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# The Development of PSS (Pumpable Sheet metal Stiffener)

# SUNSTAR

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## Introduction

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This report contains follow items regarding the PSS (Pumpable Sheet metal Stiffener) Penguin Stiffener #1190.

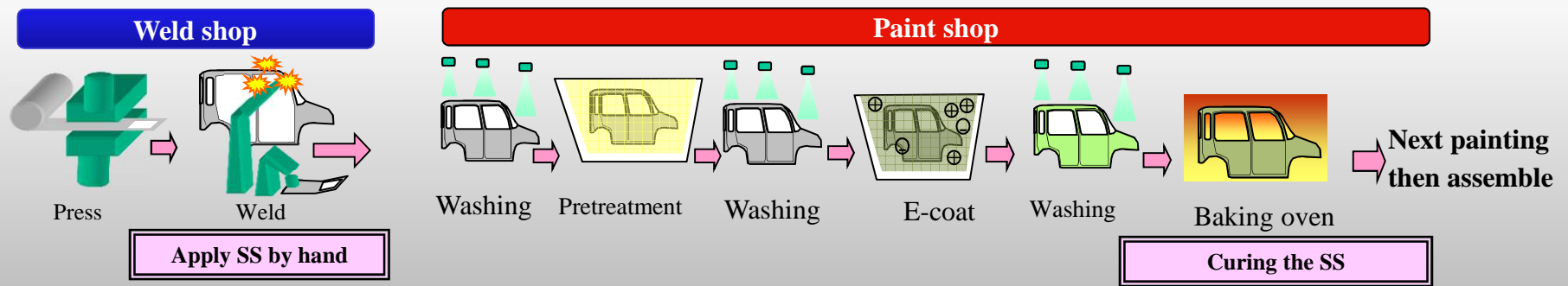
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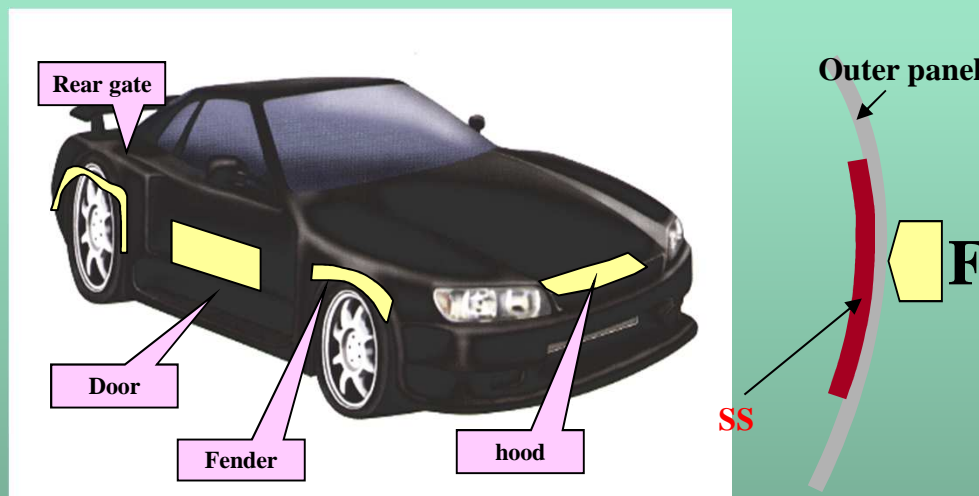
## What is the SS?

SS is Sheet metal Stiffener which enforce the outer panels of car such as door, fender and etc.

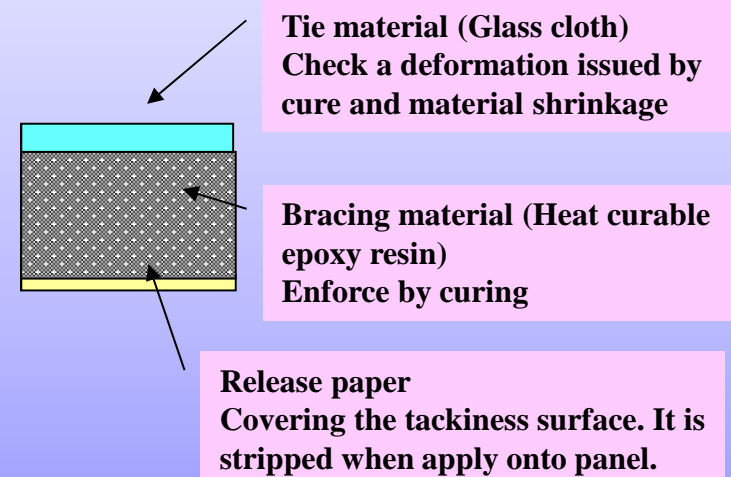
### The application process of existing sheet metal stiffener (Die cut type)



