

# STAINLESS STEEL

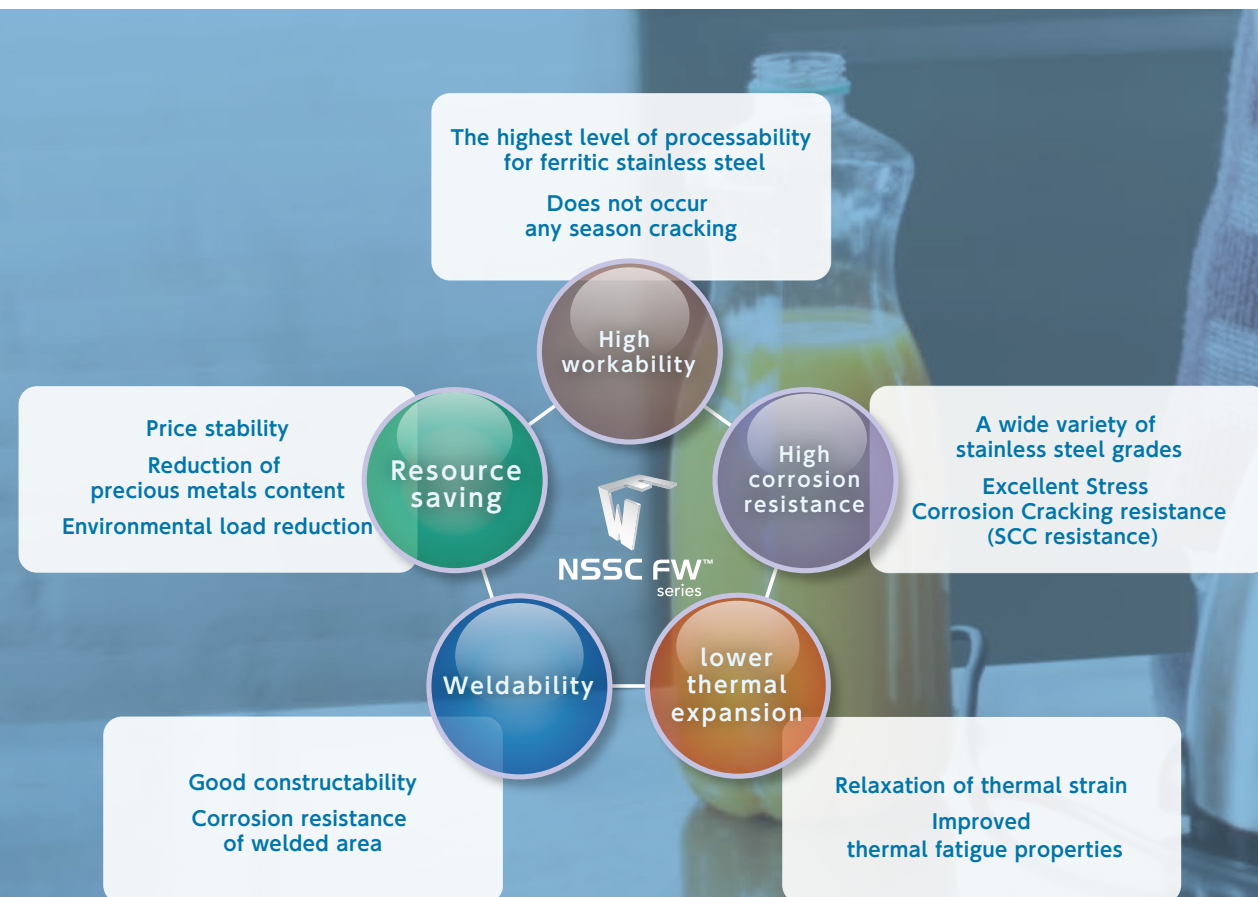
**Sn addition/Resource saving/  
High-purity ferritic stainless steel**

