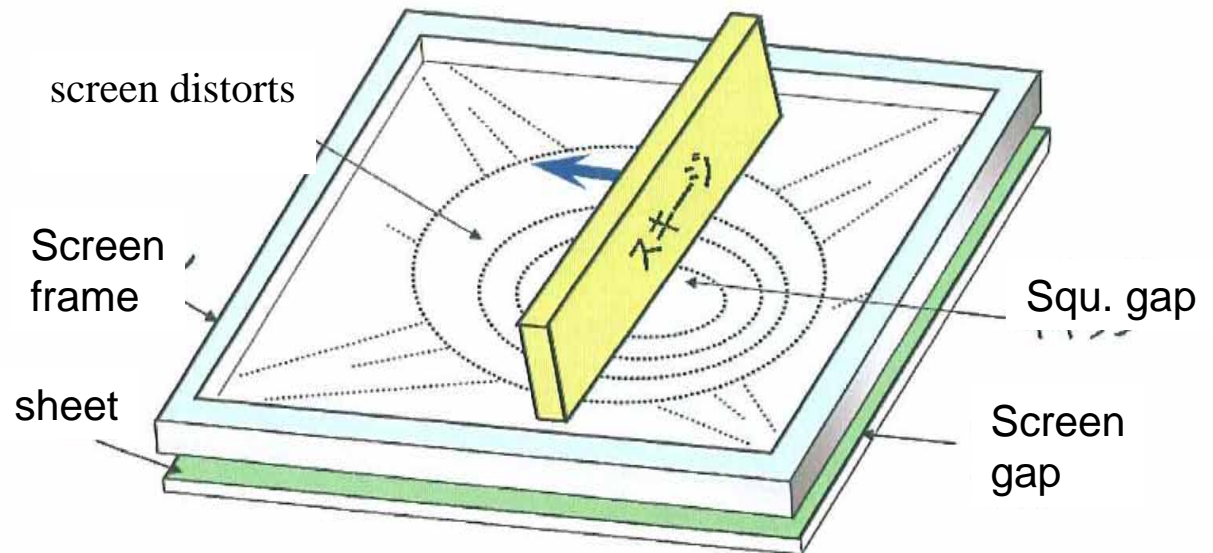
Fig. 1 Basic process of screen-printing

Simple process, lower machinery investment
save materials and environment

Issues for high precision printing



Screen deforms 3-dimensionally, the place other than where the squeegee contacts the screen as the figure below and to the side show resulting in Image distortion.



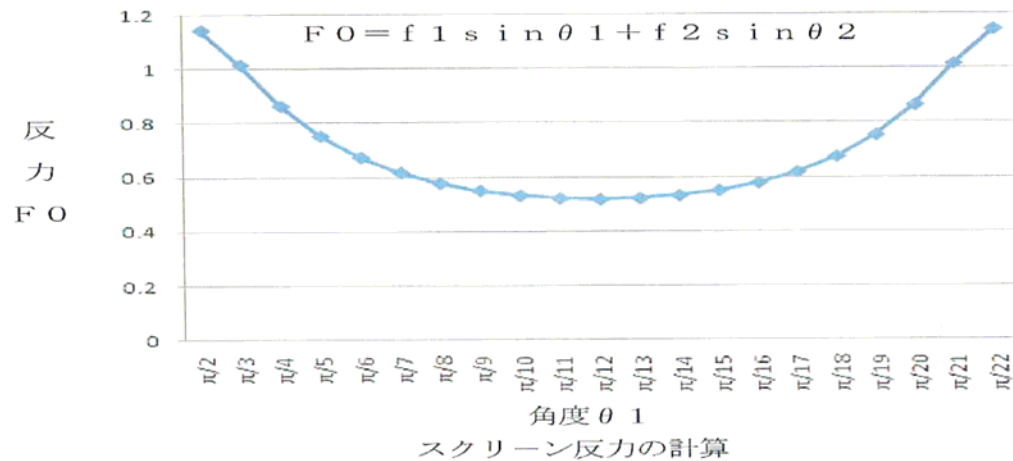
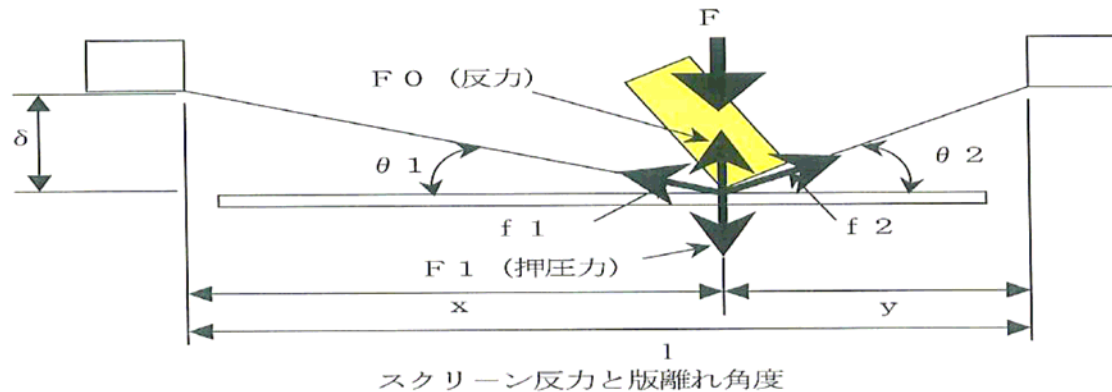
in-plane unevenness.