### The examples of the application



### The structure of existing SS (Die cut type)



**Environmental requirement**

**⚡ Cut down CO<sub>2</sub>, & waste material**

**Automaker Requirement**

**Cut down the exhaust gas by reducing car weight: Due to decrease the steel thickness**



*Keep collision safety using high-ten steel but deteriorate the stiffness of outer panel*



*Increase the requirement of SS (Sheet metal Stiffener)*



*Existing SS (Die cut type)*

*Waste material (Release paper), Intensive working, inadequate stiffness and corrosion problem due to drop the reinforcement by poor tackiness at the pre-treatment process*



**Increasing the requirement for pumpable type**

- Cut down the waste material at line
- Reduce level of intensive working
- Ensure the application (Stiffness and anti-corrosion)

### **Cost reduction**

- \* Eliminate the labor cost due to automatic application of PSS.
- \* Eliminate the scrapping cost of the release paper for the mold stiffener.

### **Improve quality**

PSS can be applied the part needed for reinforcement exactly.

### **Weight reduction**

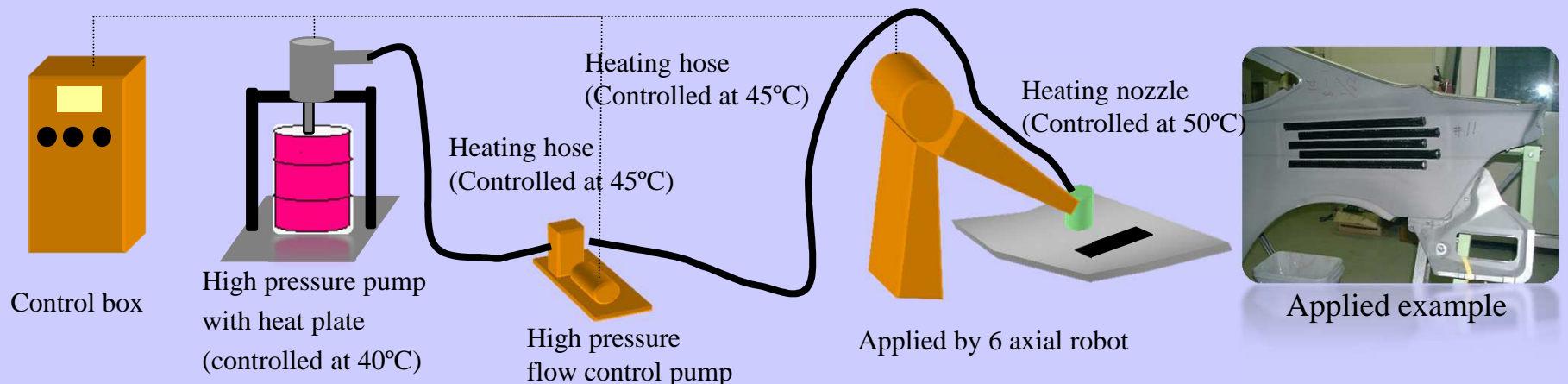
Decrease the thickness of the sheet metal with maintaining body stiffness by the use of PSS.