EXPERIENCE  
KNOWLEDGE  
INNOVATION



Cr & Ni **35%** Saving

# The world's first Sn added and Resource saving High-purity ferritic stainless steel



## Reducing precious metals by up to 35%!

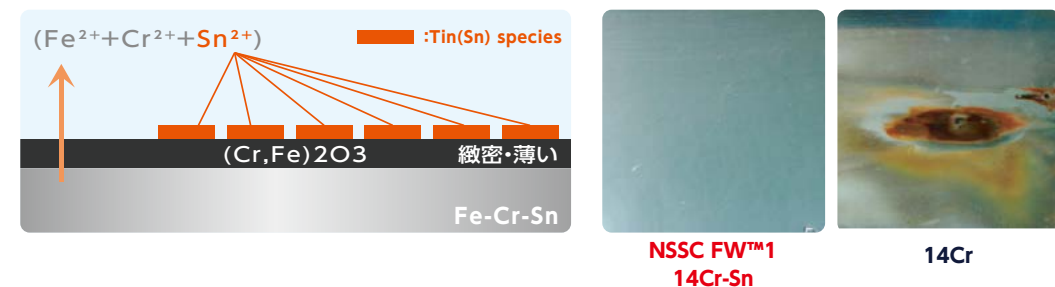
NSSC FW™ series are nickel- and molybdenum-free,  
and has significantly reduced chromium!



### Adding Tin(Sn)

By adding a small amount of Tin, the FW series shows excellent corrosion resistance even in a saltwater environment by adsorbing Tin chemical species on the surface.

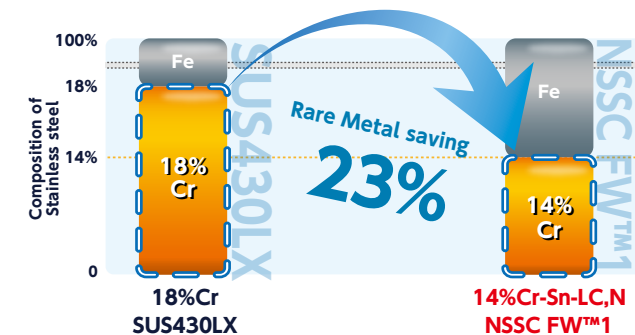
Low Cr+added Tin(Sn)



14Cr-Sn(左)と14Cr(右)で比較 (Sn添加により錆発生を抑制)

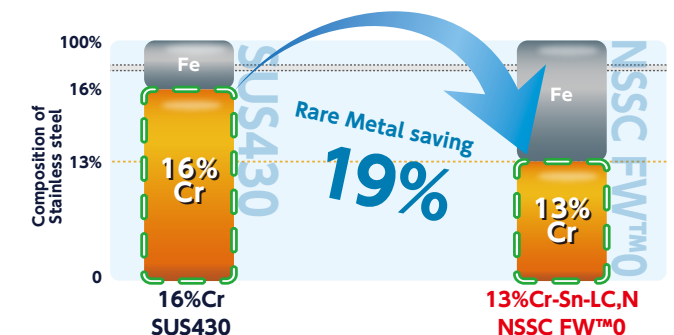
### FW1 (14Cr-Sn-LC,N)

Compared with SUS430LX, FW1 achieves 23% reduction in precious metals!



### FW0 (13Cr-Sn-LC,N)

Compared with SUS430, FW0 achieves 19% reduction in precious metals!