Pattern distorts

Plate life and
repeatability

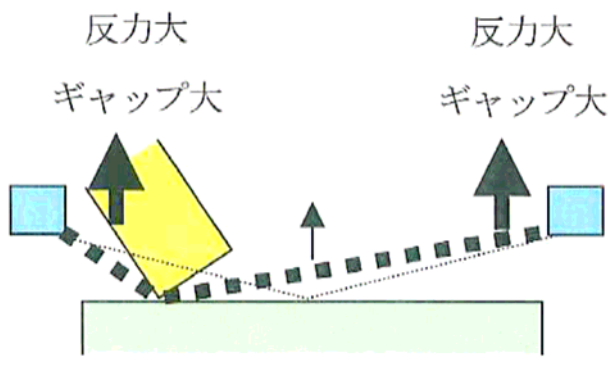
Screen reaction force in-plane unevenness

Unevenness in screen

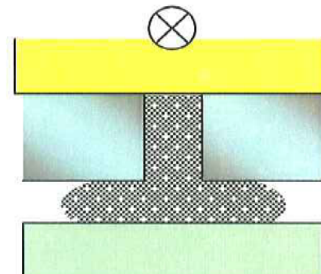


Screen reaction force and patterning

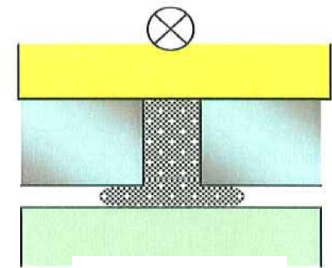
In-plane Uniformity of ink transfer



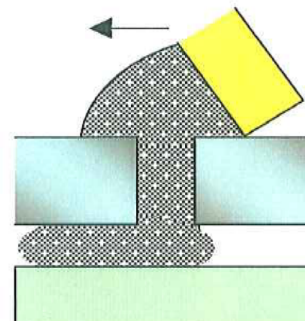
スクリーン基板間ギャップはばらつきが大きい



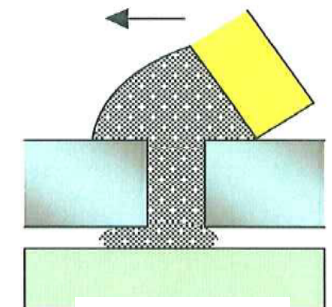
Large gap= wider line



Small gap



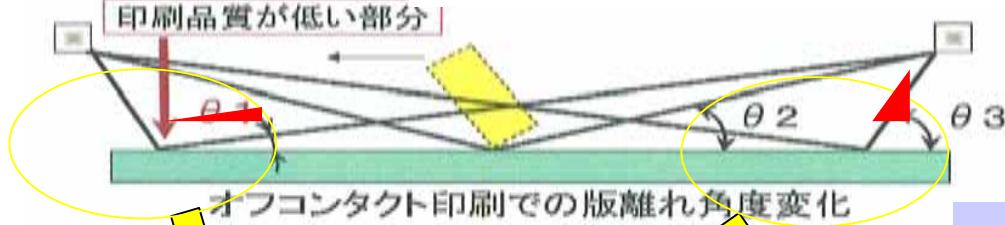
Large gap= bleeding print direction



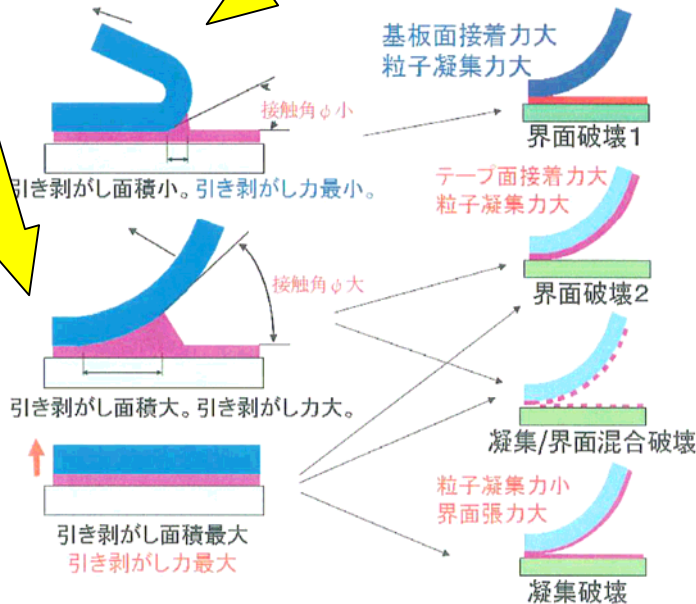
Small gap

Off-contact angle in-plane unevenness

$\theta_1 < \theta_2 < \theta_3$; Angle is changing according to the squeegee position