## Design concept of PSS (Pumpable Sheet metal Stiffener)

### The application process of PSS



### Hot apply system



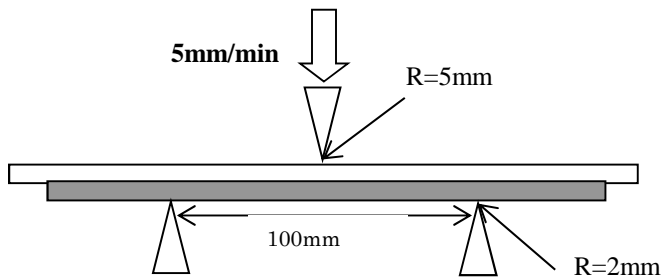
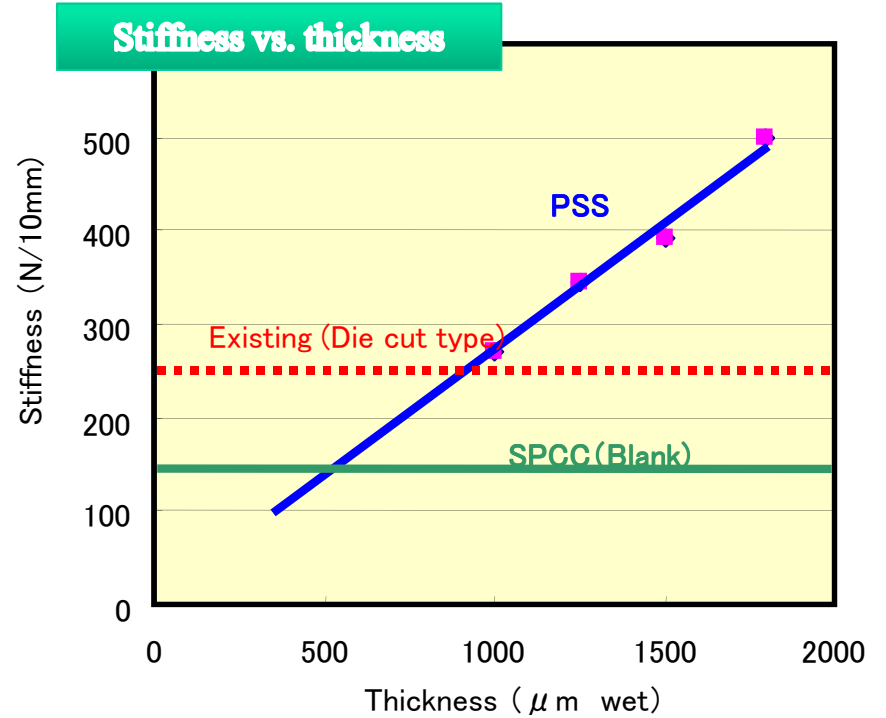
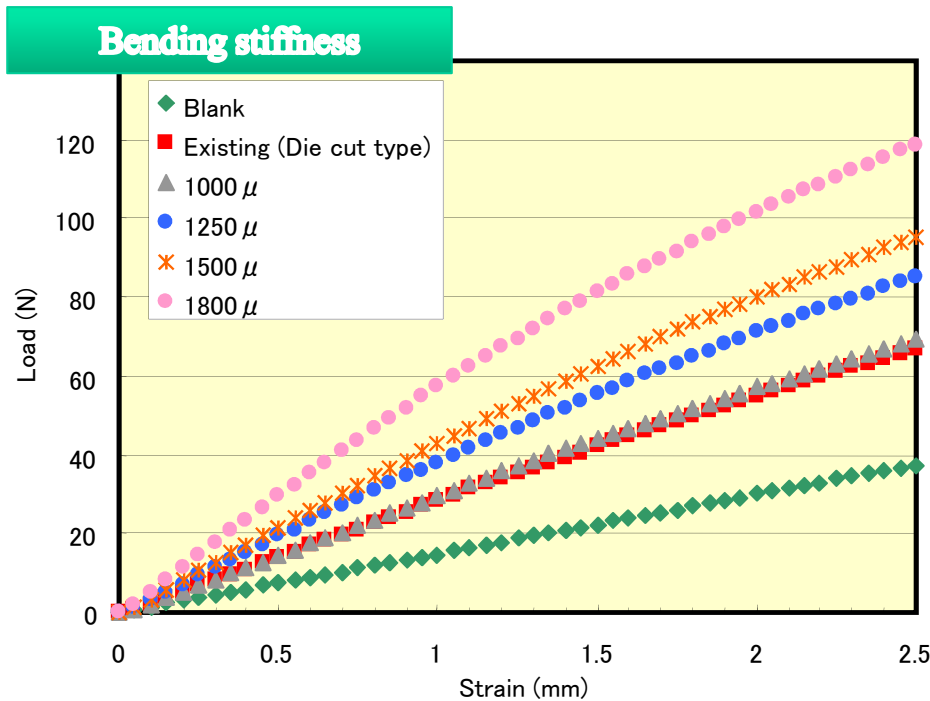
**Increase flowability due to heat the material at 45 to 50 °C. After applied, the material increase anti-shower performance due to be cooled and make higher viscosity.**