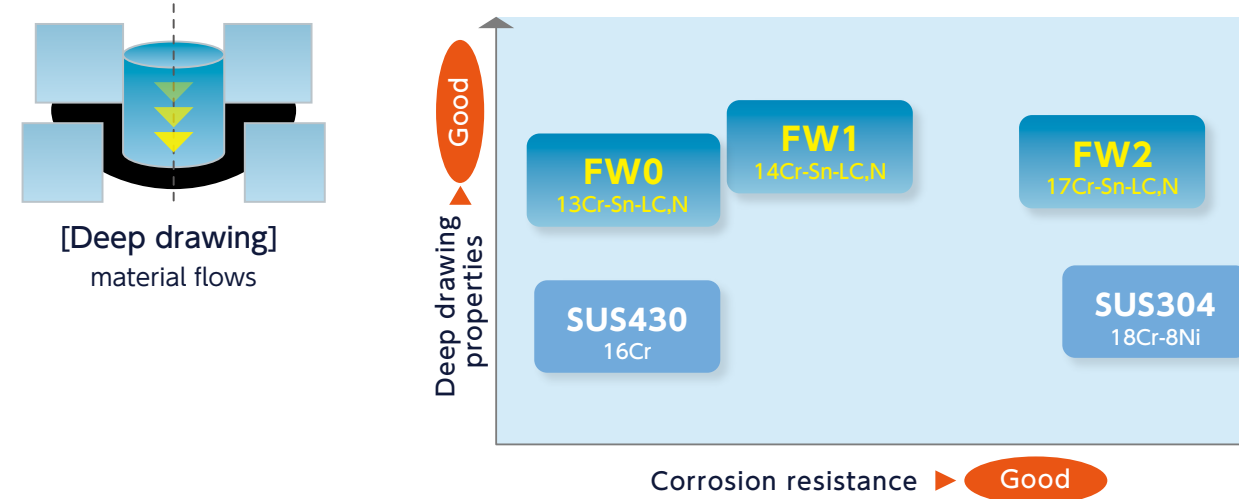


## High workability

NSSC FW™ has the highest level of workability among the ferritic grades.  
By selecting the appropriate process conditions,  
it is possible to perform equivalent level of forming processing as of SUS304.

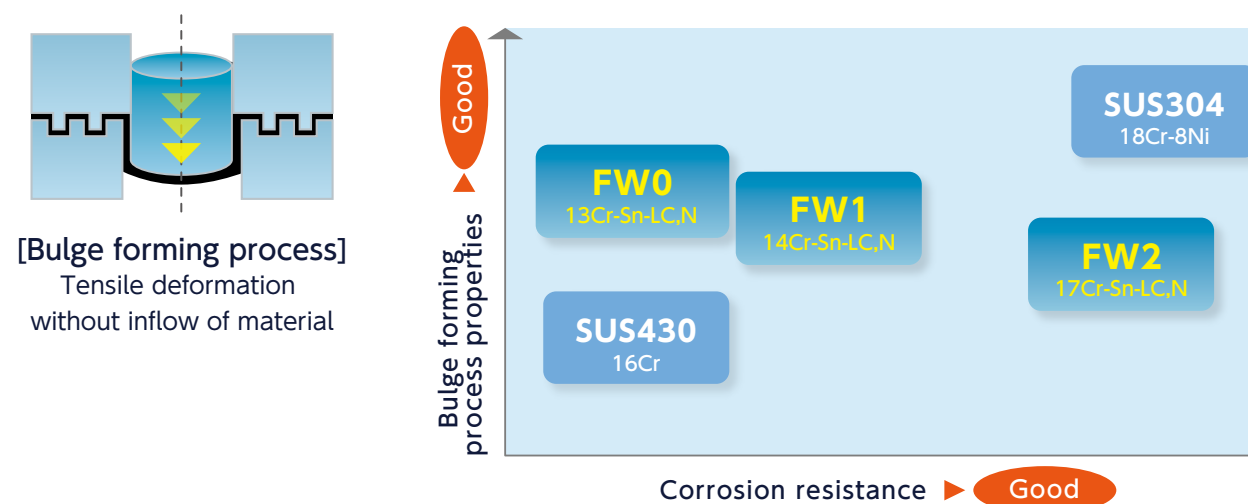
### Deep drawing properties

A processing method in which a material is forced into a die (concave mold) using a punch (convex mold) to form various shapes.



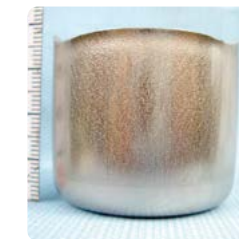
### Bulging process properties

A processing method that suppresses the inflow of material using beads(for example), and transcription the shape of the punch (convex mold) to the material for forming.  
The surface area increases as the processing progresses, but the thickness decreases.

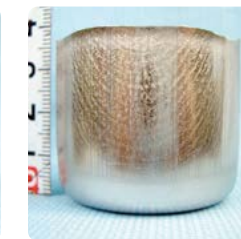


### Processing properties (thickness 0.6mm)

Maintenance after processing can be reduced as a results of less ridging.



**NSSC FW™1**  
(Single cold rolling,  
drawing ratio: 2.0)



**SUS430LX**



**NSSC FW™2** **SUS304**  
(Single cold rolling) Blank dia:  $\phi 80$ mm, Lubricant: JW#122  
Punch dia (mm): 1st  $\phi 40 \rightarrow 2$ nd  $\phi 35 \rightarrow 3$ rd  $\phi 30 \rightarrow 4$ th  $\phi 25$

|                             | Deep drawing properties |     | Bulging process properties |                                |
|-----------------------------|-------------------------|-----|----------------------------|--------------------------------|
|                             | average r-value         | LDR | n-value                    | hydraulic bulge<br>Height (mm) |
| NSSC FW™1                   | 1.7                     | 2.3 | 0.22                       | 31.5                           |
| NSSC FW™2                   | 1.7                     | 2.3 | 0.24                       | 30.5                           |
| NSSC FW™0 (thickness 0.5mm) | 1.6                     | 2.2 | 0.25                       | —                              |
| SUS430                      | 1.0                     | 2.0 | 0.16                       | 27.0                           |
| SUS304                      | 1.1                     | 2.1 | 0.42                       | 40.5                           |