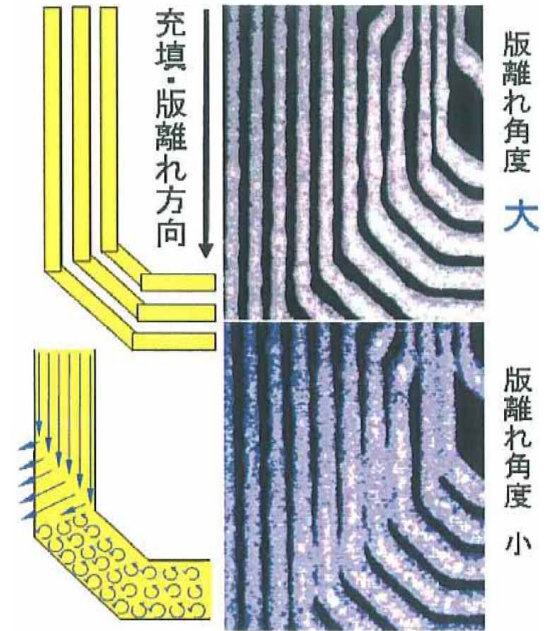


Off Contact Angle



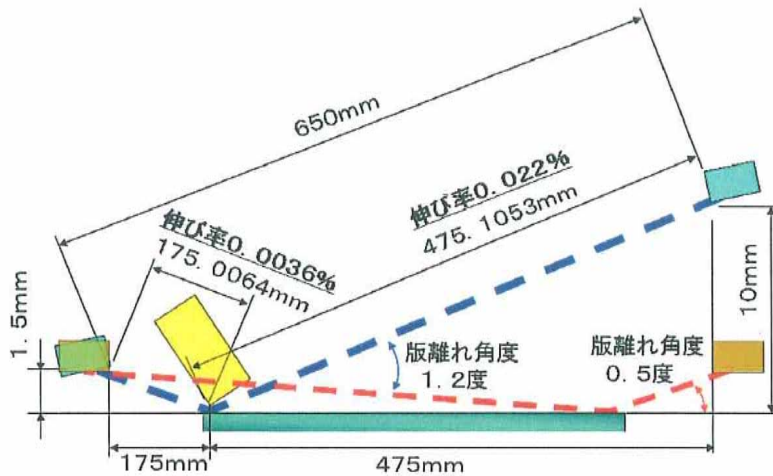
Large

Small



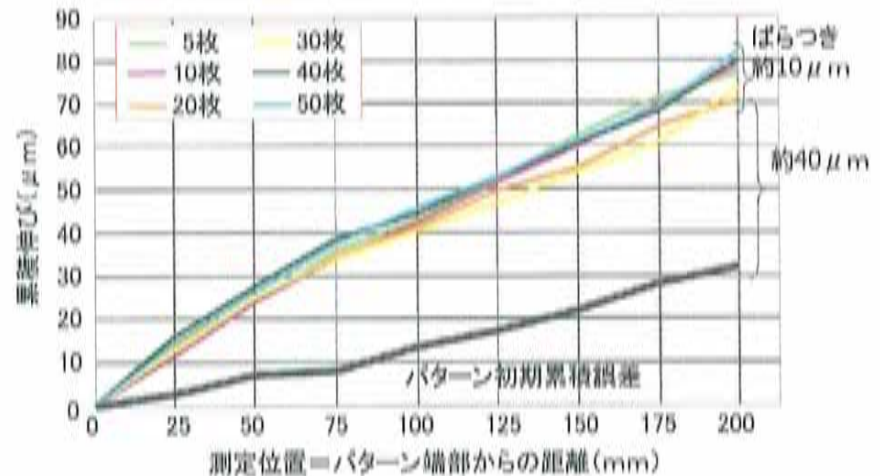
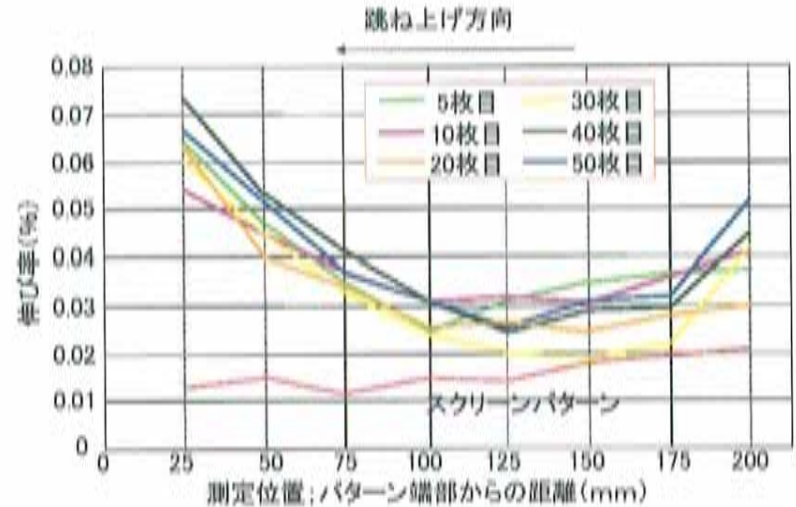
Pattern distortion (print elongation)

Pattern Distortion



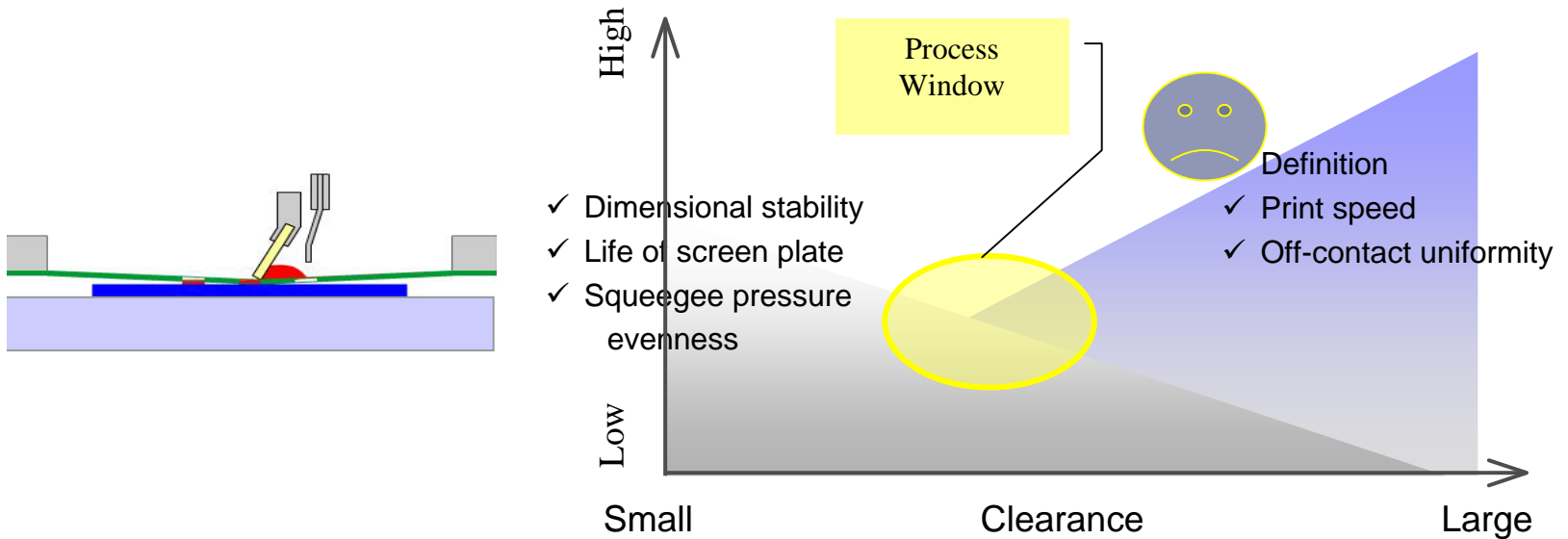
There are print elongation issues even for high precision PDP prints, approx. Horizontal direction **100 micron**, and stroke direction **60 micron** in 1000mm length of sheets. In ordinary screen printing, distortion would usually be even much higher. For example, 300-400 micron.