# Basic property

Item		Test condition	Requirement	Results	
Thickness of applied (mm)		Thickness gauge	-	2.0	
Non volatile matter (%)		105°Cx3hr	96 min.	99.8	
Viscosity (Pa-s)		430 sec <sup>-1</sup> @40deg-C	(60-150)	100	
Shear strength (MPa)	Standard	180deg-C x 30min.	13mm lap	-	3.0
Stiffness (N)	Standard	180deg-C x 30min.	specimen:40x150x0.8mm applied :25x150x2.0mm span of fulcrum : 100mm test speed : 5mm/min strength at 2mm displacement	60 min.	70
	Over-baking	200deg-C x 60min.			82
	Under-baking	160deg-C x 30min.			63
Anti-crash resistance	Before baking	slamming test	specimen:100x300x0.8mm applied :50x100x2.0mm	30 deg. x 1min.	Good at 90 deg.
	After baking				Good at 90 deg.
Aging property (%)		40 deg-C x 7 days	(30% max.)	+11%	
Shower resistance		50deg.-C , 0.2MPa	(Not peeling off)	Good	
Distortion (%)		specimen:200x25x0.7mm applied : 150x25x2.0mm	2 max.	< 1	

\* Test conditions have been done according to your specification for formed type DWG #6711Z-SIF0000.

## The effectiveness of the reinforcement



**Three point bending test**

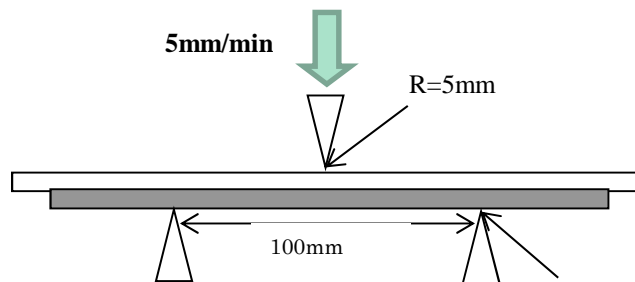
The PSS is adjustable the stiffness due to control the thickness.



## Baking Influence to Bending Stiffness

Unit: N

Temperature	Time	10min	20min	30min	60min
140°C		69	78	82	93
150°C		80	85	88	98
160°C		87	91	99	120
170°C		95	100	111	127
180°C		103	109	119	136
200°C		111	117	122	125
210°C		121	122	130	122



**Three point bending test**

- Substrate : JIS G3141 SPCC-SD 100mm×200mm×0.8mmt
- Material shape : 50mm×150mm×1.5mmt
- Baking condition : 140°C10min~210°C60min
- Distance between supporting points : 100mm
- Bending speed : 5mm/min

# Outline of the application system

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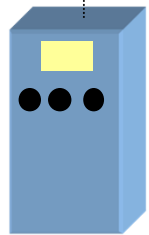
Drum Pump  
40deg.C control

Decker corp.  
SW7010  
Ratio 70:1

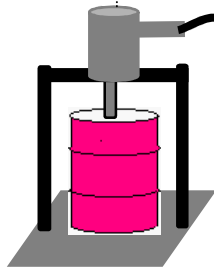
High pressure  
gun with heater  
@45 deg.C



High pressure  
are nozzle for  
air press

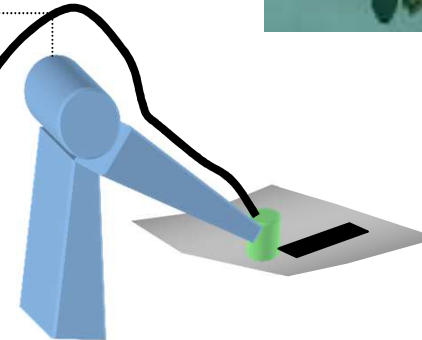


Control Box



Heated hose  
1B x 3m  
45deg. C  
control

Heated hose  
1B x 5m  
45deg. C  
control



6axis robot Capacity 20kg Yasukawa electric corp. UP-20



Rated flow pump  
Decker corp.  
Seagully