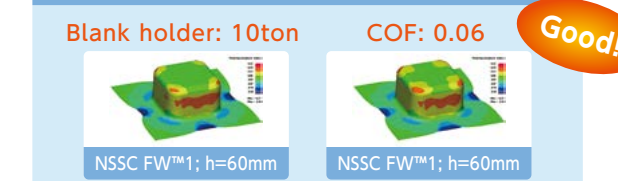
### Example of replacement solution from SUS304 to FW series

Simulation result

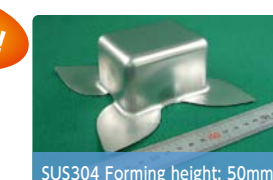


### SOLUTION

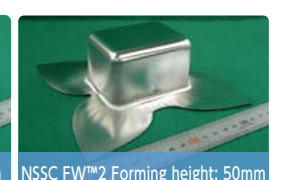
Workability comparison  
under conditions suitable for the FW series



Blank size: SUS304/150×150mm  
NSSC FW™2/175×175mm  
Thickness: 0.6mm, blank holding pressure:500kN  
Die: 82mm×62mm,rC/9mm,rd/5mm  
Punch: 80mm×60mm,rC/8mm,rp/8mm  
Lubricant: Die surface/PVC film,Punch surface/#122wax