Life of plate, repeatability



Flat-bed screen press

Clearance gap is very important for definition, print speed and off-contact uniformity, But it does cause compromises in the other area of print and press functions, see diagram



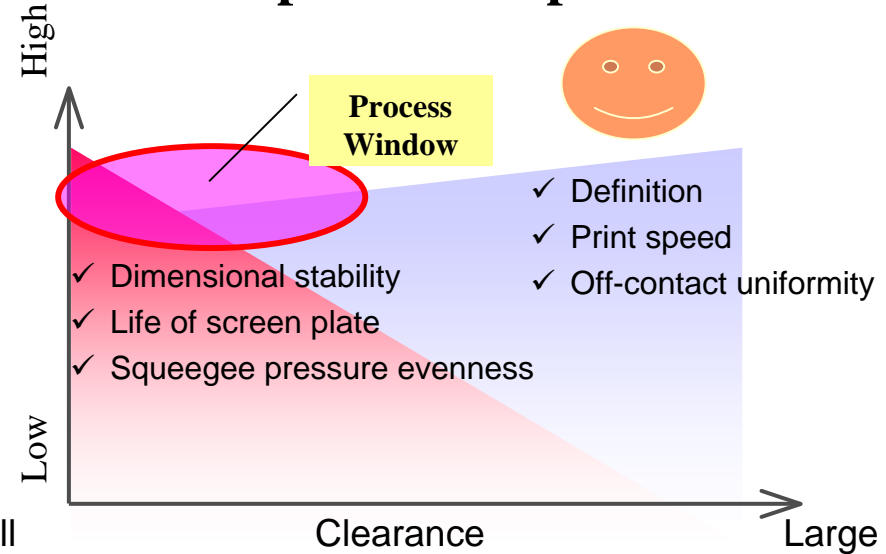
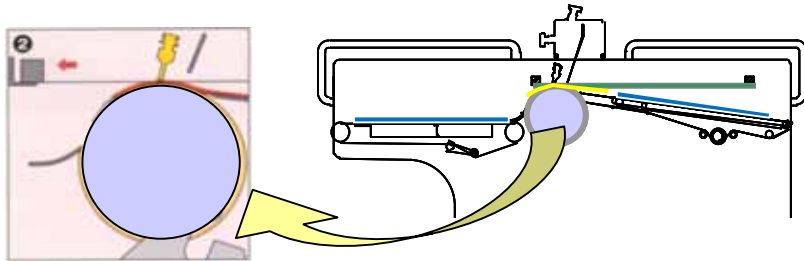
Use elastic screen mesh



Flat bed press is mesh stretching print method

NEW

Cylinder screen press has low clearance print concept



Cylinder low clearance function, High tension mesh and Print elongation corrector

Screen printing without mesh stretching

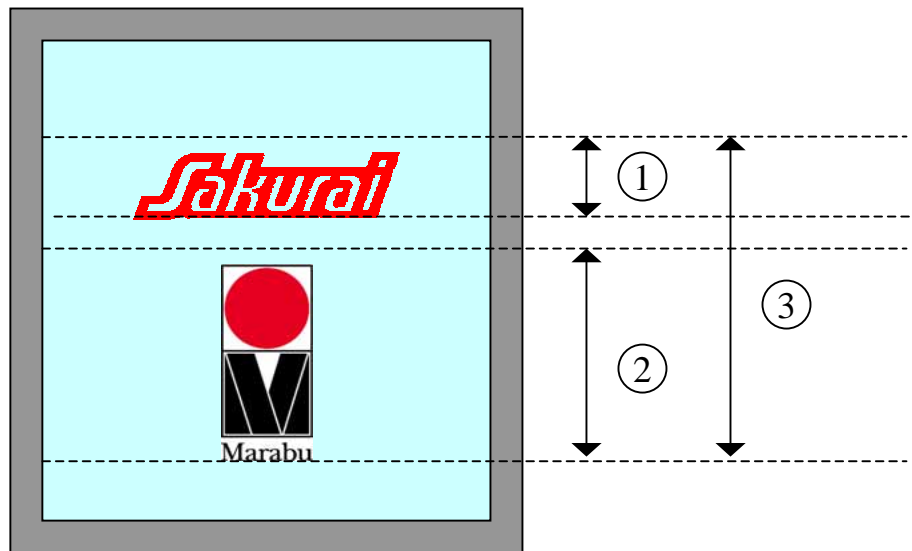
Cylinder press exclusive high accuracy and size evenness printing

Sakurai MS-SD series of presses

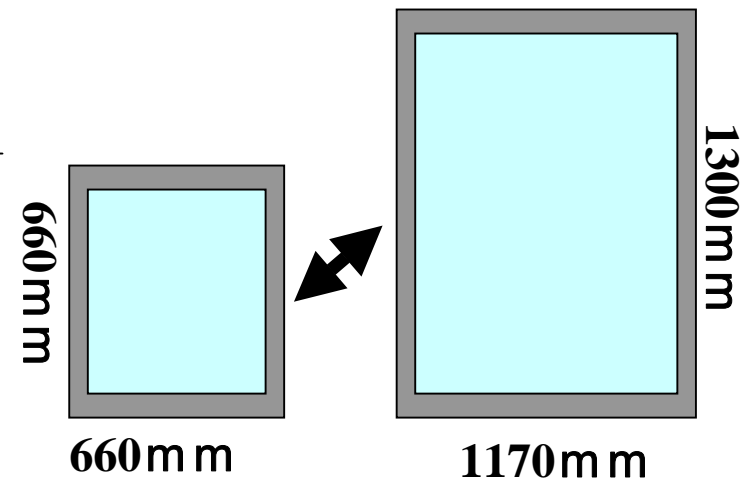
1. Individual Servo Motor Drive

Printing start position change and variety size of screen frame use can be realized because screen frame and squeegee are driven by individual servo motor