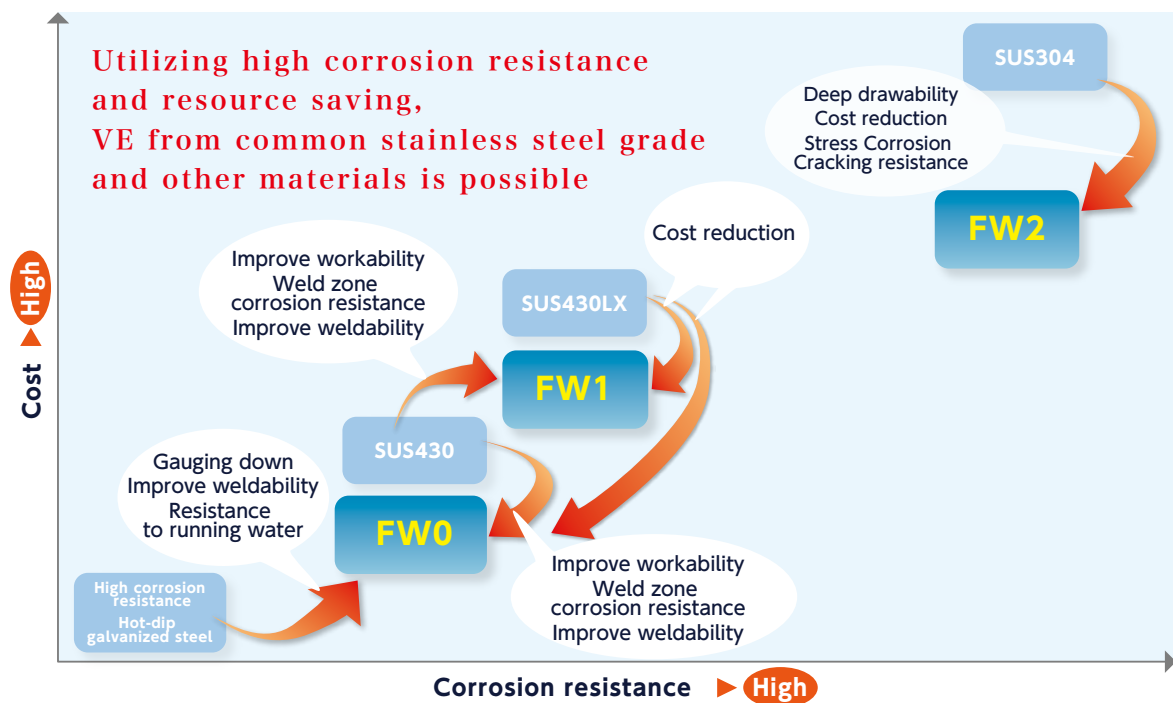


SUS304 Forming height: 50mm

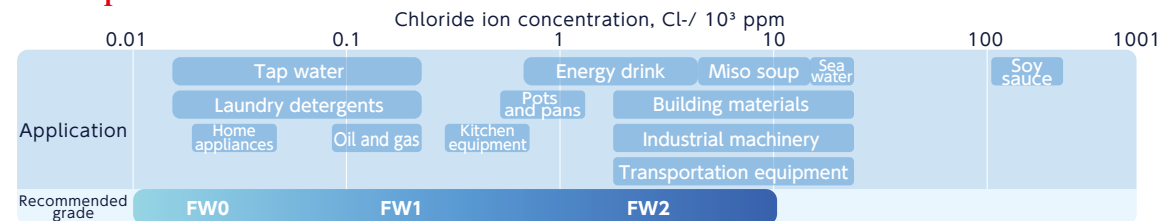


NSSC FW™2 Forming height: 50mm

## High corrosion resistance



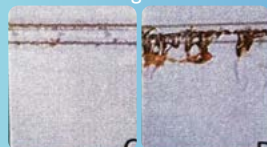
## Scope and use



## FW0

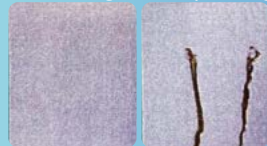
Corrosion resistance of SST is equivalent to or even higher than SUS430.

As TIG welding



NSSC FW™0 SUS430

TIG welding → #600 polishing

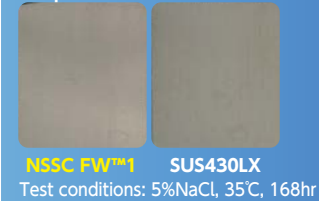


NSSC FW™0 SUS430

Test conditions: 5%NaCl, 35°C, 24hr

## FW1

Corrosion resistance of SST is equivalent to SUS430LX



NSSC FW™1 SUS430LX

Test conditions: 5%NaCl, 35°C, 168hr

Corrosion resistance including welded area is significantly superior compare to SUS430

TIG welding → #600 polishing



NSSC FW™1 SUS430LX

Immersion conditions: 0.5%NaCl, 80°C, 168hrs

## FW2

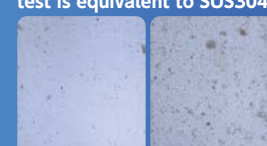
Corrosion resistance of MST is equivalent to SUS304



NSSC FW™2 SUS304

Test Conditions: 0.5%NaCl+2%H<sub>2</sub>O<sub>2</sub>, 35°C, 24hr

Corrosion resistance in exposure test is equivalent to SUS304.



NSSC FW™2 SUS304

Appearance of samples exposed for 2 years in Okinawa

## Technical data

## FW2 (17Cr-Sn-LC,N)

## Specification

## Mechanical properties

|                      | 0.2% proof stress (N/mm <sup>2</sup> ) | tensile strength (N/mm <sup>2</sup> ) | elongation (%) | Hardness (HV) |
|----------------------|----------------------------------------|---------------------------------------|----------------|---------------|
| Specification        | ≥205                                   | ≥390                                  | ≥25            | ≤200          |
| Representative value | 279                                    | 463                                   | 32             | 144           |

Surface Finish: No.2B, Thickness: 0.6mm

## reference

|        |     |     |    |     |
|--------|-----|-----|----|-----|
| SUS304 | 297 | 675 | 61 | 173 |
|--------|-----|-----|----|-----|

## Physical properties

## Measured results

| Item                            | Unit                                    | value | reference      |
|---------------------------------|-----------------------------------------|-------|----------------|
| Density                         | kg/mm/m <sup>2</sup> (room temperature) | 7.70  | SUS304<br>7.93 |
| Specific electrical resistivity | 10-8Ωm (room temperature)               | 54    | 72             |
| Specific heat                   | kJ/kg/°C (0~100°C)                      | 0.48  | 0.50           |
| Heat conductivity               | W/m/°C (100°C)                          | 25.6  | 16.3           |
| Heat expansion coefficient      | 10-6/°C (room temperature to 100°C)     | 10.8  | 16.9           |
| Longitudinal elastic modulus    | kN/mm <sup>2</sup>                      | 211   | 193            |

## FW1 (14Cr-Sn-LC,N)

## Specification

## Mechanical properties

|                      | 0.2% proof stress (N/mm <sup>2</sup> ) | tensile strength (N/mm <sup>2</sup> ) | elongation (%) | Hardness (HV) |
|----------------------|----------------------------------------|---------------------------------------|----------------|---------------|
| Specification        | ≥175                                   | ≥360                                  | ≥28            | ≤180          |
| Representative value | 260                                    | 420                                   | 35             | 130           |

Surface Finish: No.2B, Thickness: 0.6mm

## reference

|          |     |     |    |     |
|----------|-----|-----|----|-----|
| SUS430LX | 296 | 436 | 32 | 144 |
|----------|-----|-----|----|-----|

## Physical properties

## Measured results

| Item                            | Unit                                    | value | reference        |
|---------------------------------|-----------------------------------------|-------|------------------|
| Density                         | kg/mm/m <sup>2</sup> (room temperature) | 7.70  | SUS430LX<br>7.70 |
| Specific electrical resistivity | 10-8Ωm (room temperature)               | 51    | 60               |
| Specific heat                   | kJ/kg/°C (0~100°C)                      | 0.49  | 0.46             |
| Heat conductivity               | W/m/°C (100°C)                          | 26.6  | 26.4             |
| Heat expansion coefficient      | 10-6/°C (room temperature to 100°C)     | 10.8  | 10.4             |
| Longitudinal elastic modulus    | kN/mm <sup>2</sup>                      | 217   | 200              |

## FW0 (13Cr-Sn-LC,N)

## Specification

## Mechanical properties

|                      | 0.2% proof stress (N/mm <sup>2</sup> ) | tensile strength (N/mm <sup>2</sup> ) | elongation (%) | Hardness (HV) |
|----------------------|----------------------------------------|---------------------------------------|----------------|---------------|
| Specification        | ≥175                                   | ≥360                                  | ≥28            | ≤160          |
| Representative value | 253                                    | 449                                   | 32             | 144           |

Surface Finish: No.2B, Thickness: 0.5mm

## reference

|        |     |     |    |     |
|--------|-----|-----|----|-----|
| SUS430 | 308 | 516 | 26 | 155 |
|--------|-----|-----|----|-----|

## Physical properties

## Measured results

| Item                            | Unit                                    | value | reference      |
|---------------------------------|-----------------------------------------|-------|----------------|
| Density                         | kg/mm/m <sup>2</sup> (room temperature) | 7.70  | SUS430<br>7.70 |
| Specific electrical resistivity | 10-8Ωm (room temperature)               | 51    | 57             |
| Specific heat                   | kJ/kg/°C (0~100°C)                      | 0.49  | 0.46           |
| Heat conductivity               | W/m/°C (100°C)                          | 26.6  | 24.2           |
| Heat expansion coefficient      | 10-6/°C (room temperature to 100°C)     | 10.8  | 11             |
| Longitudinal elastic modulus    | kN/mm <sup>2</sup>                      | 217   | 200            |

## Application example



01

- 01. Cabinet (FW1)
- 02. Knife cutting board sterilizer (FW1)
- 03. Large kitchen bat (FW2)
- 04. Kitchen sink (FW1)
- 05. Refrigerator door (FW1)
- 06. Grill plate (FW0)
- 07. Water tank (FW2)
- 08. Tumbler (FW2)
- 09. Washing tub (FW1)



02



03



04



05



06



07



08



09

- 10. IH rice cooker (FW2)
- 11. Folding container (FW0)
- 12. Crystallizing dish (FW1)
- 13. Chimney (FW0)
- 14. Elevator lining (FW1)
- 15. Vacuum packaging machine (FW1)
- 16. Bread making equipment (FW1)
- 17. Garbage storage box (FW2)