(A) Printing start position change



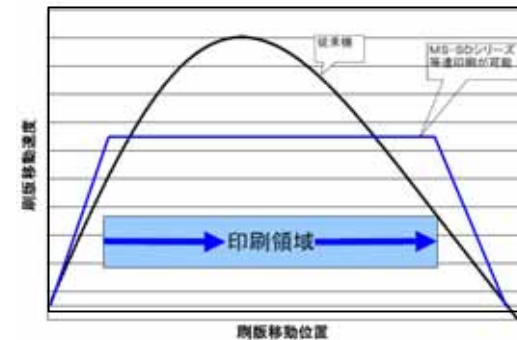
(B) Variety size of screen frame use



Sakurai MS-SD series of presses

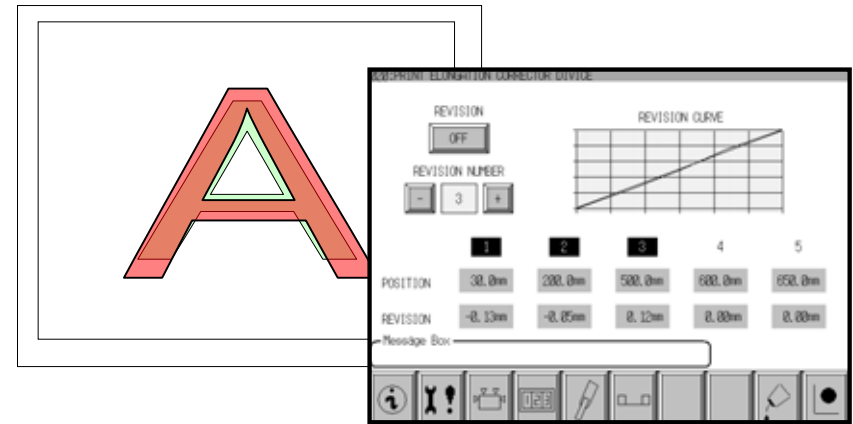
2. Squeegee constant speed control

Screen frame movement is control by servo motor. It realize constant printing speed which bring you evenness printing quality.



3. Print elongation corrector

Against elongation printing problem., mismatching the image can be adjusted by changing the movements screen frame and Cylinder. Within printing stroke, maximum 5 points can be adjusted with touch screen monitor.



Sakurai MS-SD series of presses

4. CCD Camera sheet alignment (New Option)

After adjust the sheet position with traditional mechanical register system, read printed alignment marks on sheets by CDD camera, then fine-register with center vacuum table.

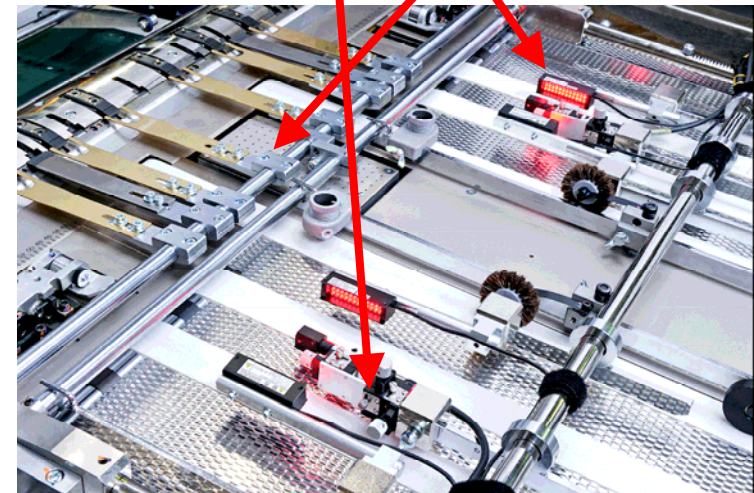
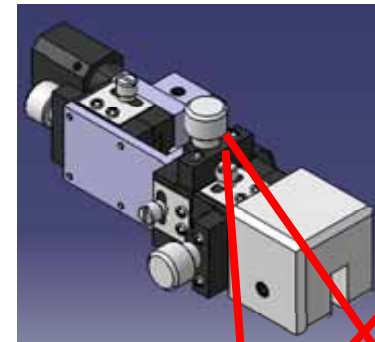
With mechanical and CCD camera register systems, production can be faster than flat bed printing press in the market.

Register accuracy: +/-30micron

Max Printing speed: 900sheets/hour

Make-ready time: Half *target

*Above numbers can be changed depends on condition.



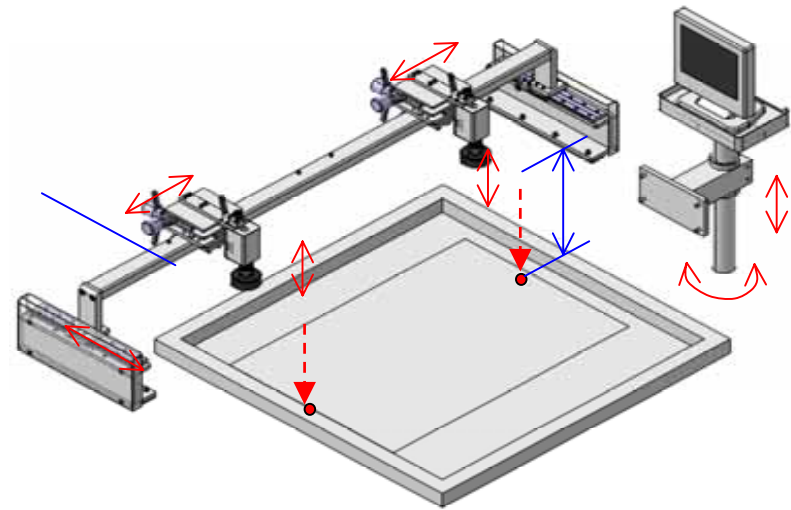
Sakurai MS-SD series of presses

5. CCD Camera screen frame positioning assist

In order to set the screen frame position at once, this device would be suggested.

Two CCD cameras see the register mark on screen and those are magnified and shown on the display.

So, operator can easily and quickly set the position of screen on the press



Latest Sakurai Factory Test Result !

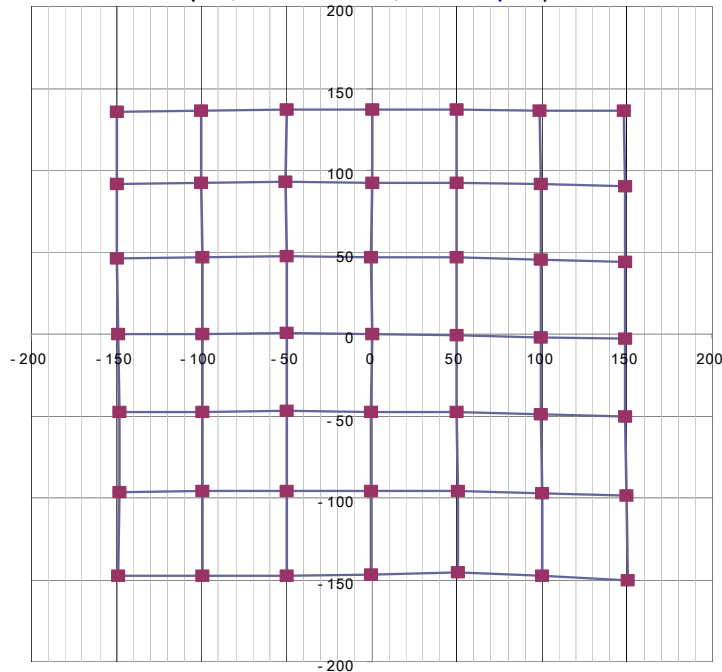
300mm width pattern, side-way distortion

$\Delta W < +/- 8\mu\text{m}$

F5s1_14

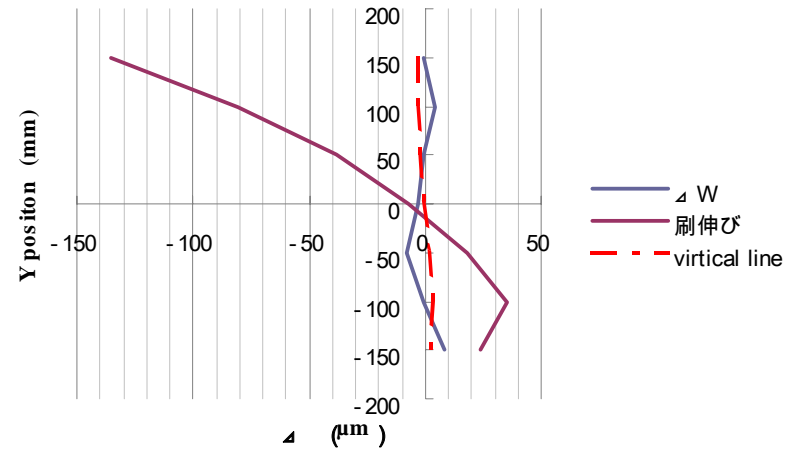
HSD_EX, CL=0mm, SQ押込み=0.5mm

(Δ X, Δ Y × 100scale, 1目盛100μ m)



イノヤ : 千葉ソニカル株式会社 工房UV/RC-SL 610S/
赤

横伸び / 刷伸び / 縦軸倒れ
F5s1_14raw



Future Screen Printing Applications

1. By applying specialist applications to normal film & board can increase your profitability.
2. Raise printing applications are very successful in advertising and products promotions.
3. Advances in name plates technology and new demands from industrial manufacturer are possible with SD technology.
4. Sakurai Maestro and SD technology opens huge area of possibility.
5. By continuing to work with our screen event partners we are helping to convert more screen printers to print UV economically and efficiently.

***Thank you very much
and
Have a nice & useful day***

Sakurai