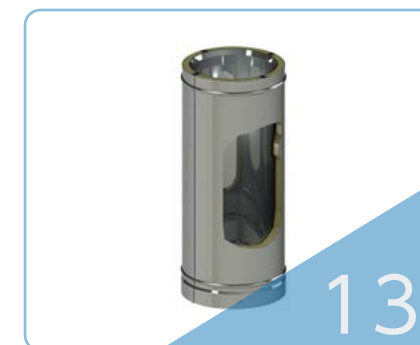
10



11



12



13



14



15



16



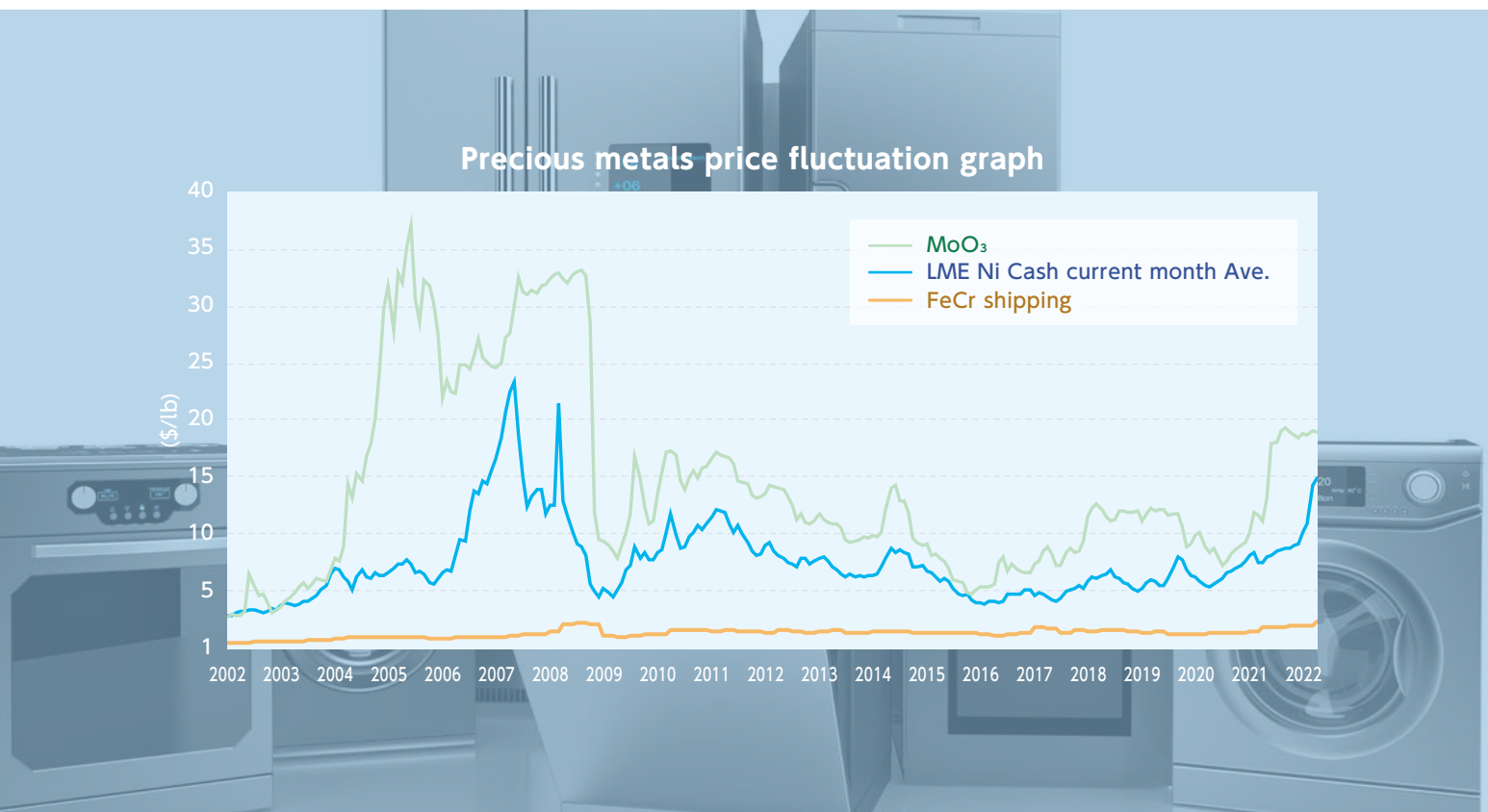
17



## Price stability

### Price trends of raw materials : chromium, nickel, molybdenum

FW series restrain the cost and have a great price stability by thorough resource saving (no nickel/molybdenum added, reduced chromium) and minimizing the impact of fluctuations of raw material price.



## Award

2010 Nikkei Excellent ProductService Award/Best Award  
Nikkei Business Daily Award

2012 The Japan Institute of Metals and Materials  
Technical Development Award

2012 Monozukuri Nippon Grand Award Prime Minister's Award

# STAINLESS STEEL



Creating the future  
one step ahead

NSSC FW

Search

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